

## Use of water resources and organizational support for their public administration in Ukraine

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**Abstract.** The paper analyzed the state of use of available groundwater and surface water that are attracted in economic complex of Ukraine. The main indicators of the use and protection of water resources, hierarchical levels of organizational support of water management in Ukraine, the system of government agencies that manage water resources at the national level and are characterized their powers are given in the article.

**Keywords:** ground water, surface water resources, water resources, industry, public administration, organizational management software, basin principle, the authorities

**Introduction.** Preservation and effective use of the natural potential of water fund requires the involvement of governance mechanisms in public water relations to meet the interests of all stakeholders. Government intervention in this area is urgent and inevitable at all levels of organization of public administration at national, regional and local. Becomes more urgent the need not only to establish scientifically grounded Theoretical and methodological principles of public management of water resources, also to develop effective organizational mechanisms of public management, taking into account the peculiarities of water potential of Ukraine and achievements of European countries.

**Materials and methods.** The problem of effective public management of water resources is a part of the general problem of environmental management and protection of the natural environment. This problem was researched in the scientific writings of leading Ukrainian and foreign scientists, such as M.A. Hvesyk, V.A. Golyan, B.M. Danylyshyn, S.I. Doroguntsov, I.A. Dragan, T.V. Ivanova, V.A. Stashuk, A.V. Yatsyk, V.A. Spiritual, V.I. Danilov-Danilyan, T. D. Claussen, R.G. Mumladze, N.N. Myrzaev [3, 6]. The majority publications are relating to technical and technological aspects of management of water resources in river basins, environmental protection and ecological and economic aspects of environmental management and water use. Unfortunately the issue of public management of water resources is considered in the context of

environmental and economic problems and apart from the theoretical foundations of modern public administration. Methods of analysis and synthesis were used. The statistical results were processed with using the software package of Excel-2010.

**The goal** was to identify the characteristics of modern public management of water resources in Ukraine by constructing hierarchical structure levels of its organizational support, analysis of water use and installation the system of state management of water resources at the national level.

**Results and their Discussion.** The Ukraine Water Fund includes three groups of water resources: surface water – natural water bodies (lakes), streams (rivers, streams), artificial water bodies (reservoirs, ponds) and channels and other water bodies; groundwater and springs; internal sea waters and territorial sea [2].

Fresh water resources in Ukraine consist of runoff and fresh groundwater. Local river flow formed within the country in the average water content year is 52.4 km<sup>3</sup>. Taking into account inflow from neighboring countries, the average long-term river flow reaches 87 km<sup>3</sup>. Groundwater Resources of Ukraine as estimated are up 22.5 km<sup>3</sup> a year, of which not hydraulically connected with the river runoff only 7 km<sup>3</sup> a year. Thus, the total water resources in the middle for the water content is estimated at the level of 94.1 km<sup>3</sup> in shallow year – 77.2 km<sup>3</sup>, and in very shallow – 59.4 km<sup>3</sup> (Table. 1).

**Table 1.** Composition of Water Resources of Ukraine, km<sup>3</sup> [6]

Type of resource	Resources for the year			Water availability in the area is very shallow year, thousand m <sup>3</sup> / km <sup>2</sup>
	average water content	shallow	very shallow	
Local river flow	52,4	41,4	29,7	49,2
The inflow from adjacent areas	34,7	28,8	22,9	37,9
Groundwater that is not hydraulically connected with the river runoff	7,0	7,0	7,0	11,6
Total resources	94,1	77,2	59,4	98,4

As per 1 sq. km area of the country average local flow is 86.8 thousand km<sup>3</sup> a year, and per inhabitant nearly 1.1 thousand km<sup>3</sup> a year. In very shallow year, these values are equal, respectively, 49.2 and 0.65 thousand km<sup>3</sup> a year. The projected groundwater resources in Ukraine estimated 22.5 billion km<sup>3</sup> a year, or 61,644 thousand km<sup>3</sup> per day. The distribution of these resources on the territory of Ukraine also unequal - 65% are concentrated in the northern and north-western (Dnipro and Volyn-Podolsky artesian basins).

