

INTRODUCTION PRINCIPLES OF THE ENVIRONMENTAL MANAGEMENT AND AUDIT INTO THE WATER SECTOR IN UKRAINE

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Develop scientific justification principles and areas of implementation of environmental management and audit system of water management Ukraine for its sustainable operation and future development. The methodology of the investigation based on the use of the modern scientific methods, viz.: analysis, synthesis, induction and deduction, mathematical statistics, systematic approach, and analysis. Involvement of significant volumes of water resources of the Southern region are led to a change in the hydrological regime in the water catchment areas, disturbance of natural equilibrium, sharp decrease in the quality of water resources potential, the predominance of degradation processes on self-sustaining and self-cleaning ability of aquatic ecosystems in economic circulation for the development of the branches of the economy: industry, recreation, agriculture, including irrigation. Today it is urgently necessary to solve the problems of integrated water management as an integral ecological-economic system of the region with the possibility of taking into account the needs of ensuring the protection and rational use of all natural resources, modern changes in the nature management and strategies of social development of the region.

The functioning of the water management complex is ineffective by the imperfection of the modern water management system, the lack of funding and the imperfection of the mechanisms for attracting extra budgetary funds, as well as the absence of a system of public-private partnership in the water sector. In addition, the lack of a powerful legislative framework for ecologization of water management activities is led to environmental problems and ecological-economic, organizational and technological risks.

There are necessary to conduct environmental audits and identification of new technological opportunities irrigation systems and waterworks, development directions and stages of modernization of irrigation systems to ensure integrated water management and adaptation of irrigation systems and irrigation modes of crops in connection with climate change to ensure ecologically balanced development of water systems. It is also necessary to create conditions for sustainable socio-economic development of the agricultural sector in the area of irrigation and rural areas. The issues of efficient functioning of the water industry are closely linked not only with the introduction of environmental audits, but also the introduction of environmental management as a water management system at the national level, as well as at the regional and local levels, remain unresolved.

The basic condition for improving the efficiency of the water industry is the development and scientific substantiation of the principles of the implementation of the environmental management system and audit in order to develop the directions of recovery and development of the industry in the context of environmental safety and on the basis of ecologization of its activities. Environmental audit and its results as water and hydraulic engineering objects, irrigated agricultural lands, are the basis for implementation of engineering, reclamation and ecological measures in the system of ecological management and audit. Improvement of the management system is impossible without substantiation of the main stages of modernization and restoration of the industry, which envisages a gradual and tolerant distribution of functions of water resources management and exploitation of water management and reclamation systems between the State Agency of Water Management and regional authorities. Strengthening the role of the State Agency for Water Management in water resources management will enable ecologically safe and balanced use of them on the basis the principles of comprehensiveness and integration.

Keywords: *water management sector, principles, environmental management and audit, ecological safety, public-private partnership, ecologization, modernization.*

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Problem statement in general. A powerful water sector reclamation complex, represented by water industry systems and hydrotechnical constructions of various levels, has been created in the South region of Ukraine. With the help of water systems the water run-off is distributed, economy sectors and population are supplied with water resources, and there is a complex protection from flooding of localities and large territories of agricultural lands and industrial objects. The main facilities of the water sector reclamation complex in the region include: South-Crimean, Krasnoznamyansky, Inhuletsky main channels, Main Kakhovsky channel, water basins cascade on Dnieper, channels Dnipro-Donbas and Dnipro-Inhulets, and a group of protective shelters on Danube in Odesa region, which includes 315 km of protective dams with hydrotechnical constructions, 215 km of which — along Ukrainian bank of Danube, 14 channels and 21 regulator sluice, which provide water exchange in the Danube lakes-water basins in Odesa region. The region's activity and natural environment state depend on effective water sector management and stable functioning of systems and constructions.

