

## THE STATE OF UTILIZATION OF WATER RESOURCES OF THE REPUBLIC OF ARMENIA AND RELATED ISSUES

A.Kh. Markosyan<sup>1,2</sup>, H.V. Tokmajyan<sup>2</sup>, E.N. Matevosyan<sup>1</sup>, V.G. Khachaturyan<sup>1</sup>

<sup>1</sup> Yerevan State University

<sup>2</sup> Shushi University of Technology

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*The current state of development of the events shows that the fight for the use of water resources and other resources will intensify both in the world and in the Republic of Armenia which can be compared to the fierce struggle for hydrocarbon fuel. We note only one difference. If oil has substitutes and activities for the wider use of alternative fuels do not stop, then water remains the only and exclusive resource that is not replaced by another alternative. Under such conditions, the issues of water use and conservation become increasingly urgent which are particularly important in the Republic of Armenia as it is impossible to develop the economy without water resources as well as to meet the growing demands of the population for this indispensable resource.*

**Key words:** water resources, water crisis, water offer and demand, water intake, water utilization, surface and underground water resources, regenerating water resources.

### Introduction

In almost all countries around the world issues about water utilization are very significant so most states have both short-term and long-term strategies for using them. The Republic of Armenia is included in a group of countries with a high level of water crisis according to the current classification of water resource crises which obliges to pay more attention to identifying ways of increasing the efficiency of utilization of water resources in the republic both today and in the future.

### Conflict setting

The authors cover a brief description of the RA water resources, the general picture of water distribution and water utilization, freshwater renewable resources, water losses and other indicators characterizing the utilization of water resources presenting the economic potential which can make possible the exporting of water. From this point of view, it was important to identify export-related issues and discuss ways to solve them.

By World Resource Institute which investigates the natural resources (water, energetics, forestry etc) and climatic changes, the data on provision of water supplies of all the countries of the world had been published which definitely vary from the visions about water resources of RA existing up to now. The researchers of the institute underline that particularly water crises become usual and typical to many countries about which such approaches have not been formed yet.

The causes of the water crises are not only limited by droughts but are also due to increased demand for water around the world noting that demand has more than doubled since the 1960s.

Researchers from all countries of the world have been divided into five groups classified by the severity of crises of water resource. Thus, in 17 countries which are in extreme crisis (12 of which are the Middle East and North African countries), one quarter of the world population lives and in average each year 80% of available water resources of those countries is produced for irrigated agriculture, industry and domestic use.

The other group consisting of twenty-seven countries, including the Republic of Armenia, is characterized as a group of countries with a high level of water crisis where each year more than 40% of available water resources is produced. The countries with the highest water resource crisis are: Chile, Cyprus, Yemen, Andorra, Morocco, Belgium, Mexico, Uzbekistan, Greece, Afghanistan, Spain,

Algeria, Tunisia, Syria, Turkey, Albania, Armenia, Burkina-Fasone, Jibuty, Namibia, Kyrgyzstan, Niger, Nepal, Portugal, Iraq, Egypt and Italy where one third of the world's population live together.

Other countries are grouped in this way:

- Countries having higher than average rate of water crisis where 24 countries are included (among them China, Kazakhstan, Tajikistan and Azerbaijan),
- Countries having lower than average rate of water crisis where 32 countries are included (among them the USA, Ukraine, Georgia, the Russian Federation and Moldova),
- Countries having low rate of water crisis where 64 countries are included (among them Canada, Finland, Norway, New Zealand, Belarus) [1].

The global crisis of water resources has many impacts on livelihoods and economies of people posing serious threats to the lives, living standards and sustainable operation of economic entities. With the increase in population and the socio-economic development of countries, demand for water tends to increase while climate change makes precipitation, weather forecasting and the formation of renewable water resources more unpredictable.

The survey by World Resource Institute also identifies the main ways to overcome the water crisis. First of all, the focus should be on increasing the efficiency of agriculture which means that every amount of water should support the growth of plants. In particular, the main emphasis may be on the use of such seeds that require less water and the use of irrigation systems that allow the use of the exact amount of water required without overcrowding and wasteful flooding of cultivated areas. In order to have an efficient agriculture, it is also important to make capital investments aimed at increasing water productivity.

The second direction which is mentioned by the specialists of the institute, is the investments in “gray” and “green” infrastructures. The analysis also shows that the indicators of the water resource crisis can vary greatly throughout the year. “Green” infrastructure built in the form of new pipelines and treatment plants can simultaneously solve issues of both water supply and water quality.

Water recycling and re-utilization is the third area that will help to cope with the water crisis. Recommendations in this regard are to treat wastewater as a “new” source of water after recycling [1].

Among the factors contributing to the socio-economic development of any country including labor, capital and entrepreneurial experience and skills are the importance of both natural resources and conditions and their inclusion in the economic circulation and the efficient management and organization of these processes.

Moreover, it is possible to achieve the improvement of such important indicators characterizing the level of development of the country as national wealth, which, being one of the main macroeconomic indicators, essentially describes the level of capitalization of the economy of the country. It is currently characterized by four components - manufactured, natural, human capital and the dimension of net external assets. It is sufficient to note that according to World Bank estimations, national wealth was totally US \$ 52894 per capita including 15451 produced capital, 12702 natural capital, 27329 human capital and US \$ -2588 net assets [2, p. 226-233].

