

# Rating of economic entities in the sector as a component of water resources management

*Nataliia Kovshun*<sup>\*</sup>, *Nina Kushnir*, *Vladyslav Solodkyy*, *Alla Zhemba*, and *Oksana Kliukha*

National University of Water and Environment Engineering, 33000 Rivne, Ukraine

**Abstract.** The study is devoted to the problem of analysing the activities of water management organizations. Such an analysis is an important component of water resources management since many important tasks (technological, environmental, economic, and others) are assigned to water management organizations. It is proposed to use ratings for a comprehensive assessment of the performance of budgetary water management organizations. This methodology involves the use of individual indicators of their activities, which can be grouped into blocks as well as combined into generalized indicators. The initial stage of rating the organization's activity is its assessment by individual parameters that form the main components of the activity, such as financial, intellectual, personnel, technological, informational, environmental, etc. Based on these data, an integrated assessment of the level of performance of organizations is carried out. The rating result for a separate period is given. The gathered array of data for the year will more objectively reflect the performance of the organization than quarterly data. Dynamic analysis in the context of the years under study will also allow identifying changes that have occurred in the rating of water management organizations as a result of identifying reserves and implementing measures aimed at improving their performance.

## 1 Introduction

Rational use, conservation and protection of water resources is the key to sustainable development of society. The growing shortage of fresh water is now considered as a major risk for the global economy [1, 2]. Scientists emphasize the need for a transition to sustainable water use, which requires appropriate state regulation, innovative projects, the initiative of the business sector, the effectiveness of budget organizations, consumer responsibility [3, 4].

Ensuring environmentally safe water use largely depends not only on the production technology, but also on the management of water resources: their use, protection and restoration. Water resources management is a complex set of measures in which legal, administrative, economic, environmental, psychological, ethical and other aspects are closely intertwined.

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<sup>\*</sup> Corresponding author: [n.e.kovshun@nuwm.edu.ua](mailto:n.e.kovshun@nuwm.edu.ua)

The spatial socio-economic development of the country largely depends on the water resource factor, which determines the level of water supply to the economy and the state of human habitat. In this regard, addressing the issue of the rational use and protection of water is an integral part of the country's security.

## 2 Related works

The implementation of environmental policy is usually carried out by the state and financed from the budget. Evaluation of the performance of budget organizations can be carried out by different methods. Thus, the postulates of the theory of public finance can be considered a traditional approach [5]. It is useful to study the effectiveness of the value, improve the analysis of the coverage of data used to assess the functioning of a particular industry [6]. There are approaches that consider the impact of budget financing on the competitiveness of business entities [7]. It is important that existing budget expenditures contribute to the sustainability of public finances [8].

This study will propose approaches to assessing the effectiveness of water management budgetary institutions. This problem can be solved by using mathematical models, in particular Bayesian networks, probability theory [9-11], etc. The peculiarity of the activity of water management organizations requires taking into account regional features and the life cycle of production processes [12-14].

The effectiveness of natural resource management in general and water resource management in particular can be investigated and evaluated by applying a rating system to water management organizations.

To improve the efficiency of management and use of budget funds, the task was to develop a methodology for assessing the work of water management budget organizations based on a certain holistic system of indicators that would maximally cover the entire range of their activities. Practical application of this methodology will allow evaluation of the performance of water management budget organizations by an integral indicator as rating.

## 3 Method

There are several definitions of the term "rating", which allow to get a general idea of the studied category. In general, a rating is:

- numerical or ordinal indicator of success or popularity, which reflects the importance or influence of a certain object or phenomenon;
- an indicator of assessing the activity, popularity, authority of a person, organization, group, program at a certain time, which is determined by a sociological survey, voting, etc. and the place they occupy among their peers;
- relative indicator of reliability of a business partner.

During the rating, the analyst must determine in advance:

- first, the parameters (indicators) by which the assessment is carried out;
- secondly, the method and criteria of assessment;
- thirdly, the weight of each indicator in the integrated assessment.