Involvement of considerable water resources in the South region into the economic turnover to provide development of economy sectors: industry, recreation, agriculture, including irrigation reclamations, lead to changes in hydrological regime on the water extraction areas, to nature balance disorder, to decrease of water-resource potential quality, to predominance of degradation processes over self-restoring and self-cleaning ability of water ecosystems. Nowadays it is necessary to solve complex development problems regarding water sector as an integral ecological and economic system of the region taking into account demands to provide protection and rational use of all natural resources, modern changes in nature management and regional public development strategy.

The current system of water resources management in Ukraine has mostly sectoral and administrative-territory orientation and unbalanced mechanism to protect waters and to reproduce water resources. In case of the only state body absence, which is responsible for water facilities condition in basin, the right for such management is given to great deal of state bodies, for which it is not the main obligation. As a result parallelism and duplication is observed while carrying out management functions.

Analysis of the recent research and publications. Privatization processes in the land use and land holding system, as a result of which owners' number of the irrigated areas was increased and they reduced irrigated systems, having broken technological relations, comparing activity of water economic complex organizations with water consumers' economic interests. Conditions of reclamation systems exploitation and efficiency of the economic activity on the agricultural lands, which are irrigated, have been greatly worsened. Besides, there are global nature and climate changes, which have negative impact on the economic efficiency of the agricultural sector in Southern region.

Today there is no region on the Earth, where anthropogenic change of the natural landscape, including that one in the hydrosphere, would directly or indirectly come out. Water resources quality was greatly worsened; their increasingly tight deficit is created. It is well-known that hydrosphere contains about 1.6 billion km³ of free resources, 1.37 billion km³ of which belong to the World ocean. There are 90 million km³ on continents, 60 million km³ of which are ground waters (almost all are saline waters), 27 million km³ — in glaciers of Antarctic and the Arctic Region and mountains. Usable storage of accessible fresh waters, concentrated in rivers, lakes, water reservoirs, water basins, under the ground at a depth of 1 km, is equal 3 million km³. It is relatively small fresh water supply, but owing to the circulation it is constantly increased and solves the problem of planet inhabitant's water supply. However, unfortunately condition to keep water resources quality is not provided at all. Even the most improved cleaning technologies, considering biological ones, do not provide total and qualitative cleaning of waste water. All dissolved non-organic substances and about 10% of organic polluting matters are in the cleaned waste water.

The world water economic balance proves that approximately 2200 km³ of water per year are spent for all types of water resources management. 20% of fresh water resources are spent for dissolution of water flows, and 1 km³ of cleaned waste water pollutes 10 km³ of river water, uncleaned — 3–5 times larger.

According to data of State Water Resources Agency of Ukraine, the water balance structure of Ukraine is formed in the table 1. According to data, the water resources amount in Ukraine, which comprises surface and underground wa-

ter, is equal to 73.1 km³ per year, and the using amount per year is 19.24 km³. Almost the third part of the water resources total reserve per year is used by the economic and productive complex of Ukraine and by way of return water, cleaned water, not enough cleaned and not cleaned water, falls into the water sources.

Thus, amount of fresh water is not decreased, but its quality is worsened, and as a result, there is fresh qualitative water resources deficit. The given examples of anthropogenic processes development justify that there is real ecological risk, formed at regional and global levels with unbalanced further development of regional economic and industrial complex.

The water management and reclamation controlling process in the South region as a complex ecological and economic system provides systematic approach to solve all tasks of every subsystem and ecological and economic system development, optimization of water use and environment protection. Development of every subsystem and separate branches put different and even reversed demands to water resources. It leads to appearing of interests conflicts in the water use management of the region. While solving these conflicts water consumers' attention is focused on water resources use and terms, and a problem regarding protection and recreation of resources is laid on state authorities, or is given to future generations. Complexity of water sector management in the region provides to solve problems concerning use, protection and recreation of water resources in the country. Given the fact there is a necessity to activate the process

of water-related activities ecologization in the system of water reclamation complex, and public relations regarding provision of stability and balance in development of a complicated water ecological and economic system in the region.