The negative dimension of trade balance was characteristic for all the years of the third Republic of Armenia. Thus, the export of Armenia amounted to USD 270,9 million in 1995, import - USD 673,9 million, the negative balance of foreign trade amounted to -403,0 million USD. In 2000 these figures were like this: exports - \$ 300,5 million, imports - \$ 884,7 million and the negative balance - \$ 584,2 million, in 2005 – 973,9, 1801,7 and -827,8, in 2010 – 1041,1, 3748,9 and -2707,8, in 2015 – 1485,3, 3239,2 and -1753,9, in 2016 – 1791,7, 3273,5 and -1481,8 respectively. In 2018 exports amounted to \$ 2412,4 million, imports - \$ 4975,5 million and negative balance - \$ 2563,1 million [3].

The negative balance of foreign trade led to the negative balance of payments balance of the republic which led to the increase of the external debt of the Republic of Armenia (which amounted to USD 5536,4 million in 2018) [3], whose further increase is due to serious socio-economic and political problems.

Taking into account the above mentioned and many other circumstances, it is important to identify and use new sources of revenue growth in the country among which we believe that water resources are important. And if we notice that a significant portion of these resources are not used in the country and are flowing to neighboring countries, then it will become clear that one of the most valuable natural resources in the world, water, is “exported” from the country at zero cost. If in the basis of the exchange value of any commodity the consumption value of that commodity is primarily (but not exclusively) set, then water is the only commodity that is indispensable (as opposed to, for example, oil that can be replaced by many other alternatives).

### Research results

**Brief description of water supplies of the Republic of Armenia.** Water resources of Armenia are formed mainly from the regional atmospheric precipitation and from the water flows of border rivers the Araks and the Akhuryan. Though most part of researchers has one opinion on the sources of formation of water resources of Armenia, however, various dimensions are presented during the estimation of their storages [4, p. 45, 5, p. 27 and 34, 6, 7, 8, p. 84 and 278, 9, 10, p. 63-67, 11].

Even for an index such as the average long term surface water flow which is relatively stable (determined on the basis of averaged data of 75–80 years), the conclusions are very different. There are also significant differences between the indices of groundwater characterization, in particular, in terms of the use of their storages (or, as previously assumed, “operation”). Thus, water resources (both surface and underground) are estimated to range from 11,7 km<sup>3</sup> to 9,0 km<sup>3</sup> and even 7 km<sup>3</sup>, respectively [12, p. 59].

Average annual precipitation in Armenia was 592 mm. and in 2017 it was 481,0 mm in 1961-1990. (The 2017 precipitation deviation was – 111,0 mm compared to that of 1961-1990) [13, p. 118]. Unlike 2017 and 2018, such deviation has had a positive effect. The average annual precipitation was 606,3 mm. in 2018 which is 14,3 mm higher than the long term norm of 1961-1990 [14, p. 132].

Over 80% of the total river flow is formed (excluding Lake Sevan) in the Republic of Armenia. Much of the leftover surface flow forms the transit flow of border rivers of the Araks and the Akhuryan [15, p. 5]. Borderline river influx is estimated equally as 0,9 billion cubic meters per year. The difference between groundwater influx and outflow is positive, about 0,1 billion cubic meters per year. The current evaporation is 11,5 billion cubic meters and the continuous flow of inner rivers is 6,3 billion cubic meters. The renewing storages of surface waters comprise 7,2 billion cubic meters per year. About 2,3 billion cubic meters of this water are used (originally 4 billion cubic meters), 2 billion cubic meters of which (previously 3 billion cubic meters) are used for irrigation and provision for other production areas and 430,0 million cubic meters (previously 550 million cubic meters) for drinking and domestic purposes [16, p. 5-6].

The study of the data in Table 1 allows to observe the above-mentioned patterns summarizing of which we can note that all indicators of water intake and water utilization decreased in 2018 compared to 1990 with the total volume of water intake by 31,1%, water intake from groundwater sources decreased by 10,1%, total water use by 44,9%, drinking and domestic water use by 70,8%, water utilization for industrial, utility and construction purposes by 65,2% and water utilization in agriculture, fish production and forestry by 34,9 %.

**Table 1**

**Water intake and water utilization in the Republic of Armenia in 1990-2018, mln. cube meters**

	1990	1995	2000	2005	2010	2015	2016	2017	2018
1	2	3	4	5	6	7	8	9	10
Water intake, totally	3942.0	2531.0	1871.2	2770.6	2126.4	3271.7	3181.9	2865.4	2714.4
Among them from underground waters	1325.4	851.0	533.0	803.0	1005.2	1304.4	1136.3	1154.5	1191.6

1	2	3	4	5	6	7	8	9	10
Totally used water	3497.0	1478.0	1046.0	1905.0	1341.2	2533.1	2470.0	2040.0	1926.5
Including for needs									
Drinking *	634.0	527.0	107.0	69.0	67.1	96.5	107.7	107.6	185.1
Industry, household and construction	406.0	209.0	42.0	70.0	121.4	153.3	145.4	225.2	141.4
Agriculture, fish industry and forestry	2457.0	742.0	897.0	1766.0	1152.7	2283.3	2216.8	1707.2	1600.0

\* Up to 2000 included for drinking and domestic needs

Source by data base of RA statistical service of the department of “Water resources”, statistical annual of Armenia of 2019, RA Statistical committee, 2019, p. 216, RA Statistical committee, 2011, RA NSS, 2011, p. 217, statistical annual of Armenia of 2007, RA NSS, 2007, p. 190, statistical annual of Armenia of 2002, RA NSS, 2002, p. 217, statistical annual of Armenia of 2001, RA NSS, 2001, p. 173, statistical annual of Armenia of 1993-1994, RA NSS, (<https://www.armstat.am/am/?nid=586&year=1994>), p. 69

Table 2 presents the data on renewable freshwater resources in the Republic of Armenia for the years 1990-2018 as well as the average values of long term observations which can be compared with the deviations for each year from the “normal” values.

