

WATER RESOURCES MANAGEMENT OF UKRAINE ¹

M. D. Domashenko¹ O. V. Panchenko ², M. Yu. Troyan ³ and T. Yu Makarenko

¹Sumy State University, Ukraine
Email : 687737fem@gmail.com

²Sumy State University, Ukraine
Email : pan_ov@ukr.net

³Sumy State University, Ukraine
Email : m.troyan@macro.sumdu.edu.ua

⁴Sumy State University, Ukraine
Email : tm99ua@gmail.com

ABSTRACT

The article deals with main problems of the water resources irrational use in Ukraine. Main difficulties of the water resources effective management at the state and regional level are analyzed. The rational water use role and harmful substances reduction are justified at the level of the territory peculiarities in the region. Water resources of Ukrainian rivers and their use and protection indicators are shown in the article. The water resources basin management system is suggested, which will greatly improve the environment, particularly water resources to the level which is secure for the whole society. The main attention is paid to economic tools to provide rational water use. Their introduction will let to improve the total state of water resources in Ukraine that will lead to increase of ecological and economic security level in the country. The conclusions are made concerning state policy priorities introduction, where one of the main ones has to be an effective water resources management in Ukraine.

Keywords: basin principle, water resources, water consumption, water use, water supply, water intake

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1. INTRODUCTION

Nowadays there are many problems in the water economy in Ukraine, because if water consumption level is growing, there will be a tendency of fresh water reserves reduction. The water supply problem grows by worsening of water quality as a result of the intensive selection of river flow and waste waters ineffective cleaning, which are polluted as a result of chemicals use. Technical level of cleaning facilities and water protection objects is in poor conditions, and it leads to complication of

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ecological state of water resources. Bad quality of water resources is an unfavorable phenomenon for state's balanced development, because it causes great ecological, economic and social problems.

Water resources are included to the important natural resource, which provides stable social and economic development in every country and gives opportunities to develop most economy sectors.

The water resources effective use improves inhabitants' living standards, health and welfare.

There is a complicated and tense situation with water resources in Ukraine. As a result of industry and agriculture high concentration, load on these resources has achieved high level. In this regard investigation of water resources state, their rational use and protection problems have become especially important

2. GENERATION OF THE DATA

There are many works regarding issues of water resources study, main directions of water use development in Ukraine. They include works of such economists as Pysarenko O.A. [7], Danylyshyn B.M.[4], Yatsyk A.V. [8], Stashuk V.A. [7], Matsenko O.M. [5]. Taking into account their scientific research, it is necessary to mention that some aspects of the rational water use and environment protection require more profound investigation concerning economic tools of impact on their consumption. Main purpose of the article is to form approaches to the water resources effective management at regional and state levels, based on problems and development analysis of economic tools of influencing for rational water use with their ecological state improvement. In order to achieve the set objective, it is necessary to perform tasks, particularly: to observe general structure of water resources in Ukraine; to assess level of inhabitants' supply with water resources; to investigate main directions of water resources use; to analyze modern state of water objects in Ukraine; to define main problems of water resources and possible ways to solve them; to develop group of economic tools for rational water use.

3. RESULTS

Water resources include surface and ground waters, which are used in economy to satisfy society's material needs. The river flow amount, water reserves in lakes, ponds and swamps, water basins and underground hydrosphere belong to them.

Ukraine is one of the largest countries in Central-Eastern Europe by territory, population and resources potential. At the same time it is one of regions, which possesses little reserves of water resources (fresh water reserves are 8.5 times lower than the world index, 1.04 thousand m³ per capita). According to the statement of the UNO European Economic Committee, state is supposed to be water supplied, if its water resources do not exceed 1.7 thousand m³ per capita [7].

The main part of water resources in Ukraine includes river flow, 60% of which is formed on the country's territory (local flow), and respectively 40% - abroad (transit flow), performed in Belarus (58% of the general inflow), Russia (26%), Poland, Moldova, Hungary.

The main indices of water resources regarding rivers of Ukraine are presented in the table 1 [6].

Table 1: Water resources of rivers in Ukraine [6]

River	Water catchment area, km ²	River flow, m ³		
		Average year by the water content	Dry year	Extra dry year
Dnipro (near Kyiv)	328000	43.20	35.90	27.00
Dnipro (estuary)	540000	53.50	43.00	32.20
Prypyat (estuary)	114300	13.20	9.91	6.82
Desna (estuary)	89900	11.40	8.90	6.42
Ros (estuary)	12600	0.861	0.577	0.34
Sula (estuary)	19600	1.39	0.95	0.58
Psel (estuary)	2230	1.88	1.36	0.85
Vorskla (estuary)	14700	1.15	0.762	0.44
Siversky Donets	52400	3.47	2.48	1.59
Sothern Bug (estuary)	63700	5.00	2.19	1.26
Dnister (estuary)	72100	8.66	6.78	4.89
Prut (at the border)	8260	2.08	1.37	0.77
Tysa	9140	6.26	4.70	3.20

Thus, the highest index of the river flow depends on water intake area. According to the data from the table, one can see that Dnipro occupies the largest area 328000 m², and the smallest - Tysa 9140 m²

Total area of water basins and ponds is 12 thousand km², which contain 58,6 km³ of water. They are artificial lakes, created to keep melted snow water and to control rivers flow.

