

# Water monitoring in Ukraine: methods for assessing water quality for various purposes in connection with changes in the regulatory framework (2014-2022)



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# Introduction

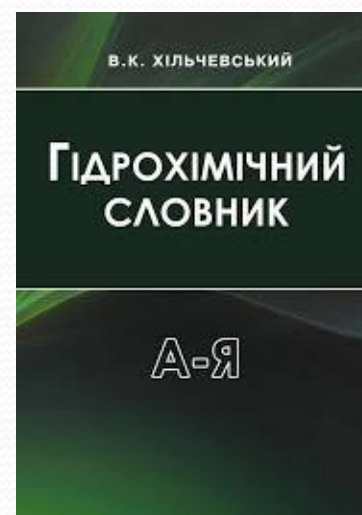
**Publications  
of the Department of Hydrology and Hydroecology  
Taras Shevchenko National University of Kyiv  
on the topic "Water monitoring in Ukraine: methods  
of water quality assessment..."**

ДОПОСТАЧАННЯ

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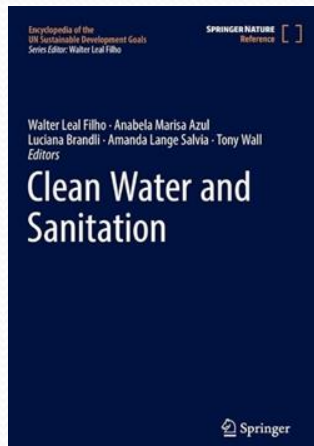
# Books published by the Department of Hydrology and Hydroecology by topic in 2019-2024 (I)

- 1) Kravchinskyi R.L., Khilchevskyi V.K., Korchemlyuk M.V., Stefurak O.M. **Monitoring of natural water sources of the Carpathian National Nature Park: monograph** / Ed. V.K. Khilchevsky. Ivano-Frankivsk. Foliant, 2019. 124 p.
- 2) Khilchevskyi V.K., Zabokrytska M.R. **Chemical analysis and assessment of the quality of natural waters: training. manual.** Lutsk. Tower-Print, 2021. 75 p.
- 3) Khilchevskyi V.K. **Hydrochemical dictionary.** K. DIA, 2022. 208 p.
- 4) Khilchevskyi V.K., Hrebin V.V., Manukalo V.O. **Hydrological dictionary.** K. DIA, 2022. 236 p.
- 5) Khilchevskyi V.K., Hrebin V.V. **Water bodies of Ukraine and recreational assessment of water quality: training. manual.** K.: DIA, 2022. 240 p.



# Books published by the Department of Hydrology and Hydroecology by topic in 2019-2024 (II)

- 6) Khilchevskiy V., Karamushka V. **Global Water Resources: Distribution and Demand**. In: Leal Filho W. (eds). **Clean Water and Sanitation**. Encyclopedia of the UN Sustainable Development Goals. Springer. 2022. P. 240-250.
- 7) Khilchevskiy V.K. **Hydrography and water resources of Europe: training**. manual. K. DIA, 2023. 308 p.
- 8) Khilchevskiy V.K., Zabokrytska M.R., Stelmakh V.Yu. **Hydro-ecological aspects of water supply and drainage: training**. manual. K. DIA, 2023. 228 p.
- 9) Khilchevskiy V.K., Hrebin V.V., Zabokrytska M.R. **Management of river basins: teaching**. manual. K. DIA, 2024. 236 p.
- 10) Khilchevskiy V.K. **Management of transboundary water resources: training**. manual. K. DIA, 2024. 208 p.



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● Khilchevskiy V.K. **Water monitoring in Ukraine: methods of assessing water quality for various purposes in connection with changes in the regulatory framework (2014-2021).** Hydrology, hydrochemistry and hydroecology, 2021. No. 3(61). C. 6-19.

● Khilchevskiy V.K. **Assessment of the quality of the recreational water environment: global trends, WHO recommendations, the EU directive on bathing water.** Hydrology, hydrochemistry and hydroecology, 2021. No. 4(62). C. 6-17.

● Khilchevskiy V.K., Zabokrytska M.R. **Peculiarities of normative assessment of water quality of water bodies for recreational purposes in Ukraine.** Hydrology, hydrochemistry and hydroecology. 2022. No. 1(63). P. 40-53.

● Khilchevskiy V.K., Zabokrytska M.R. **Arrangement, monitoring and environmental certification of beaches on recreational water bodies.** Hydrology, hydrochemistry and hydroecology, 2022. No. 2(64). C. 40-52.