**Table 2**

**The renewing resources of freshwater in RA in 1990-2018, the rates, mln. cube meters**

	Average long term values	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007
Precipitation	16710	15794	15407	11264	12516	17761	18595	15287	18714	16658	19221
Summative evaporation	9851	10426	10526	9032	9750	10930	10997	10531	11320	11081	11367
Influx	6859	5368	4881	2232	2766	6831	7598	4756	7394	5577	7854
Surface and underground influx	910	1442	1189	641	557	1062	1086	1546	1063	1157	1513
Renewing water resources	7769	6810	6070	2873	3323	7893	8684	6302	8457	6734	9367

Continued

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Precipitation	13378	17713	19447	19579	15997	16310	16493	18506	19012	14335	18059
Summative evaporation	9840	10674	12549	11066	10816	10773	11432	12827	12928	10382	12120
Influx	3538	7039	6898	8512	5181	5537	5061	5678	6084	3953	5939
Surface and underground influx	901	1294	1783	773	641	842	471	763	798	710	632.4
Renewing water resources	4439	8333	8681	9285	5822	6379	5532	6441	6882	4663	6571

Information source by data base of the department of “Water resources” of RA statistical committee

### The current state of utilization of water supply of the Republic of Armenia

Data of freshwater intake and water utilization (by classification of economic activity) studied in 2011-2018 in the RA shows that water intake increased by 11,3% in 2018 compared to 2011 (from 2438,3 million m<sup>3</sup> in 2011 to 2714,4 million m<sup>3</sup> in 2018). The largest volume of water intake was observed in 2015 – 3271,7 million cubic meters. A study of water utilization indicators shows that it increased by 10,8% in 2018 compared to 2011 (from 1738,1 million cubic meters in 2011 to 1926,5 million cubic meters in 2018) and the highest rate of water utilization was also in 2015 – 2533,1 million cubic meters (Table 3).

According to classification of economic activity the largest water intake implementers were the spheres of water supply, sewerage, waste management and recycling with a share of total water intake from 65,8% in 2011 decreasing to 70,7% in 2018 with water utilization indicators comprising 9,5% and 12,3% respectively. Irrigation occupies the first place in the water utilization index with the share of total water use rate reaching 49,3% from 2011 to 55,3% in 2018. The water intake and water utilization for the purpose of fish industry is also significant, the water intake for these purposes was only 20,5% in 2011 and 18,1% in 2018 and water utilization 28,7% and 25,4% respectively (Table 3).

**Table 3**  
**Freshwater intake and utilization (according to the types of economic activities) in 2011-2018, mln. m<sup>3</sup>**

	2011		2012		2013		2014		2015		2016		2017		2018	
	Intake	Utilization	Intake	Utilization	Intake	Utilization	Intake	Utilization	Intake	Utilization	Intake	Utilization	Intake	Utilization	Intake	Utilization
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Total RA	2438.3	1738.1	2941.2	2187.2	2955.1	2089.1	2860.5	2112.8	3271.7	2533.1	3181.9	2470.0	2865.4	2040.0	2714.4	1926.5
Agriculture, forestry and fish industry	627.5	1367.7	790.9	1793.2	1362.8	1845.9	921.3	1748.1	1097.7	2269.9	896.6	2191.6	961.4	1751.6	660.4	1553.8
Irrigation	127.5	867.7	178.7	1181.1	561.1	1044.5	224.9	1051.7	357.6	1519.1	227.3	1522.3	446.3	1236.6	167.8	1064.6
Forestry	0.3	0.2	0.4	0.4	0.6	0.5	0.5	0.5	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0
Fishing/ fish industry	499.7	499.7	611.8	611.7	801.1	800.9	695.9	695.9	740.1	750.1	669.3	669.3	515.1	515.0	492.6	489.2
Mining industry and open mine exploitation	54.9	54.9	152.3	152.2	58.4	58.3	101.9	133.8	44.0	88.1	81.6	81.5	83.9	83.9	84.0	84.0
Processing industry	93.6	9.4	45.9	4.5	41.7	4.1	38.0	4.2	41.1	4.2	5.9	6.0	7.7	7.7	17.1	17.1
Electricity, gas, steam and good quality electricity provision	40.9	38.3	33.5	32.1	23.1	22.2	27.9	27.8	24.2	24.2	21.6	21.4	27.2	27.2	28.9	28.9
Water supply, sewage, waste management and recycling	1603.2	165.4	1902.3	147.6	1456.8	113.1	1744.2	147.8	2060.7	119.1	2166.0	123.2	1747.7	132.1	1919.1	237.8
Water supply (water collection, processing, distribution)	1602.0	164.3	1902.2	147.4	1444.9	111.2	1743.8	147.5	2050.7	97.2	2165.7	122.7	1744.4	128.8	1805.7	124.4