Natural lakes and swamps have a significant value in Ukraine. The volume of water in fresh lakes is 2.3 km³, in saline and coastal lakes - 8,6 km³, in swamps – almost 30 km³ of all reserves.

Water resources of Ukraine are completed with ground water reserves, which are 27.4 km³ and are mostly concentrated in the northern part of the country between Polissya and Prydniprovskia lowland. Small reserves are also in Carpathian, Crimea, on Donetsk ridge and within Ukrainain crystalline shield [4].

It should be noted that water resources reserves are unevenly distinguished on the territory of Ukraine. Western and northern regions are more supplied with water in comparison with eastern and southern parts. Important industrial areas of Donetsk, Zaporizhya, Kherson and Odesa regions are the least supplied with water.

The main directions of water resources use in Ukraine include water supply of cities, industrial and agricultural sector, hydroenergetics.

It is revealed in the research that during the last decade water intake from surface sources was decreased more than 1.5 times as a result of production shortening and instability of agricultural sector demands supply. Owing to it, there was a rapid decrease (84%) of water use volumes for irrigation and watering of dry regions, water use volumes for production needs were reduced (60%) and drinking water use volumes were reduced (44,4%). Nowadays an average daily consumption of water in Ukraine is approximately 270 liters per capita [3].

In spite of such fact, practically all water resources are located in regions of powerful industrial and agricultural complexes. It leads to pollution, exhausting and degradation of water objects. Analysis of

the main indicators regarding water resources use and protection in Ukraine during 2011-2016 (table 2) proves this situation.

Among main reasons of water resources pollution in Ukraine, one can distinguish the following ones: the dumping of untreated household and industrial waste water, and after that, polluting substances (petroleum products, phenols, nitrogen compounds, heavy metals, etc.) get into surface and ground waters, and at the same time, soil erosion in the water catchment area is observed.

Annually, approximately 8.5 billion m³ of flows, 0.6 billion m³ of which are untreated and 2.1 billion m³ are not enough cleaned, are disposed [2]. This situation appears as a result of underdeveloped level of communications, moral and physical ageing of the cleaning equipment, its late replacement, and also as a result of periodical electricity outage, which cause emergency situations in the sewerage systems, and consequently untreated waste water discharge.

Pollution of water resources has especially negative impact on agriculture development, because there is soil salinization, the yield level is reduced, productivity in cattle rising is decreased when cattle is watered with polluted water, and commodity quality of fish is worsened.

Table 2: Main indicators of water resources use and protection in Ukraine during 2011-2016 [1]

Years	Water from natural water objects, which is taken, mln. m³	Consumed fresh water, mln. m³	Total drainage of return water mln. m³	Including			Power of treatment facilities, mln. m³
				soiled		Normative-cleared	
				of all	of them without purification		
2011	14846	9817	8141	1744	312	1760	7425
2012	14651	10086	8044	1612	309	1763	7687
2013	14651	10507	8081	1521	292	1800	7577
2014	13625	10092	7722	1717	265	1477	7592
2015*	11505	8710	6587	923	175	1416	7190
2016*	9699	7125	5581	875	184	1389	5801
2011 - 2016	Reducing in 1.5 times	Reducing in 1.3 times	Reducing in 1.4 times	Reducing in 2 times	Reducing in 1.7 times	Reducing in 1.27 times	Reducing in 1.27 times

*Without consideration of temporary occupied territory of the Autonomous Republic of Crimea, Sevastopol and part of the antiterrorist operation zone.

Data from the table show that water use level during 2011-2016 is being constantly decreased. First of all, the reason is that it is impossible to get full information regarding all water resources in Ukraine owing to occupied territories of the Autonomous Republic of Crimea and the antiterrorist operation zone, production reducing, where industry takes 50 %, agriculture - 18 %, communal services - 27 % in the sectoral structure of water use.

The wettest industrial sectors include metallurgy, fuel and energy complexes, chemical, petrochemical, pulp and paper sectors. In order to produce 1 tone of paper 1000 m³ of water, 300 m³ of steel, 2800 m³ of synthetic rubber, 4000 m³ of nickel are used. These figures are compared with water use volumes 180—200 m³, which is necessary for melting of 1 tone of cast iron.