In 2015 Government of the country approved Single complex strategy of agriculture and rural territories development in Ukraine for 2015–2020, which gives a strategic base to develop agricultural sector on the whole, including the problem of crop growing, land use and land management, access to credits, taxing, agricultural research and education, state support mechanisms, food safety, environmental protection etc. However, the strategy does not totally reveal the problem concerning water management sector development in Ukraine. In July 2015 Minister of Agrarian Policy and Food Supplies of Ukraine created the Coordinating Council with five working groups. They had a task to investigate strategy of irrigation and drainage for Ukraine, and, thus, filled a strategic gap of the Agriculture and Rural Territories Development Strategy.

A significant contribution to solve the above problem was made by native and foreign scientists; their scientific studies are urgent and scientifically sound. For example, academician of NAAS Romashchenko M.I., together with scientists from Institute of Water Problems and Reclamation of NAAS, developed the conceptual approach and Conception of irrigation recreation in Ukraine (2013) (Romashhenko, M.I. (2013), Romashhenko, M.I. (2014)), which define main conceptual directions of irrigation recreation; academician of NAAS P.I. Kovalenko (2011)

Table 1

Water balance of Ukraine
(it is investigated by authors on the basis of data from State Water Resources Agency of Ukraine)

Amount of water resources, formed in Ukraine, %	Total amount of water resources, km ³ /year	Amount of water resources use, km ³ /year	Amount of water resources by sectors, km ³ /year
1. Western Bug — 4%	Internal surface water — 53.1 km ³ /year	19,24 km ³ /year	Industry — 13.44 km ³ /year
2. Siversky Donets — 5 %			
3. Prut — 6 %			Communal needs — 4.61 km ³ /year
4. Dnipro — 41%			
5. Dnister — 18%	Internal underground (subsoil) water — 20 km ³ /year		Agriculture — 1.19 km ³ /year
6. Tysa — 13%			
7. Southern Bug — 7%			
8. Near-shore waters — 61%			
Total — 100%	73.1 km ² /year	19.24 km ³ /year	19.24 km ³ /year

and Chandra A. Madramootoo (2011) observe the problem of rational water resources use at the modern state and proved the necessity and significance to introduce water resources effective management (Kovalenko, P.I. (2011)); academician of NAAS Romashchenko M.I. and Dekhtyar O.O. in their scientific publications give the analysis of Bulgaria, Armenia, Moldova, Israel and France experience to reform the water management sector as a necessary condition to provide the innovative development of the sector, based on environmental management introduction (Romashchenko, M.I., Dehtyar, O.O. (2016)). European Commission (2013) concentrates scientists' attention on the water policy improvement and water management sector activity as a result of climate change (Communication from the Commission to the European Parliament..., 2013). O. Zhovtonog, W. Dirksen, K. Roest (2003) analyze water reforms of different countries in the world and develop possible directions to reform water policy in Ukraine (Zhovtonog, W. Dirksen, K. Roest (2003)). Experience of Bulgaria, as Hadzieva V. points out (2007), shows that it is necessary to carry out institutional reforming of the water sector, in order not to enable the Bulgarian situation of irrigation sector fall (Hadzieva V. Condition (2007)). Necessity of the only one state partnership in the controlling system of water sector and while setting the price policy for water supply service is observed in the scientific works of O. Zhovtonog, W. Dirksen, K. Roest (2003) (Zhovtonog, W. Dirksen, K. Roest (2003)). Besides, they focus attention on necessity to consider global experience while developing the innovative management system during the water sector reforming and creating of water consumers' associations, taking into account ecological constituents and based on the introduction of environmental audit. Chandra A. Madramootoo (2011) points out that difficulties, which appear in the further functioning of water sector in countries, which underwent social and economic transformations stages, are related to the fact that there were no institutional transformations after social and economic ones in the water sector (Chandra A., Madramootoo (2011)). It caused ecological, technological, reclamation, social and economic problems. Doctors of Science Reinders F.B. and Nimkale V.E. (2015) mention that in the process of irrigation modernization and recreation it is important to introduce innovative management systems, environmental management and audit into the system of water sector regulation (Felix R. Reinders, Edited by Megh R. Goyal, Vishal K. Chavan and Vinod K. Tripathi (2015), V. G. Nimkale, S. R. Bhakar, H. K. Mittal and B. Upadhyay (2015)). Only results