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
from which for irrigation	1017.7	-	1317.6	-	927.9	-	1221.7	-	1574.9	-	1645.9	-	1165.2	-	1221.6	-
Construction	0.7	0.7	0.5	0.5	0.2	0.2	4.7	4.7	0.1	0.1	0.1	0.1	3.6	3.6	0.2	0.2
Other types of economic activity	17.4	101.7	15.8	57.1	12.2	45.3	22.5	46.4	3.2	27.5	10.1	46.5	33.9	33.9	4.7	4.7
GDP, mln. USD (PPP, equivalent value, 2011)	-	20192.6	-	21646.5	-	22360.8	-	23165.8	-	23907.1	-	2395.9	-	25751.6	-	27090.6
Water utilization by GDP 1000 USD (PPP, purchasing value, 2011), mln.m <sup>3</sup> /1000 USD	-	86.1	-	101.0	-	93.4	-	91.2	-	106.0	-	103.1	-	79.2	-	71.1

Information by data base of RA statistical committee «Water resources» department

Citation <http://armstatbank.am/pxweb/hy/ArmStatBank/?rxid=002cc9e9-1bc8-4ae6-aaa3-40c0e377450a>

The dimension of the indicator of water utilization depends on the technological as well as anthropogenic and other factors of individual types of economic activity. Table 4 presents the water utilization of the Republic of Armenia in 2015-2018 by main economic activity types of water utilization. From the above mentioned data it follows that water utilization for 1000 AMD of GDP of Armenia in 2015-2018 differ significantly from each other. Thus, if the index in 2018 was the highest in the water supply, sewage, waste management and recycling sector comprising 8,10 and for certain types of activity it stood around 0,0 in construction and in recycling industry it comprised about 0,03. Totally, the water utilization for 1000 AMD of GDP produced in the RA comprised 0,32 m<sup>3</sup> in 2018 and it decreased (0,50) compared to 2015 while the average for the years studied (2015-2018) was 0,42 m<sup>3</sup>.

**Table 4**

**Water utilization for 1000 AMD in RA GDP in 2015-2018 according to main types of economic activities of water users**

	GDP, mln. AMD				Water utilization, mln. m <sup>3</sup>				Water utilization for 1000 AMD of GDP (current prices), m <sup>3</sup> /1000 AMD				
	2015	2016	2017	2018	2015	2016	2017	2018	2015	2016	2017	2018	Average 2015-2018
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Agriculture, forestry and fish industry	868,671.0	830,553.4	834,354.6	822,444.4	2,533.1	2,470.0	2,040.0	1,926.5	2.92	2.97	2.45	2.34	2.67
Mining industry and open mine exploitation	107,717.5	130,835.2	185,510.3	173,213.2	88.1	81.5	83.9	84.0	0.82	0.62	0.45	0.48	0.59
Processing industry	464,325.5	521,153.4	591,568.3	679,030.0	4.2	6.0	7.7	17.1	0.01	0.01	0.01	0.03	0.01
Electricity, gas, steam and good quality air provision	231,279.0	227,107.8	226,849.4	220,860.0	24.2	21.4	27.2	28.9	0.10	0.09	0.12	0.13	0.11

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Water supply, sewage, waste management and recycling	19,223.5	23,795.6	27,839.0	29,340.4	119.1	123.2	132.1	237.8	6.20	5.18	4.75	8.10	6.06
Construction	474,107.0	393,176.4	404,402.7	397,824.6	0.1	0.1	3.6	0.2	0.00	0.00	0.01	0.00	0.00
Other types of economic activities	2,878,309.7	2,940,671.7	3,293,969.0	3,682,345.5	27.5	46.5	33.9	4.7	0.01	0.02	0.01	0.00	0.01
Total (gross domestic product or water utilization)	5,043,633.2	5,067,293.5	5,564,493.3	6,005,058.1	2,533.1	2,470.0	2,040.0	1,926.5	0.50	0.49	0.37	0.32	0.42

Source by statistical annual of Armenia 2019, p. 236, 247-248, data base of RA statistical committee «Water resources»

Citation by <http://armstatbank.am/pxweb/hy/ArmStatBank/?rxid=002cc9e9-1bc8-4ae6-aaa3-40c0e377450a>

Let us note that freshwater of Armenia differs with its high quality and part of it being «formed» contain those useful mineral substances necessary for human beings (Table 5).