● Khilchevskiy V.K., Grebin V.V. **Some aspects regarding the state of the territory of river basin areas and water monitoring during the Russian invasion of Ukraine (2022).** Hydrology, hydrochemistry and hydroecology, 2022. No. 3(65). P. 6-14.

● Khilchevskiy V., Netrobchuk, I., Sherstyuk N., Zabokrytska M. **Environmental assessment of the quality of surface waters in the upper reaches of the Pripyat basin in Ukraine using different methods.** Journal of Geology, Geography and Geoecology. 2022. 31(1). P. 71-80.

● Shumilova, O., Sukhodolov, A. Tockner, K., Khilchevskiy, V., De Meester L, Stepanenko, S., Trokhymenko A., Hernandez-Aguero J. A., Gleick P. **Impact of the Russia-Ukraine armed conflict on water resources and water infrastructure.** Nature Sustainability. 2023. 6. P. 578-586.

# Chapter 1

**Normative documents on water monitoring  
and water quality assessment that have  
appeared in Ukraine in 2014-2022**

ДОПОСТАЧАННЯ

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# 1.1. Water quality standardization



- **Assessment of water quality** is always based on certain standards.
- **Rationing** is a setting in a directive of the order of regulated, permissible values limits of this or that indicator.
- **Water quality norms** - values of water quality indicators (physical, chemical, biological) that meet certain requirements are established in a directive manner, in which human health is reliably protected, favorable conditions are created for various types of water use, water protection and ecological well-being of the water body of the object
- **Normative methods of water quality assessment** are documents approved in a directive manner, which are based on water quality standards.
- **The use of normative methods is a mandatory condition when designing**, drawing up official certificates and conclusions, etc.

# 1.2. Association Agreement between Ukraine and the EU, 2014

In recent years, there have been many changes in Ukraine that relate to both water monitoring and regulatory methods and methods of water quality assessment for various purposes, which is due to the **course of integration with methodological approaches in this field in the European Union.**

A significant incentive for this process was the signing of the **Association Agreement between Ukraine and the EU in 2014**, which led to the reform of many spheres of activity, including those related to the management of water resources and their quality.

Below we will briefly dwell on some aspects.





# 1.3. Normative documents on water issues that appeared in Ukraine in 2014-2022 (I)

● In 2015, DSTU 7525:2014 entered into force **"The water is drinkable. Requirements and methods of quality control"**.



● In 2017, **sanitary legislation acts of the Ukrainian SSR and the USSR** were repealed, which became an important feature of water quality regulation for various purposes at the current stage. Therefore, when starting to assess the quality of water for hygienic purposes, one should be guided by the order of the CMU **"On the recognition of acts of sanitary legislation as having lost their validity and as not applicable on the territory of Ukraine"** dated January 20, 2016 No. 94, which acts of sanitary legislation issued by the central executive authorities of the Ukrainian SSR and the USSR, including sanitary rules and regulations, are recognized as not applicable on the territory of Ukraine.



● In 2017, the **State Sanitary and Epidemiological Service** of the Ministry of Health of Ukraine was liquidated (Resolution of the Cabinet of Ministers of Ukraine dated March 29, 2017 No. 348). Its functions are performed by **the Ministry of Health, the State Labor Service and the State Production and Consumer Service**.

# 1.4. Normative documents on water issues that appeared in Ukraine in 2014-2022 (II)

● In 2017, the "List of pollutants for determination of the chemical state of surface and underground massifs artificial or significantly altered waters and ecological potential massif of surface waters» / Order of the Ministry of Natural Resources dated February 6, 2017 No. 45.

● In 2017, the «Procedure for developing a river basin management plan» / Decree of the CMU of May 18, 2017 No. 336 was approved.

● In 2018, the "Procedure for implementation of state of water monitoring" / Resolution of the CMU of September 19, 2018 No. 758.

● In 2019, the "Methodology for determining surface and underground water bodies" was approved / Order of the Ministry of Natural Resources of Ukraine of January 14, 2019 No. 4.

● In 2019, the "Methodology for assigning a body of surface water to one of the classes of ecological and chemical state of the body of surface water, as well as assigning an artificial or significantly altered body of surface water to one of the classes of ecological potential of an artificial or significantly altered body of surface water" / Order Ministry of Natural Resources of Ukraine dated January 14, 2019 No. 5.



# 1.5. Normative documents on water issues that appeared in Ukraine in 2014-2022 (III)

● In 2021, the "**Marine Environmental Protection Strategy**" was approved of Ukraine" / Ordinance of the CMU of October 11, 2021 No. 1240



● In 2022, the Law of Ukraine "**On the Nationwide Targeted Social Program "Drinking Water of Ukraine" for 2022-2026**" was adopted / VRU, February 15, 2022, No. 5723.