The term "rating" means evaluation, determination of order, classification, and ranking of a certain phenomenon on a certain scale. Rating can be applied when objective difficulties prevent measuring a phenomenon on a certain scale and is a means of generalizing a large amount of information. Economic rating is a mandatory, objectively determined variant of generalization and evaluation of the behaviour of economic system entities, directions, forms, and methods of management, mechanisms, tools, and means of their implementation, which are mandatory for all these entities and are used within the

current legal framework. That is, the economic rating is a generalization of the outlined, common to all, rules of behavior of the studied structural elements of a certain economic system, taking into account various factors affecting them. The main advantage of economic rating is that it is the process of the "birth" of an information product that clearly illustrates the position and prospects of an economic entity in a competitive environment. To conduct a comprehensive assessment of the performance of budgetary water management organizations (determination of the rating), individual indicators of their activities are used, which can be grouped into blocks, as well as combined into generalized indicators. The initial stage of rating the organization's activity is its assessment by individual parameters that form the main components of the activity, such as financial, intellectual, personnel, technological, informational, environmental, etc. Based on these data, an integrated assessment of the level of performance of organizations is carried out.

Let us consider the sequence of determining the components of a comprehensive assessment of the activities of water management budget organizations.

The key indicators that summarize the results of financial and economic activities of water management entities achieved in the reporting period are taken as a basis. Other parameters allow assessing the dynamics of changes in all areas of activity. The list of indicators can be specified and adjusted depending on the relevance of a particular criterion in a certain period of time.

The calculation of primary indicators in specific units of measurement is based on the accumulated data for the reporting period. In determining the derived indicators, the current methodology for calculating relative values is applied. The organizations' performance is assessed on the basis of methodological principles of analysis of economic and social development indicators taking into account their dynamics.

The peculiarity of this methodological approach for water management budgetary organizations is the study of indicators by enlarged blocks:

- operational block
- financial and economic block;
- block of inspection activities;
- water and soil monitoring block;
- block of personnel work.

In accordance with the defined list, the set, qualitative characteristics of the indicators of each block and the method of their calculation are detailed.

The operational block of indicators characterizes the performance of water management budgetary organizations in the operation of water management facilities of complex purpose, inter-farm irrigation and drainage systems, as well as ensuring the repair of on-farm land reclamation network or its structures on a contractual basis.

The set of factors of financial and economic activity of the economic entity, which belong to the relevant block, is determined annually taking into account the Priority tasks for the development of the water sector of Ukraine (Priority tasks). Based on the qualitative and quantitative analysis of the criteria, a conclusion is made about the rating position of the water management organization by the block of financial and economic activities.

The generalized indicator of inspection activity characterizes the results of the activities entrusted to water management organizations to ensure that water users of all forms of ownership comply with the basic principles of water protection legislation on the lands of the water fund. To determine the ranking place by the generalized indicator of inspection activity, extensive and intensive indicators and factors are subject to analysis, the list of which is annually regulated by the Priority Tasks for the use, protection and restoration of water resources. To form a generalized indicator of water and soil monitoring, a set of tasks and objectives of water resources management is taken into account.

The basis for determining the rating by the generalized indicator of personnel work is a set of factors and areas of activity in accordance with the Priority tasks of personnel policy.

Integral criteria for rating the activities of water management budget organizations are determined taking into account two possible methodological approaches:

1. The use of the "better than worse" method, which involves establishing the rank of a particular object under study in the list of others. The advantages of this method are simplicity of calculation of indicators and factors that regulate the rating of a water management organization, as well as sufficient visibility of the information obtained. The disadvantage of the method is the lack of qualitative characterization of the advantages or disadvantages of the subject under study in comparison with the rating position of others.

2. Point assessment, which involves the establishment of a scale of evaluation and ranking using a system of points. Among the advantages is a relatively higher accuracy of the ranking results. The disadvantage is a relatively more complicated method of calculating the position and rank of a water management organization in the overall rating. This method also involves the establishment of evaluation criteria - determining the boundaries of intervals that characterize the work as "good", "satisfactory" or "unsatisfactory".

Taking into account the chosen methodological approach, evaluation criteria and the weight of each indicator from the above blocks, the analyst forms an integral indicator that characterizes the rank of the water management budget organization, determined using the basic principles and criteria of rating.