**Table 5**

**Freshwater intake (surface and underground),  
according to their indicators and years, mln. m<sup>3</sup>**

	1990	1995	2000	2005	2010	2015	2016	2017	2018
1. Water intake (Totally 2+3), mln.m <sup>3</sup>	3942.0	2531.0	1871.2	2770.6	2126.4	3271.7	3181.9	2865.4	2714.4
2. Water intake from surface springs, mln. m <sup>3</sup>	2616.6	1680.0	1338.2	1967.6	1250.6	1967.3	2045.6	1710.9	1522.8
3. Water intake from underground springs, mln.m <sup>3</sup>	1325.4	851.0	533.0	803.0	875.8	1304.4	1136.3	1154.5	1191.6
4. Renewing water resources, mln.m <sup>3</sup> annually	7769.0	6070.0	2873.0	8457.0	8681.0	6441.0	6882.0	4663.0	6571.4
5. The index of exploitation of water resources (WREL), %	50.7	32.6	24.1	35.7	27.4	42.1	41.0	36.9	34.9

Source by data base of RA statistical committee «Water resources»

Citation <http://armstatbank.am/pxweb/hy/ArmStatBank/?rxid=002cc9e9-1bc8-4ae6-aaa3-40c0e377450a>

**Losses of water resources**

The study of statistical data shows that there are still significant losses of water resources in the Republic of Armenia. It should be noted that the water losses in 2011-2018 did not decrease but increased reaching from 700,1 million cubic meters in 2011 to 787,9 million cubic meters in 2018. The highest loss was in 2013 (866,0 million cubic meters). In other words, if in 2011 the loss of water resources to total water intake (2438,3 million cubic meters) was 28,7%, then in 2018 it comprised 29,0%. In terms of storage the largest loss of water resources was recorded in the water supply, sewerage, waste management and recycling sectors where the share of total losses was 99,6% in 2011 and 95,8% in 2018 (Table 6).

Table 6

**Water losses (according to the types of classification of economic activities)  
in 2011-2018, mln. m<sup>3</sup>**

	2011	2012	2013	2014	2015	2016	2017	2018
Total RA	700.1	754.0	866.0	747.4	738.6	711.9	825.4	787.9
Agriculture, forestry and fishing	0.1	0.1	0.2	0.2	0.0	0.0	0.0	33.1
Irrigation	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Forestry	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0
Fishing /fish industry	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Mining industry and open mine exploitation	0.0	0.1	0.1	0.1	0.0	0.1	0.0	0.0
Processing industry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electricity, steam, gas and good air provision	2.5	1.4	0.9	0.0	0.0	0.2	0.0	0.0
Water supply, sewage, waste management and recycling	697.5	752.4	864.8	747.1	738.6	711.7	825.4	754.8
Water supply (water collection, processing, distribution)	697.5	752.4	854.8	747.1	738.5	711.7	825.4	754.8
Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other types of economic activity	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source by data base of RA statistical committee «Water resources»

Citation <http://armstatbank.am/pxweb/hy/ArmStatBank/?rxid=002cc9e9-1bc8-4ae6-aaa3-40c0e377450a>

If we consider the coefficient of efficiency of water resources in the Republic of Armenia (water utilization ratio to water intake), then we find it appropriate to consider it at two levels: a) the rate of final water utilization in water intake; and b) the rate of final water utilization of water utilization in the territory of the Republic of Armenia (we take them as 10 km<sup>3</sup> or 10 billion cubic meters per year). In this case, we will have the following picture: in 2011, the coefficient of the efficiency of utilization of water made up for a) 71,3%, water utilization made up 1738,1 mln. m<sup>3</sup>) and for b) 17,4% and water resources loss comprised 8261,9 million cubic meters, in 2017 respectively for a) 71,2%, water utilization comprised 2040,0 million cubic meters and b) 20,4% and water resources loss comprised 7960,0 million cubic meters. The estimated utility coefficient for 2018 will be a) 71,0% , water utilization comprised 1926,5 million cubic meters and b) 19,3% and loss of water resources comprised 8073,5 million cubic meters.

In other words, every 4- 8 years (38,21 km<sup>3</sup>/7,96 km<sup>3</sup>) the Republic of Armenia “loses” one Lake Sevan. Thus, it turns out that the most expensive resource “exported” from the Republic of Armenia, fresh water is “exported” to the neighboring country at zero cost. It follows that radical reforms are needed in the country to improve the state of water utilization and increase the efficiency of utilization of water resources.

**Exporting and importing rates of natural or artificial mineral waters and soft drinks in RA.** It can be seen from the data in Table 7 that the sizes of export and import of natural or artificial mineral water and soft drinks are insignificant which does not correspond to the potential and capacity of the RA water resources. Hence there is a strong need to sharply increase the export volumes of the above mentioned products.

Table 7

**Exporting and importing rates of natural or artificial mineral waters and soft drinks in RA in 2005-2018**

Goods	Date	Export (tonne)	Export (1000 USD)	Import (tonne)	Import (1000 USD)
1. Waters (natural or artificial mineral waters) and drinks (without sugar)	2019*	17424.2	6603.0	411.9	291.1
	2018	18391.4	7430.4	585.8	364.3
	2017	16905.3	7333.3	1022.4	652.5
	2016	15039.8	6055.7	345.9	186.7
	2015	14702.6	5997.6	543.2	184.3
	2010	12771.1	5341.1	288.5	197.5
	2005	6342.2	1661.6	50.3	30.6
2. Mineral water and soft drink (with sugar)	2019*	4164.3	2401.5	44808.7	12447.3
	2018	25526.5	2611.6	20018.5	11456.1
	2017	4353.4	2980.0	18191.1	11555.1
	2016	5638.4	3661.9	70162.9	9305.3
	2015	3844.9	2848.3	14832.8	9105.6
	2010	2006.1	2025.9	20494.9	14639.4
	2005	1384.3	805.8	7526.5	3964.5
Total (1 + 2)	2019*	21588.5	9004.5	45220.6	12738.4
	2018	43917.9	10042	20604.3	11820.4
	2017	21258.7	10313.3	19213.5	12207.6
	2016	20678.2	9717.7	70508.8	9492.0
	2015	18547.6	8845.9	15375.9	9289.8
	2010	14777.2	7367.0	20783.4	14836.9
	2005	7726.5	2467.4	7576.9	3995.1