Thus, we can see that the main problems in the water resources sphere in Ukraine are:

- low level of Ukraine's provision with own water resources and their nonoptimal distribution in regions;
- small volumes of citizens, agriculture and industry supply with qualitative water;
- high index of the anthropogenic load on water resources in Ukraine;
- unsatisfactory technical condition of water economy complex main funds;
- insufficient level of modern technologies use to prepare and to use water, their inconformity with demands of resources efficient use and ecological safety.

Legislation, which controls water relations in Ukraine, plays a significant role in fulfillment of scientific, organization, economic, technological and other actions, oriented to protect and to use rationally water objects, to keep water content of rivers at the regional and state levels and water resources reserves while their rational and cost effective use. The state policy in the water economy sector has to assist achieving of citizens' economic and ecological interests balance, and to provide possibilities for water resources reproduction [8].

Today in Ukraine there is a Law "On main fundamentals (strategy) of the state ecological policy of Ukraine till 2020", which defines main tasks concerning water resources development, particularly:

- stable use of water resources by means of integrated water resources management introduction;
- legislative strengthening of basin (ecosystem) approach to the water resources management, basin authorities strengthening, including interstate and regional authorities;
- increase of water use effectiveness by way of economic stimulus introduction at the level of basins, costs total reimbursement, increase of access level to the qualitative drinking water in all regions and cities;
- increase of the overflowing effective control, mitigation of droughts and climate changes – to reduce losses after floods and droughts to 10% of basic level for the mid-term perspective and to 30% till 2020 (for long-term perspective) [2].

Basin principle of the water resources management is one of the most effective methods to solve global ecological problems of water consumption, reproduction and water resources protection. It provides cross-border cooperation concerning water use and protection at the border areas.

Realization of the basin system to control water resources will enable to stabilize and to improve the natural environment, particularly, water resources, to the secure level for the whole society.

Analysis of problems concerning Ukraine's supply with water resources requires selection of economic tools in order to solve them. The formation of these tools should be based on the relationship between the payment for water use and pollution and the financing of priority water protection measures within the basin. The procedure for the installation, collection and further use of floating charge and irreversible water consumption, as well as for the discharge of normalized substances, should be fair and understandable for all, first of all, for water users.

List of the economic tools to provide rational water use is shown in the fig.1.

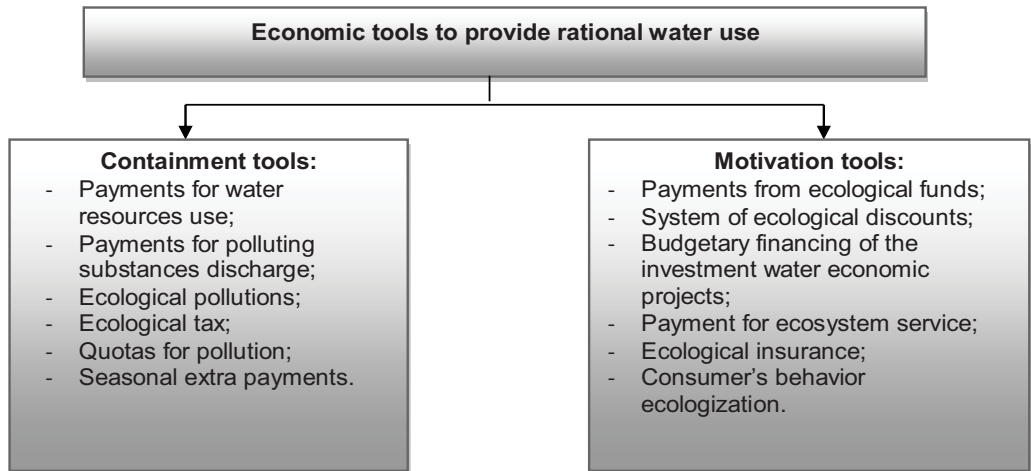


Figure 1 – Fluctuation of the shares market price for Apple Inc. by NASDAQ data [9]

The program of the water resources rational use and protection has to be realized, first, by the state authorities (ministers, departments), and by the industrial goods producers, task of which must be organization of rational water use and actions fulfillment, which prevent from its pollution

4. DISCUSSION AND CONCLUSION

Summing up the above, one should mention that water resources are the most important natural factors, which provide development of most sectors of economy in every country. However, modern state of water resources in Ukraine is unsatisfactory, because one can observe a tendency when fresh water reserves are decreased and are progressively polluted. That is why, one of the most priorities of state policy has to be water resources rational use and protection. Introduction of the suggested economic tools for rational water use and their further interconnection provision will let to improve general state of water resources in Ukraine and will assist increasing of ecological and economic security in the country.

Results of this research may be implemented in further scientific investigations, which will be connected with estimation of tools for rational water use provision.

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