of the environmental audit of the reclaimed lands and reclaimed objects are bases to introduce the innovative ways of irrigation and water resources use rational directions. Research and investigation to form theoretical and methodological and organizational and economic fundamentals of the environmental management, its practical implementation directions have been carried out by scientists (Galushkina, T.P. (2008), Galushkina T.P., Hranovska L.M. (2009)). Thanks to works of these scientists, peculiarities of interconnections between nature, society and economy were analyzed. They confirm mutual dependence between natural and economic factors, ecologically safe development of the economic and industrial complex and society development. The theoretical and methodic bases and principles of ecologically balanced nature management are developed and main directions for country's economy, branches and enterprises moving to the sustainable development are suggested. However, the conception of environmental management is new for Ukraine and it is not fixed legislatively. At the same time, there is experience for its realization in practical mechanisms of activity with legal, methodic, economic and regulating base, in the international practice.

Statement of the problem. The imperfection of modern water management system, lack of funding in the water sector, lack of mechanisms to involve extrabudgetary funds and absence of state-private partnership system in the water sector do not assist an effective functioning of the water management and reclamation complex. Besides, absence of powerful legislative base regarding ecologization of the water-related activity and environmentally friendly land use and landowning in the irrigation zone lead to a number of ecological problems, ecological and economic, organizational and technological risks.

In order to reconstruct and to extend irrigation areas and to provide ecologically balanced development of water systems, it is necessary to solve several ecological and reclamation problems, to fulfill environmental audit and to define modern technological possibilities of irrigating systems and hydrotechnical constructions, to carry out ecological and reclamation evaluation of the agricultural lands, to investigate directions and stages of irrigation systems modernization, to provide integrated management of water resources, to adapt work of irrigation systems and regimes of agricultural crops irrigation to the climate changes, to increase indicators of quality and fertility of the irrigated soils, to introduce innovative watering ways, to improve landowning and land use system, and also the system to provide institutional water resources effec-

tive management. At the same time it is necessary to create conditions for sustainable social and economic development of the agricultural sector in irrigation and rural territories zone. Questions regarding restoration and extension of the irrigated areas in conditions of Southern region in Ukraine are urgent problems, and the questions of combining the current ecological state of irrigated land with the improvement of legislation and the environmental management introduction either into the water management system at the national level or at the regional and local levels have not been solved yet.

The object of the article. The object of the article is to develop scientifically grounded principles and directions to introduce environmental management and audit into the water sector of Ukraine with purpose of stable functioning and further development.

Methods. The methodology of the investigation based on the use of the modern scientific methods, viz.: analysis, synthesis, induction and deduction, mathematical statistics, systematic approach, and analysis.

Main material. Definition «environmental management» was firstly heard in «Agenda for XXI century», approved in Rio de Janeiro in 1992, which underlined that «environmental management must be a key dominant of the sustainable development and simultaneously must be one of the higher priorities in the economic activity and entrepreneurship».

1. It is necessary to correct this concept for Ukrainian realities, given that without transformation of general system to manage economic and production complex sectors in the country, it is impossible to talk about management system reforming at the local level, i.e. at the organization level. Such situation is defined with motivation and impetuses to realize the environmental management system. It is about preparation of the proper base (legislative, normative, economic), which would provide environmental management development in Ukraine. Nowadays one can confirm that the impelling impetuses to introduce environmental management and audit in Ukraine and abroad are different (Galushkina T.P., Hranovska L.M. (2009)).

For the West it is conscious desire to improve its image and to be included to the leaders at the market, which gives additional chances to receive bank's guarantee for credit, and for Ukraine — the enterprise's desire to get the discounts system in the legislative order (in taxing, crediting, social programs). This is explained by the fact that a friendly macroenvironment has not been formed yet for Ukrainian nature consumers, which would motivate them to find

effective managerial decisions concerning the current management system ecologization.