\* Indices of 10 months of 2019

Information by data base of «Foreign trade» of RA statistical committee and «Data base of foreign trade according to the 4<sup>th</sup> classification of goods list appellation»

Citation <https://www.armstat.am/am/?nid=148>

### **Drinking water as product of international trade**

The study of individual products and services of world market shows that deep and comprehensive changes have taken place in the field over the last 20-30 years. Depending on demand, new products have emerged and on the contrary, due to lack of the demand, some of them are gradually “leaving” the market.

One of the important products of the world market in recent years is drinking water which is gradually attracting more and more sizes and sectors in the export and import turnover of different countries. We can also surely say that the volumes of drinking water will increase significantly in the near future. Obviously, meeting the needs of the population for drinking water in individual countries is extremely problematic and these countries are looking for different ways to solve this problem. For example, it was mentioned about Antarctica icebergs in the ways to satisfy the demand for potable water in Arab countries in 1970s which were pushed to the Arabic Peninsula and bottled to the population. On the other hand, the countries that are rich in drinking water can take advantage of the situation on the world market and receive foreign exchange revenues which is needed to reduce the negative foreign trade balance of the country.

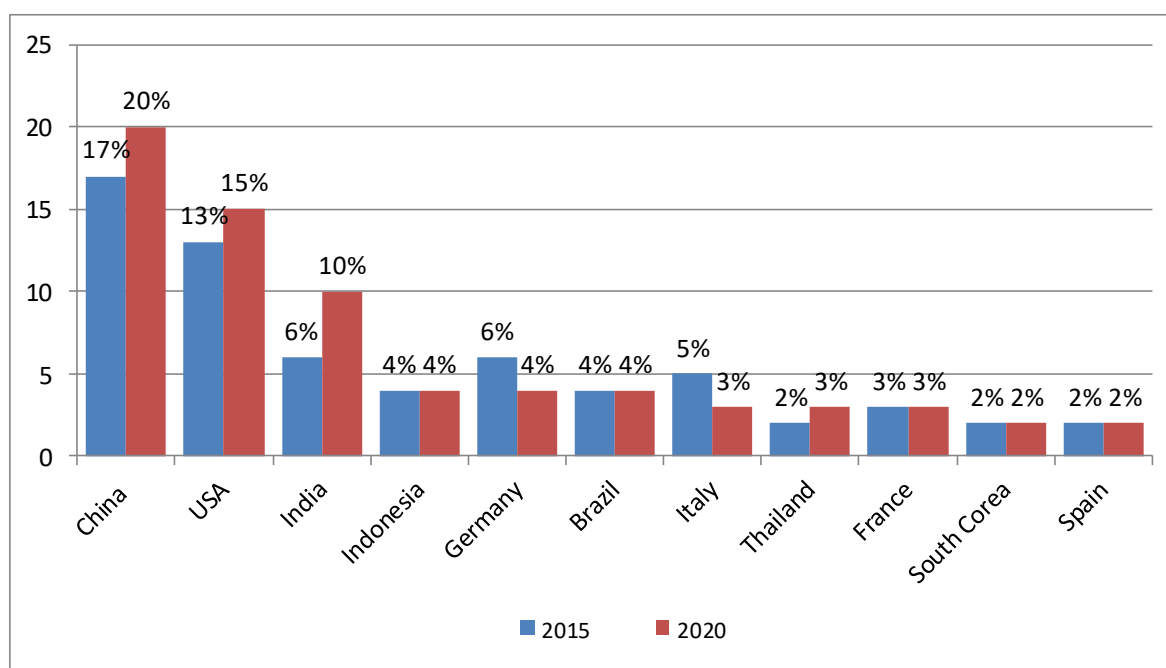
From the point of view of expanding the export of potable water from the Republic of Armenia, it is important to present its developments in global market and discuss the dynamics of consumption of bottled water as well. With the rise of global urbanization and environmental pollution, the problem of drinking water is increasingly sharpened worldwide today as a result of which bottled water becomes a demanded product and its production becomes a profitable and promising business. Drinking water is one of the rare resources that our country is rich in.

Production of drinking water, especially bottled water in our country is starting to gain new scale and quality. There has been a sharp increase in competition in this segment of the market lately with new players emerging, leading to increased market saturation. However, we still have an unsolved problem of distributing bottled water to the world market which is particularly important in the context of a rapidly changing context of world market.