The surface water bodies Ukraine occupy 24.1 thousand km<sup>2</sup> or 4.0% of its territory (603.7 thousand km<sup>2</sup>). Majority of the rivers located in the Black and Azov seas and only 4.4% - in the Baltic Sea. Resources of river flow in high water content for the year is 87.1 km<sup>3</sup>, and taking into account the flow of the Danube in Kili branch, this value increases to 209.8 km<sup>3</sup>, of which 52.4 km<sup>3</sup> formed in Ukraine. The choice of the priority directions of water resources should be based on a study of major trends of attracting water resources into the economic sector of Ukraine.

**Table 2.** Main indicators of the use and protection of water resources in Ukraine\*

Indicator	Year							
	1990	1995	2000	2005	2010	2011	2012	2013
Removed water from natural water bodies, million m <sup>3</sup>	35615	25852	18282	15083	14846	14651	14651	13625
Losses during transportation, million m <sup>3</sup>	2590	2179	2281	2140	2145	2327	2335	2437
Consumed of fresh water, million m <sup>3</sup>	30201	20338	12991	10188	9817	10086	10507	10971
The total drainage of return water, million m <sup>3</sup> , including:	20261	14981	10964	8900	8141	8044	8081	7440
- contaminated	3199	4652	3920	3444	1744	1612	1521	1717
- normative cleared	3318	1936	2100	1315	1760	1763	1800	1700
Capacity of sewage treatment plants, million m <sup>3</sup>	8131	8419	7992	7688	7425	7687	7577	7592

\* According to the State Water Resources Agency of Ukraine

Analysed the main trends during the period from 1995 to 2013, it should be mentioned that the total water intake in Ukraine has decreased significantly in recent years. Thus, in 2013 compared with 1990 the intake decreased by 38.3%. The largest decrease in water taken from natural water bodies were observed in 2005 that compared to 1990 is less than 42.4%. This is connected to the significant decline in production, not with implementation of effective forms and technologies of water use that provide saving of fresh water. According to the intake decreases the amount of use of fresh water in Ukraine and in 2013 was 10971 billion m<sup>3</sup>, and in 2000 – 30201 billion m<sup>3</sup>. This tendency is explained by the significant reduction in water use in the industrial sector, as well as a significant decrease in water consumption in agriculture, partial and reversible transition to re-consistent use of water.

Changing volumes of water to the economic turnover and the nature of water use requires analysis of the structure of fresh water to the main directions. So in the 2013 the structure of use of fresh water 56,0% accounted for production needs, 14,8% – irrigation, 19,9% – domestic and drinking needs, 2,1% – agricultural purposes and 7,1% – other needs that compared with 2000 these indicators have changed accordingly 53.8%, 23.0%, 15.4%, 5.6% i 2.2%. The use of water for production needs increased due to the growth of scale of agricultural production based on irrigation farming. Consumption for household and drinking needs has increased by 4.5%, due to the process of building private accommodation, according to the formation of additional water systems.

Water resources are the means of production in many areas, is necessary to form system of ecologically dominants of water use levels in some economic complex. In

the water sector, water resources are the means of labor, in others - the subject of labor. This factor determines the functional orientation of water and thus - the scope, methods and rates of its use in economic turnover. Besides, water can appear in the form of services or the finished product (hot water), when in the form of a resource it will be charged by a fee.

In the structure of water use in Ukraine in 2013, the largest proportion of water use accounts for industry – 48.9% (4.719 billion m<sup>3</sup>), agriculture – 23.9% (2914 million m<sup>3</sup>), public services – 26.7% (2.167 billion m<sup>3</sup>) (Table 3). Different rates of economic entities led to changes the structure of water use for household needs. In particular, comparing these structures during the period 1990 and 2013 there are differences: 2.17% decrease the water use in industry, fell by 6.42% in agriculture, increased by 9.54% in the utilities municipal engineering. The biggest water users in Ukraine is an industrial complex that includes water-intensive industries such as ferrous and non-ferrous metallurgy, food industry and processing of agricultural products, machine building and metalworking, mining, chemical and petrochemical, woodworking and pulp and paper, light industry, electricity and other.