This methodology provides an opportunity to comprehensively assess the performance of an economic entity (including water management) in the context of various areas of functioning in the absence of such a generalized performance indicator as profitability.

## 4 Results

The State Agency of Water Resources in Ukraine is responsible for executing the government's strategies concerning the management, utilization, and preservation of surface water resources. Additionally, it oversees the advancement of water management and land reclamation practices, as well as the operation of multipurpose state water facilities, inter-farm irrigation systems, and drainage systems. The following water management organizations are subordinated to it: basin water resources management departments, regional water resources offices, canal management departments, technical school, other state enterprises. To test the rating methodology, regional water resources offices were selected, the number of which in 2021 was 14. The Regional Water Resources Office is a budgetary non-profit organization that belongs to the sphere of management of the central executive body - the State Agency of Water Resources of Ukraine.

In accordance with the national legislation, within the limits of its authority, the Regional Water Resources Office ensures the implementation of the state policy in the field of management, use and reproduction of surface water resources, development of water management within the relevant basin on the defined territory, solves in the prescribed manner together with local executive authorities and other organizations the issues of providing the population and economic sectors with water resources. The Regional Water Resources Office performs the functions of operation of water bodies, hydraulic structures, and state land reclamation network.

The diversity and impossibility of direct comparison of indicators characterizing the performance of the Regional Water Resources Offices requires the use of a rating approach for an objective assessment. The study used the methodology described above for assessing the activities of water management organizations, determining their ranks through the rating. A fragment of the diagnostics conducted by us during 2021 is shown in Table 1.

**Table 1.** Rating of water management organizations based on the results of activities in the first quarter of 2021.

<b>Water management organization</b>	<b>Rating</b>	<b>Operational block</b>	<b>Block of inspection activities</b>	<b>Water and soil monitoring block</b>	<b>Financial and economic block</b>	<b>Block of personnel work</b>
Regional Water Resources Office in Volyn region	9	12	2	9	6	13
Regional Water Resources Office in Dnipropetrovsk region	7	5	8	1	10	12
Regional Water Resources Office in Luhansk region	10	14	12	11	4	7
Regional Water Resources Office in Kirovograd region	1	2	1	3	7	8
Regional Water Resources Office in Mykolaiv region	3	7	5	4	1	11
Regional Water Resources Office in Poltava region	4	4	11	5	5	4
Regional Water Resources Office in Rivne region	6	11	6	6	2	10
Regional Water Resources Office in Sumy region	12	13	10	7	14	9
Regional Water Resources Office in Ternopil region	5	9	4	8	11	2
Regional Water Resources Office in Kharkiv region	12	3	13	10	13	14
Regional Water Resources Office in Khmelnytskyi region	8	10	9	2	12	5
Regional Water Resources Office in Cherkasy region	2	1	3	12	8	3
Interregional Office of Protective Arrays of the Dnipro reservoirs	4	6	7	12	3	1
Regional Water Resources Office of the Ros River	11	8	14	13	9	6

According to the integral indicator, two water management organizations shared the fourth place and the other two organizations shared the 12th place. The rating assessment of water management organizations should be carried out in dynamics. The formed array of data for the year will more objectively reflect the performance of the organization than quarterly data. Dynamic analysis in the context of the years under study will also allow identifying changes that have occurred in the rating of water management organizations as a result of identifying reserves and implementing measures aimed at improving their performance. The development of such measures should be based on the criteria used in the diagnosis [15].

For example, in order to improve the rating in the block of inspection activities (Table 2), it is advisable to increase the number and effectiveness of inspections on compliance with water protection legislation on the lands of the water fund and water users of all forms of ownership.