The growing interest in bottled water in the world is also evidenced by the amount of bottled water consumption compared to other beverages. In particular, according to statistics in the largest bottled water market in the United States in the last decade, consumption of this product appeared in the second place among beverages whereas it was the 5<sup>th</sup> only 10 years ago. Over the years, bottled water has surpassed beer, coffee and milk and currently only rebates carbonated soft drinks. So in 2000 the United States consumed 57 billion liters of carbonated soft drinks which comprised 28% of all beverages while bottled water was only 9% or 18 billion liters. According to the results in 2008, the consumption of carbonated soft drinks has decreased to 53 billion liters, while the consumption of bottled water has reached 33 billion liters (about 15% of total drinks consumption). There are clearly shaped market giants in the global bottled water market including Nestle, Danone, Coca-Cola and Pepsi Cola. The latter together account for more than 35% of world turnover. The leader is Nestle with 12%, the second is Danone with 8,5%. According to expert estimations, in the next five years these multifunctional food companies will focus on water production issues which in turn will contribute to increasing their role and market concentration in the global market. In total, 8 of the world's top 10 brands in terms of sales belong to "Big Four", 3 to Danone and Nestle each, 2 to Coca-Cola and Pepsi Cola each. The top five best-selling brands in the world are Aqua (Danone), Pure, Lile (Nestle), Wahaha (Danone) and Aquafina (Pepsi Cola).

Chart 1 shows the countries with the largest amounts of bottled water sales in 2015 and the projected sales volumes of those countries in 2020. Figures indicate that China will remain the world leader in sales of bottled water which provided a 17% share of that product in 2015.

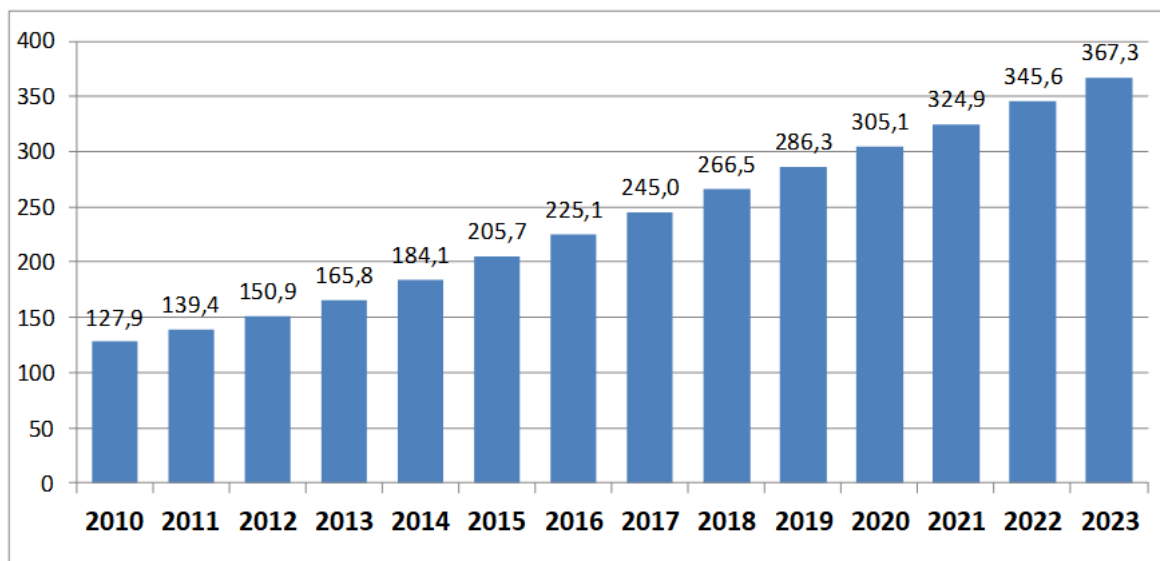
According to the results of research conducted by The Business Research Company, the global bottled water market has grown by more than \$ 200 billion providing a 9% annual increase due to concerns over the threat of contaminated water consumption from 2014 to 2017. In addition to concerns over health threats, the increase in bottled water consumption has also contributed substantially to the increase in disposable income of the population of Asia and the Pacific region as the largest bottled water consumers [17].



**Chart 1. The largest sizes of sale of bottled water in the world in 2015 and forecasting for 2020 (%)**

Source by <https://www.statista.com/statistics/252208/global-bottled-water-volume-share-by-region/>

Revenues in bottled water market worldwide totaled \$ 286,2 billion in 2019 and this market is expected to grow at a very high rate with an average annual growth of 6,4% for 2020-2023 (Chart 2). At the same time, the largest part of the income of this sector in the world was formed in the USA, it was 67,6 billion USD in 2019. The income per capita in bottled water production totaled \$ 38,84 in 2019 with average consumption of per capita 61,5 liters in 2019 [18].



**Chart 2. The revenues in bottled water sphere in 2010-2019 and the predictions until 2023, billion USD**

Source by <https://www.statista.com/outlook/20010000/100/bottled-water/worldwide#market-revenue>

If we admit that one liter of drinking water exported from Armenia can be sold for \$ 0,37 in the world market (let us note that the value of one liter of drinking water in the world market is almost equal to the value of one liter of oil which has risen significantly in the recent period, comprising 0,5 USD on October 22, 2018) [19], it is easy to see that the revenue from the export of one million liters (1000 cubic meters) of drinking water will amount to \$ 370 million USD, exporting 10 million cubic meters we will get \$ 3,7 billion which exceeds the amount of exports from Armenia in 2017 more than three times. Such a quantity of water can be taken from Lake Sevan and exported mainly through the shoreline to the Persian Gulf. It is also important to note that the amount of water can also be delivered to the countries of the region by gravity, knowing that Armenia is 700 meters higher above sea level than the countries of Persian Gulf by its geographical location which would significantly reduce the costs of transporting drinking water. By the way, for the implementation of this project it is advisable to create a consortium at the expense of those countries that would like to use the drinking water of the RA as they did in the neighboring Azerbaijan during the export of oil and gas.