Main directions and objectives of state policy in the field of water identified in the "National Program ... by 2021". These include: the satisfaction of needs of the population and national economy in water resources, preservation and restoration of water resources, the introduction of integrated water management basin principle, restore the role of reclaimed land in the food and resources for the state, optimization of water use, prevention and elimination of harmful consequences effects of water and other [4].

**Table 3.** Usage of water resources in economy sectors of Ukraine, million m<sup>3</sup>\*

Economy sectors	Year							
	1990	1995	2000	2005	2010	2011	2012	2013
Industry	15150	8762	6793	6432	5384	5387	4475	4719
Agriculture	10892	5979	2976	2269	1936	2233	2395	2914
Municipal services	3772	3727	3112	2801	2578	2498	2279	2167
Other	422	370	159	56	54	49	47	44

\* According to the State Water Resources Agency of Ukraine

Water resources, given the planetary scale of their distribution, water cycle and its various states have acquired global dimension and global importance. Considering this aspect, participation in each country, as well as the level of state management of water resources can take different organizational levels, from the highest – the world (global), to the lowest – local [5].

At allocation levels of government should be specific to water resources, their so-called "dualism" – spread on

the territory of a hydrographic object and divides it into basins and sub-basin, separate water bodies on the one hand, and the division of the country into administrative units - village, district, region, other regions. Considering these characteristics, consider it appropriate to allocate seven hierarchical levels: global, European integration, cross-border, national, inter-regional (basin), regional and local (object) that shown in Fig. 1.