● In 2022, "**Hygienic water quality standards of water bodies to meet drinking, household and other needs of the population**" was approved / Order of the Ministry of Health of Ukraine dated 05.02.2022 No. 721

● In 2022, the "**Water Strategy of Ukraine for the period until 2050**" was approved of the CMU of December 9, 2022 No. 1134.



● In 2019, DSTU 2439:2018 "**Chemical elements and simple substances**" entered into force. **Terms and definitions of basic concepts, names and symbols**", in which most of the Ukrainian names of chemical elements and the rule for writing the names of elements with a lowercase letter are returned.

By the way, according to this DSTU, the spelling of the term «**yion**», which is often found in publications as "**ion**", will be correct.

# Water quality assessment scheme of a water body for various purposes



# Chapter 2

**State water monitoring and ecological goals  
of water quality assessment**

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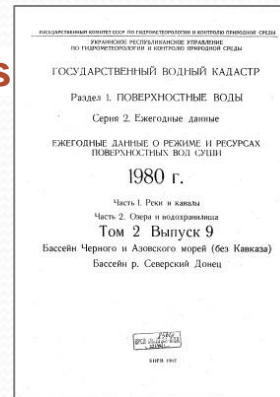
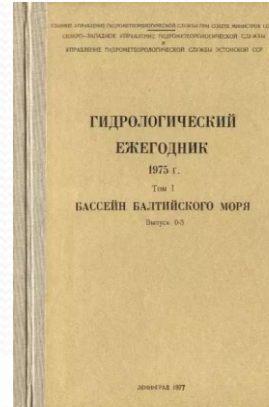
КИЇВА

# 2.1. From the history of water monitoring in Ukraine

● In the 1930s, the collection of water samples for chemical analysis was started at some hydrological stations of the system of hydrometeorological service of the former USSR, with the subsequent placement of data in the **"Hydrological Yearbooks"**.

● In the early 1970s, a system of hydrochemical monitoring of water bodies was created in the territory of the former USSR as part of the national system environmental monitoring and control. In particular, quarterly **"Hydrochemical bulletins"** (since the 1980s - **"Annual data on the quality of surface waters of Ukraine"**) were published in Ukraine with an expanded list of monitoring points for surface waters and the range of chemical components (including pollutants), and as well as some hydrobiological indicators issued by the Ukrainian Department of Hydrometeorology and Control of the Natural Environment of the State Hydrometeorological Committee of the USSR.

● This methodical approach was preserved in the system of the Hydrometeorological Service of Ukraine even after 1991, despite the changes in its departmental affiliation - **since 2011**, it is the **hydrometeorological organization of the State Emergency Service of Ukraine** In 2016, in the system. hydrometeorological organizations of the State Emergency Service of Ukraine there were 201 surface water quality monitoring points.



## 2.2. Law of Ukraine "On Amendments to Water Resources Management...", 2016

● In 2016, the Verkhovna Rada of Ukraine adopted the Law "On Amendments to Certain Legislative Acts of Ukraine Regarding the Introduction of Integrated Approaches to Water Resources Management According to the Basin Principle".

● This Law approves, in particular, the hydrographic zoning of the territory of Ukraine, which allocates 9 river basin district:

- Dnipro,
- Dniester,
- Danube,
- Southern Bug,
- Don,
- Vistula,
- Crimean rivers,
- Black Sea rivers,
- rivers Azov region



## 2.3. The procedure for state water monitoring in Ukraine (2018)

● In 2018, a resolution of the Cabinet of Ministers of Ukraine approved the "Procedure for State Water Monitoring", which is based on the EU Water Framework Directive, 2000.



### TYPES OF STATE WATER MONITORING (SWM)

● According to the SWM Procedure, the following types of land water monitoring are distinguished:

- diagnostic,
- operational,
- research.



● Types of state monitoring of **sea waters**:

- basic evaluation,
- accompanying,
- research.



● The DMV program provides control over four **GROUPS OF INDICATORS**:

- 1) biological;
- 2) physical and chemical;
- 3) chemical;
- 4) hydromorphological.



## 2.4. Types of land water monitoring.

### Diagnostic monitoring



- **Diagnostic monitoring** is carried out for surface and underground water bodies with the aim of:
  - supplementing and confirming the results of determining the main anthropogenic influences on the quantitative and qualitative state of surface and underground waters, including from point and diffuse sources;
  - development of the state water monitoring program;
  - establishment of reference conditions and assessment of their long-term changes.
- For surface water bodies, diagnostic monitoring is carried out during the **first year** of state water monitoring.
- For surface water bodies that do not have a risk of not achieving environmental goals, diagnostic monitoring is additionally carried out during **the fourth year** of state water monitoring

## 2.5. Types of land water monitoring.

### Operational monitoring



● **Operational monitoring** is carried out for bodies of surface and underground water in which there is a risk of not achieving environmental goals, with the aim of:

-- determination of the ecological and chemical state of surface water bodies and the quantitative and chemical state of underground water bodies;

-- assessments of changes in the ecological and chemical state of surface water bodies, as well as in the quantitative and chemical state of underground water bodies, which are the result of the implementation of the river basin management plan.