### **Conclusion**

Since independence the whole vision of scientifically-based and consistently implemented natural (including water) resource management has not been formulated in the Republic of Armenia for the long-term development of the economy of the country which would set out a systematic action plan for sector development. Such a package should take the utmost account of geopolitical, national security, resource, socio-psychological issues, the formation of new culture of utilization of natural resources, comparative advantages of foreign trade and other features.

No matter how limited the resources are, there are always standards for their poor, good or better utilization and possible solutions. The subprojects providing access to the objectives set in the national interest are diverse (in the fields of agriculture, energy, information technology, education,

health) and include a comprehensive water resource utilization program in this list followed by detailed elaboration and step-by-step implementation.

Therefore, taking into account the unique significance of water resources in the development of the Republic of Armenia and its economy, it is necessary to develop and approve integrated development plans in the form of laws for the use of the water resources of the Republic of Armenia for at least 15-20 years by five years term, three years term and yearly term phases.

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ՀՏԴ - 556:627.1:34.1

## ՀԱՅԱՍՏԱՆԻ ՀԱՆՐԱՊԵՏՈՒԹՅԱՆ ԶՐԱՅԻՆ ՌԵՍՈՒՐՍՆԵՐԻ ՕԳՏԱԳՈՐԾՄԱՆ ՎԻՃԱԿԸ ԵՎ ՀԻՄՆԱԽՆԴԻՐՆԵՐԸ

**Ա.Խ. Մարկոսյան<sup>1,2</sup>, Հ.Վ. Թորմաջյան<sup>2</sup>, Է.Ն. Մաթևոսյան<sup>1</sup>, Վ.Գ. Խաչատրյան<sup>1</sup>**

<sup>1</sup> Երևանի պետական համալսարան

<sup>2</sup> Շուշիի տեխնոլոգիական համալսարան

Իրադարձությունների զարգացման ներկայիս վիճակը ցույց է տալիս, որ ինչպես ողջ աշխարհում, այնպես էլ Հայաստանի Հանրապետությունում սրվելու է ջրային ռեսուրսների և այդ ռեսուրսների օգտագործման համար ընթացող պայքարը, որը կարելի է համեմատել աշխաջրածնային վառելիքի համար մղվող թե՛ պայքարի հետ: Միայն մեկ տարբերությամբ: Եթե նավթն ունի փոխարինիչներ, իսկ վառելիքի այլընտրանքային տեսակների ավելի լայն կիրառման համար աշխատանքները չեն դադարում, ապա ջուրը շարունակում է մնալ որպես միակ և բացառիկ ռեսուրս, որը չի փոխարինվում մեկ այլ այլընտրանքով: Նման պայմաններում խիստ արդիական են դառնում ջրային ռեսուրսների օգտագործման, պահպանման հիմնախնդիրները, որոնք հասկապես կարևորվում են ՀՀ-ում, քանի որ առանց ջրային ռեսուրսների անհնար է

զարգացնել տնտեսությունը, ինչպես նաև բավարարել բնակչության հարածուն պահանջմունքներն այդ անփոխարինելի ռեսուրսի նկատմամբ:

**Բանալի բառեր.** ջրային ռեսուրսներ, ջրային ճգնաժամ, ջրի առաջարկ և պահանջարկ, ջրառ, ջրօգտագործում, մակերևութային և ստորերկրյա ջրային ռեսուրսներ, վերականգնվող ջրային ռեսուրսներ:

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## СОСТОЯНИЕ И ПРОБЛЕМЫ ИСПОЛЬЗОВАНИЯ ВОДНЫХ РЕСУРСОВ РЕСПУБЛИКИ АРМЕНИЯ

А.Х. Маркосян<sup>1,2</sup>, О.В. Токмаджян<sup>2</sup>, Э.Н. Матевосян<sup>1</sup>, В.Г. Хачатурян<sup>1</sup>

<sup>1</sup> *Ереванский государственный университет*

<sup>2</sup> *Шушинский технологический университет*

Нынешнее положение дел и прогнозы развития показывают, что борьба за водные ресурсы и их использование будет обостряться. Притом эти тенденции замечаются как во всем мире, так и в Республике Армения, и в мировом масштабе сравнимы с борьбой за углеводородные энергетические ресурсы. Существенную роль играет одно отличие. Если у нефти есть заменители, а работы по нахождению и более широкому использованию альтернативных видов топлива не прекращаются, то вода остается единственным и исключительным ресурсом, который не имеет заменителей. В таких условиях вопросы водопользования и охраны водных ресурсов становятся все более актуальными, что имеет особое значение для Республики Армения, поскольку невозможно развивать экономику без водных ресурсов, а также удовлетворить растущие потребности населения в этом незаменимом ресурсе.

**Ключевые слова:** водные ресурсы, кризис водных ресурсов, предложение и спрос на воду, водозабор, водопользование, поверхностные и подземные водные ресурсы, возобновляемые водные ресурсы.

Ներկայացվել է՝ 08.01.2020թ.

Գրախոսման է ուղարկվել՝ 08.01.2020թ.

Երաշխավորվել է տպագրության՝ 18.03.2020թ.