**Table 2.** Determination of the generalized indicator of inspection activities.

No.	Name of indicators	Algorithm for determining
1	Generalized indicator of inspection activities for the reporting period	The place of the organization is determined by the sum of places for indicators from 1.1 to 1.9 inclusive
1.1	Number of inspections per 1 specialist who has the right to carry out inspections	It is defined as the ratio of the number of inspections during the reporting period to the number of specialists authorized to carry out inspections on compliance with water protection legislation on the lands of the water fund and water users of all forms of ownership
1.2	Number of considered cases of administrative violations per 1 specialist who has the right to consider such cases	It is defined as the ratio of the number of cases considered during the reporting period to the number of specialists authorized to consider such cases
1.3	Share of the number of cases on administrative violations in the total number of inspections	It is defined as the ratio of the number of cases of administrative violations considered during the reporting period to the total number of inspections, %
1.4	Share of the amount of collected fines in the total amount of imposed fines	It is defined as the ratio of the amount of collected fines to the total amount of imposed fines for the reporting period, %
1.5	Share of the number of joint inspections with other authorities in their total number	It is defined as the ratio of the number of joint inspections with other authorities to their total number for the reporting period, %
1.6	Number of cases of charging damages for violation of water protection legislation	The place of the organization is determined by the actual number of cases of accrual of losses for violation of water protection legislation for the reporting period, units
1.7	Level of implementation of planned indicators of budget revenues for the lease of water bodies of national importance	It is defined as the ratio of actual budget revenues for the lease of water bodies of national importance for the reporting period to the annual targets, %
1.8	The amount of fines imposed on violators of water protection legislation, thousand UAH	The place of the organization is determined by the actual amount of fines imposed on violators of water protection legislation during the reporting period, thousand UAH
1.9	The amount of damages imposed on violators of water protection legislation, thousand UAH	The place of the organization is determined by the actual amount of losses imposed on violators of water protection legislation for the reporting period, thousand UAH

The rating in the block of personnel work can be improved, for example, by increasing the level of employees with higher education, internships or advanced training and by increasing the share of young employees (Table 3). The use of this approach should be based on the postulates of industrial logic. That is, the organization should not strive to ensure that all employees are under the age of 30, or to carry out a biased attitude towards violators in order to collect a fine.

**Table 3.** Indicators for determining the generalized indicator of personnel work.

No.	Name of indicators	Algorithm for determining
1	Generalized indicator of personnel work	The place of the organization is determined by the sum of places by component indicators
1.1	Share of employees under 30 years old	It is defined as the ratio of the number of employees under 30 to the total number of employees as of the reporting date, %
1.2	Share of employees with higher education among managers and specialists	It is defined as the ratio of the number of employees with higher education to the total number of managers and specialists as of the reporting date, %
1.3	Completeness of coverage of employees for training, retraining and advanced training	It is defined as the ratio of the number of employees who underwent training, retraining and advanced training during the reporting period to the total number of employees as of the reporting date, %
1.4	Staff turnover at the reporting date	Characterized by the staff turnover rate
1.5	Share of managers and specialists who undergo advanced training at the State Institute of Water Resources Management and Economics	It is defined as the ratio of the number of managers and specialists who have undergone advanced training during the reporting period at the State Institute of Water Management and Economics to the total number of managers and specialists as of the reporting date, %
1.6	Share of young professionals among managers and specialists	It is defined as the ratio of the number of young professionals among managers and specialists to the total number of managers and specialists as of the reporting date, %
1.7	Share of employees who study in the total number of employees	It is defined as the ratio of the number of employees who study to the total number of employees for the reporting period, %

However, the simplicity of the methodology and clarity of the indicators used in it allows to form a basic assessment of the performance of budgetary water management organizations.

## 5 Conclusions

Implementation of the state policy in the field of water resources management is carried out in Ukraine by water management organizations subordinated to the State Agency of Water Resources. In certain territories, in the context of administrative regions, the main functions are entrusted to the Regional Water Resources Offices. In the absence of such a traditional generalizing indicator for assessing the effectiveness of their financial and economic activities as profitability, there is a need to use a rating approach. For the process of assessing the effectiveness of water resources management, it is advisable to determine the rating for individual blocks: operational, financial and economic, inspection, monitoring, and personnel. The overall rating is an integral indicator that should be studied in dynamics in order to identify optimization reserves and develop and implement appropriate measures.

Further research will involve expanding the number and improving the quality of indicators used in a particular block, with the obligatory consideration of national trends and needs. At the same time, it is necessary to continue adapting the proposed rating indicators to the existing reporting system of the Regional Water Resources Offices, to provide for the use of the expert assessment method, and to consider the introduction of weighting coefficients for each block and for the individual indicators that form them.



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