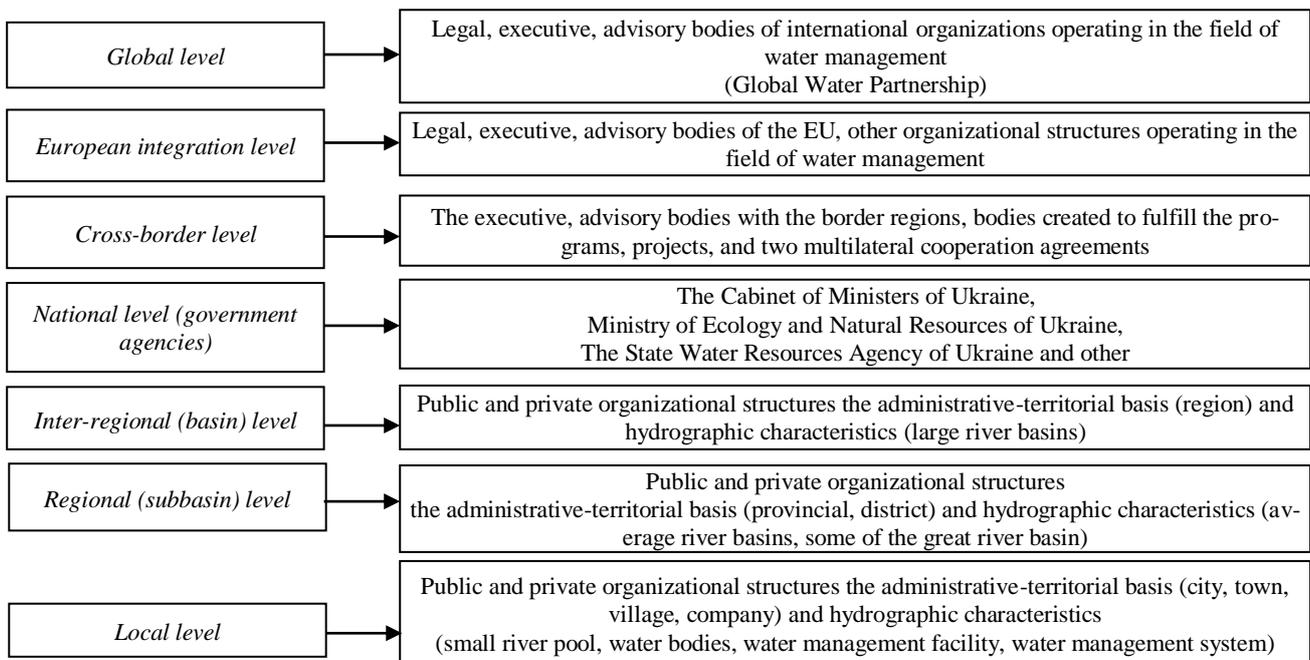


Fig. 1. Hierarchical structure levels organizational support of public water management in Ukraine

Global level ensured continued participation of Ukraine in international organizations, international water forums and conferences of Heads of Government. What generally form a system of Global Water Partnership, as well as with representatives of Ukraine in managerial, executive, advisory bodies of international organizations, primarily created by UN. With many countries are signed the Memorandum of cooperation and mutual understanding.

European integration level includes legal, executive, advisory bodies of the European Union (EU), other European organizational structures entry of which declared Ukraine and which Ukraine as a country develops cooperation with international projects, including the direction and management of water resources. European integration level provided by Ukraine's accession to the Water Framework Directive of the European Union implemented the integrated water management basin principle.

Cross-border level includes various bodies established by Ukraine with EU border regions to address transboundary water resources management and water bodies, implementation of programs, projects, bilateral and multilateral cooperation agreements. Currently, cross-border cooperation is provided with all countries - neighbors (Russia, Slovakia, Moldova, Poland, Romania, Hungary, Belarus) by creating Water commissions for major transboundary rivers.

National level is a major public water management and includes various branches and agencies of government and includes legislative, executive and judicial branches. Inter-regional (basin) level includes public and private organizational structure created administrative and territorial basis (region, some areas) and hydrographic characteristics (large river basins). Regional (subbasin) level includes public and private organizational structure created administrative and territorial basis (provincial, district) and hydrographic characteristics (sub-basin of major rivers, ponds medium rivers).

Local level includes public and private organizational structures for the administrative and territorial basis (city, town, village, company) and hydrographic characteristics

(small river basin, separate water bodies, water management facility, water management system). At this level, organizational structures of public and private importance can take many forms - community, unions, associations, committees, etc.

The following approach allows during the research cover the entire network of existing organizational structures, identify the most effective and not effective enough, extra or missing and improve organizational support for of public management of water resources.

At the beginning of 2015 the central executive authorities in the formulation and implementation of state water policy in Ukraine is the Ministry of Ecology and Natural Resources of Ukraine and its structural divisions: State Service of Geology and Mineral Resources of Ukraine, State Water Resources Agency of Ukraine, State Environmental Inspection of Ukraine, State Environmental Investment Agency of Ukraine, State Agency for Management Exclusion Zone Ukraine (Fig. 2).

Currently in the use, protection and reproduction of water resources Water Code of Ukraine defines participation of central authorities:

- 1) Central authorities that provides state policy in the field of environmental protection (4 function [Art. 15]);
- 2) Central authorities that implement the national policy in the field of environmental protection (6 functions [Art. 15-1]);
- 3) Central authorities that realize state policy of state supervision (control) of protection and rational use of water and restoration of water resources (2 functions [Art. 15-2]);
- 4) Central authorities that realizes state policy in the field of water management (24 functions [Art. 16]);
- 5) Central authorities that realizes state policy in geological exploration and management of mineral resources (5 functions [Art. 17]).

We performed a detailed analysis of the available in Water Code competences and tasks for different branches and different government agencies for their presence, separate or joint implementation.