Nowadays the main government body, which controls water sector in Ukraine, is State Agency for Water Resources, which is subordinated to Ministry of Ecology and Natural Resources of Ukraine. Agency performs functions of water resources management, lands reclamation, territories flood protection, hydrotechnical constructions exploitation, water management facilities and reclamation systems. Sometimes there are conflicts of interests because of those functions fulfillment.

2. That is why, today the most important factor to reform the existing system of water sector is creation of organizational bases and proper motivating impetuses to introduce innovative management with environmental management elements into water sector. However, today this direction is not totally developed, but strategic goal of Ukraine's development is to transfer its natural and resources potential into the main support of the economic growth for sustainable development from the world community position. The environmental management has to be observed as a qualitatively new ideology to control water sector activity under the market conditions, which is the base for the following principles:

- *significance of the water management sector for development of the country's economy.* Water management supplies economy sectors, including agriculture and population, with water for drinking, irrigation and industrial sectors. It creates working places, allows the economy to be developed in the regions and country as a whole. The strategy of water sector development and modernization for agriculture will solve top-priority tasks of the Strategy of agriculture and rural territories development till 2020;

- *complexity of economy, cities and rural territories development.* Complexity principle will let to orient investment resources to the water management, agriculture and rural territories innovative development. It will let to create legal institutional environment to form and to develop decentralized and environmentally balanced enterprises and associations in agricultural sector of economy in the irrigation region through introduction of state and private partnership into the water sector;

- *water resources complex management.* Agriculture of Southern region in Ukraine is a powerful consumer of water resources, however water resources complex management has to foresee conflict-free supplies with qualitative water resources and other water consumers: industry, communal service, population and recreation;

- *separation of functions regarding water resources management and water management infrastructure.* Nowadays these two functions of water resources management are performed by State Agency for Water Resources in Ukraine that sometimes leads to contradictory decisions and actions. Hydrotechnical constructions and water facilities are built for the branches needs and have more regional value (protection from floods, drinking water supply, lands reclamation, control of the groundwater level), that is why, management of these objects must be decentralized and must not be to combined with water resources management function. Water consumers have to be involved into the water resources management at the level of reclamation system;

- *introduction of the state and private partnership into the water sector management.* This principle provides transfer of irrigation and drying systems management to the lower level, i.e. uniting of water users (associations etc). Based on the scientists' studies of Sumy school, it was proved that state and private partnership in the nature management sphere can be defined as legally formalized mutual cooperation between state bodies and business structures regarding to the natural and resources objects and environmental infrastructure objects. Such partnership distinguishes responsibility, risk and results between partners in order to realize the most effective projects in the nature management sphere, which have significant state, regional and public value (Zakon Ukrainy (2010)). Therefore, the state and private partnership system in the water sector may be ascertained as a beneficial cooperation of management system state bodies with private authorities for the engineering infrastructure objects. Management of trunk pipelines and water supply facilities of interregional significance is carried out by regional state operators. The reclamation objects are controlled by the water users, which are united into the organizations and associations of water users.

«State and Private Partnership Act of Ukraine» (2010) defines organization and legal bases of cooperation between state and private partners and main principles of the state and private partnership on a contractual basis, defines spheres of state and private partnership use, which include also water sector, and sets forms to perform state and private partnership and agreements types, which may be concluded between state and private partners (concession, joint activity etc) (Hranovska, L.M., Kyseliova, R.A., (2012));

- *reconstruction and modernization of water management objects with purpose of their ecologi-*

cal safety and credibility. In order to fulfill this principle it is necessary to introduce the system of environmental audit in the whole infrastructure of water sector and agricultural irrigating lands;

- *environmental audit as a base to reconstruct and to develop water sector.* The environmental audit is one of the important tools in the environmental management in the sphere of nature protection activity. Audit as a separate controlling element, started its development in the USA in the early 70s. In the late 80s of XX century some companies achieved high ecological indicators in comparison with those ones, which were predicted by government (Communication from the Commission to the European Parliament..., 2013). An active environmental audit as environmental management was firstly introduced not only in the companies of the USA, but enjoyed great confidence among the European companies. Today, the environmental audit is being actively introduced at the enterprises of Canada, Great Britain, Sweden and other countries. Great Britain is leader of the environmental audit development, where in 1992 British Standardization Institute developed Standard on the environmental management BS 7750 (Specification for Environmental Management System). Since 80s of the last century in Europe a system of standards ISO 14000 «Environmental Management» and ISO 9000 «Quality Management» was adopted, which were approved as state standards in 1997 by Gosstandard of Ukraine and are legal bases for activity in the environmental audit sphere. Necessity to organize the environmental audit of the reclaimed lands and water management and reclamation facilities is substantiated by the irrigated, dried and surrounded lands ecological state worsening, decrease of repair and restoration works at water sector facilities and hydrotechnical constructions, sharing of reclamation fund lands, changes of property forms for agricultural lands and water sector reclamation facilities, transformation of economic conditions in the country and in the water management system. The environmental audit of water sector facilities is a tool for human's economic activity control with purpose to protect the environment, to increase environmental safety and to reduce probability of risks as a result of economic activity and in the sustainable development interests. Results of the environmental audit form a base to develop directions and measures for reconstruction and modernization of water sector infrastructure, renovation and reconstruction of the irrigated areas with various technologies and ways of agricultural crops watering;

• *principle of financial and ecological balance.* Reconstruction and modernization of the water sector infrastructure may be fulfilled only with investment, since it is the long, gradual and expensive process. Modernization is not simply the substitution of «old» infrastructure, it is a complex system of actions, for which it is necessary to define concrete directions and priorities. In order to provide ecologically balanced and ecologically save use of water resources, it is necessary to reconstruct irrigating channels, pumping stations, hydrotechnical constructions, irrigating machines and facilities. It is urgent to improve methods to calculate water cost, which is supplied for irrigation and drinking needs. Tariffs for water have to be clearly calculated according to costs for water transportation and water cost as a natural resource.

• *Environmental management as a condition to provide ecologically safe water sector functioning in Ukraine.* In order to introduce an effective environmental management system into the water sector, it is necessary to:

– create an effective institutional infrastructure of the environmental management taking into account clear separation of functions, rights and responsibilities of central, regional and local state and executive bodies regarding the water-related activity;

– develop the stimulating taxing system and discounts mechanism to provide ecologically safe and complex use of water resources;

– form flexible system of the water sector objects ecological insurance in order to accumulate funds for loss elimination, which may appear in the environment;

– introduce special regimes of the investment activity concerning investors' stimulation, who assist the water sector infrastructure ecologization and contributed to the ecologically save projects realization in the water sector management;

– improve organization and economic mechanism of environmental management system introduction in Ukraine, which is based on investigation of environmental management formation methodology; on monitoring of current legislation in the water sector management system with purpose of its improvement.

Thus, improvement of the environment quality has to be a task of state value, and the main way to solve it — is state support, development and introduction of the systems to control environment quality according to the standards ISO 9000 and 14000, principles of the environmental initiatives, recognized in Europe and in the world. As a result of the above mentioned, the goal to introduce environmental management is to determine strategic directions and priorities, ecological and economic grounds to realize state policy in the sphere of water resources management, their protection and recreation.

Conclusions. The main directions to increase water sector effectiveness is to develop and scientifically to justify principles of environmental management and audit system introduction with purpose to investigate stages of sector recreation and within the framework of environmental safety and based on its activity ecologization. The environmental audit and its results of either water sector and hydrotechnical facilities, or agricultural irrigating lands, are bases for introduction of engineering, reclamation and ecological measures in the environmental management and audit system. It is impossible to improve the management system without justifying main stages in modernization and recreation of the sector activity, which provide gradual and tolerant distribution of functions to manage water resources and to exploit water sector and reclamation systems between State Water Agency and regional bodies of water resources management. Increase of State Water Agency's role in water resources management will enable their ecologically safe and balanced use, based on complexity and integrity principles. Further studies in this sphere have to be oriented to develop organization and economic mechanism to introduce environmental management and audit into the water sector, to form Strategy of sector development, recreation stages and irrigated areas extension.