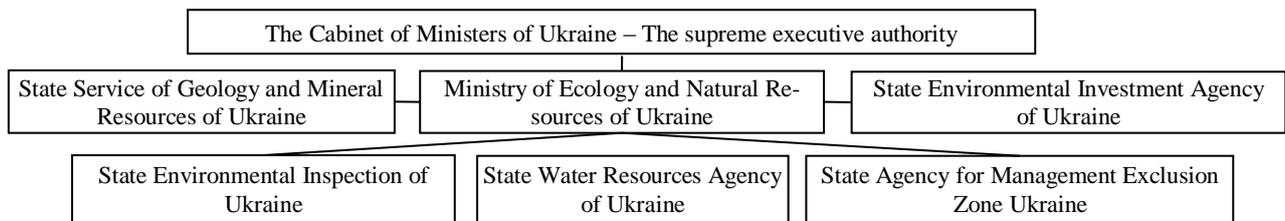


Fig. 2. System central authorities of the Ministry of Ecology and Natural Resources of Ukraine

The content of the powers of public authorities in the field of management of water resources revealed at 42 tasks. All representative bodies (the Verkhovna Rada of the Autonomous Republic of Crimea to village, town, city and district councils in cities) generally mentioned 38 times in the 16 tasks (functions) that they perform individually or jointly. All executive power (Cabinet of Ministers of Ukraine, central executive bodies, regional administrations, Kyiv and Sevastopol city administrations and executive Crimea) generally mentioned 67 times in the performance of 41 tasks. The analysis of the powers showed that their performance attracted a large number of central governments, and they focus on the upper levels of government and not delegated to lower levels of government, especially at the level of local government.

The most widely deployed structural units of the central executive power in Ukraine on interregional and regional levels in the management of water resources is the organizational structure of the State Water Resources Agency of Ukraine. This is the main agency and has today an extensive organizational structure of institutions, organizations, companies and performs most tasks in water management on interregional and regional level. According to the Statute of State Water Resources Agency of Ukraine, it is the central body of executive power which - "realizes state policy in the field of water management and land reclamation hydraulic engineering, management, use and reproduction of surface water".

In the main tasks of State Water Resources Agency of Ukraine the sphere of "management, use and reproduction of surface water" among the tasks is the first priority: 1) implementation of state policy in the field of management, use and reproduction of surface water resources, development of water management and land reclamation and operation of public water management facilities integrated setting, inter-farm irrigation and drainage systems; 2) make proposals to ensure public policy in the field of

water management and hydraulic land reclamation, management, use and reproduction of surface water resources.

According to the Statute of State Water Resources Agency of Ukraine perform 52 tasks, and the by the Water Code - 24 function, which turns it into a complex, branched structure with a large number of industrial and sectoral objectives in the areas of land reclamation, and operation of plants, water distribution, water supply etc., which reduces the efficiency of administrative work. In Ukraine is "administrative" approach to water resources management, which manifests itself in symbiosis part of the basin and the administrative-territorial approach and that is why management of water resources system in Ukraine is insufficiently effective in comparison with other countries, including the European [3].

The analysis of the organizational support of public management of water resources indicates parallelism (duplication) of certain functions to manage, use, protection and restoration of water resources by basin departments and regional offices, their subordinated institutions. These require a need of detailed analysis of the reasons for this situation and eliminate duplication at the regional and national levels.

**Conclusions.** Ukraine is among the European countries that are the least provided with water. By the standards of the UN Commission the amount of water per person must constitute at least 1.7 thousand m<sup>3</sup> per year, in Ukraine this indicator is 0.57 thousand m<sup>3</sup>. The territorial concentration of stocks of water resources is not in line with the need for these regional economic complexes. Most concentrated of water is in the rivers of Danube basin where the need is less than 5% of their total reserves. The shortest supply of water resources is in industrial areas (Donbas and Kryvyy Rih), Crimea where the largest consumers of water. The system of water management in Ukraine complicated implementation of basin principle not complete organizational support governance needs improvement and reform.

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