The system of investment regarding water sector innovative development and justifying of the investigated measures economic efficiency on modernization and reconstructions of the water sector infrastructure.

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ПРИНЦИПИ ВПРОВАДЖЕННЯ ЕКОЛОГІЧНОГО МЕНЕДЖМЕНТУ ТА АУДИТУ У ВОДОГОСПОДАРСЬКУ ГАЛУЗЬ УКРАЇНИ

Розробити науково обґрунтовані принципи та напрямки впровадження системи управління навколишнім середовищем та системи управління водними ресурсами України для її сталого функціонування та подальшого розвитку. Методологія дослідження базується на використанні сучасних наукових методів, а саме: аналізу, синтезу, індукції та дедуції, математичної статистики, системного підходу та аналізу. Залучення значних обсягів водних ресурсів Південного регіону призвело до зміни гідрологічного режиму у водосховищах, порушення природної рівноваги, різкого зниження якості водних ресурсів, переважання процесів деградації на самообслуговуючих територіях і самоочищаюча здатність водних екосистем в економічному обороті для розвитку галузей економіки: промисловості, рекреації, сільського господарства, у тому числі зрошення. Сьогодні терміново необхідно вирішити проблеми інтегрованого управління водними ресурсами як цілісної еколого-економічної системи регіону з можливістю врахування потреб забезпечення охорони та раціонального використання всіх природних ресурсів, сучасних змін у природокористування і стратегії соціального розвитку регіону.

Функціонування системи управління водними ресурсами неефективне через недосконалість сучасної системи управління водними ресурсами, брак фінансування та недосконалість механізмів залучення позабюджетних коштів, а також відсутність системи державно-приватного партнерства в водний сектор. Крім того, відсутність потужної законодавчої бази для екологізації діяльності з управління водними ресурсами призводить до екологічних проблем та еколого-економічних, організаційних та технологічних ризиків. Необхідно провести екологічний аудит та виявлення нових технологічних можливостей зрошувальних систем та гідротехнічних споруд, напрямків розвитку та етапів модернізації іригаційних систем для забезпечення інтегрованого управління водними ресурсами та адаптації зрошувальних систем та режимів зрошення сільськогосподарських культур у зв'язку зі зміною клімату для забезпечення екологічності збалансованого розвитку водних систем. Необхідно також створити умови для стійкого соціально-економічного розвитку аграрного сектора в районі зрошення та сільської місцевості. Питання ефективного функціонування водного господарства тісно пов'язані не тільки з впровадженням екологічних аудитів, але й впровадження екологічного менеджменту як системи управління водними ресурсами на національному рівні, а також на регіональному та місцевому рівнях залишаються невирішеними.

Основною умовою підвищення ефективності водного господарства є розробка та наукове обґрунтування принципів реалізації системи екологічного менеджменту та аудиту з метою розробки напрямів відновлення та розвитку галузі в контексті екологічної безпеки та на основі екологізації її діяльності. Екологічний аудит та його результати як об'єкти водно-гідротехнічної техніки, зрошувані сільськогосподарські угіддя є основою для впровадження інженерних, меліоративних та екологічних заходів у системі екологічного управління та аудиту. Покращення системи управління неможливе без обґрунтування основних етапів модернізації та відновлення галузі, що передбачає поступове та толерантне розподіл функцій управління водними ресурсами та експлуатації систем управління водними ресурсами та меліоративних систем між Державним агентством водного господарства та регіональні органи влади. Посилення ролі Державного агентства водного господарства в управлінні водними ресурсами дозволить екологічно безпечно та збалансовано використовувати їх на основі принципів всебічності та інтеграції.

Ключові слова: сектор водного господарства, принципи, екологічний менеджмент та аудит, екологічна безпека, державно-приватне партнерство, екологізація, модернізація.

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