● Operational monitoring is carried out **every year** in the period between years of diagnostic monitoring.

## 2.6. Types of land water monitoring.

### Research monitoring



● **Research monitoring** is carried out for bodies of surface water with the aim of: - establishing the reasons for deviation from ecological goals:

- clarification of the scale and consequences of accidental water pollution;
- establishing the reasons for the risk of non-achievement of environmental goals, identified in the process of diagnostic monitoring, before the start of operational monitoring.

● **Research monitoring is carried out by subjects of state water monitoring.**

Subjects of state water monitoring independently determine the monitoring points, the list of indicators and the frequency of their measurement.

## 2.7. State monitoring program of water for 2023



● By Order No. 27 dated January 17, 2023, the Ministry of Environment approved the "Program of state water monitoring (in terms of diagnostic and operational monitoring of surface water bodies) for 2023"

№	River basin district	Number of <b>diagnostic monitoring</b> points	Number of <b>operational monitoring</b> points
1	<b>Dnipro</b>	150	60
2	<b>Dniester</b>	2	91
3	<b>Danube</b>	2	99
4	<b>Southern Bug</b>	35	15
5	<b>Don</b>	4	69
6	<b>Vistula</b>	-	23
7	<b>Crimean rivers</b>	-	-
8	<b>Black Sea rivers</b>	-	16
9	<b>Rivers Azov region</b>	14	3
	<b>In total</b>	<b>207</b>	<b>376</b>

## 2.8. Regional water monitoring laboratories of the State Water Agency



Within the structure of the State Water Agency of Ukraine during 2020-2021, as part of the implementation of the provisions of the EU Water Framework Directive, 4 basic regional water monitoring laboratories (WML) were organized, which correspond to the international level:

- WML Zakhidny region (**Ivano-Frankivsk**);
- WML Pivnichny region (**Vyshgorod, Kiev region**);
- WML Pivdenny region (**Odesa**);
- WML Skhidnogo region (**Slovyansk, Donetsk region**).

## 2.9. Subjects and objects of state water monitoring, bodies of water

● The subjects (leading agency) of conducting state water monitoring are determined by the **Ministry of Environment of Ukraine** with the direct participation of the **State Water Agency**, the **State Geological Survey**, **hydrometeorological organizations of the State Emergency Service of Ukraine**.

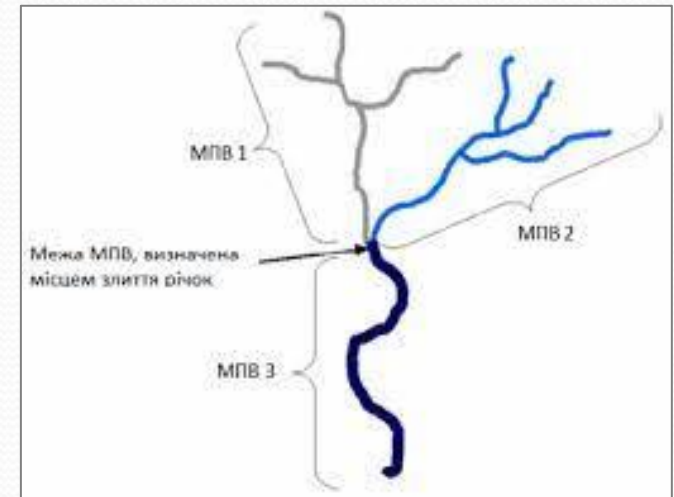
● The objects of the SWM are the **water bodies** of surface water of land and underground water and sea water.

● **Water bodies of surface waters (WBSW)** is a specially defined surface water body or its part, it must be a separate and significant part of the water body.

### WATER BODIES OF SURFACE WATERS, THEIR CATEGORIES

● WBSW can be classified into one of five categories:

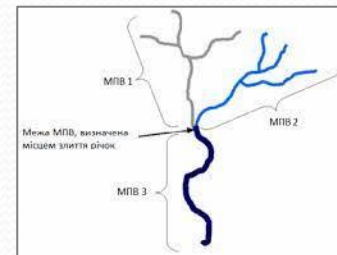
- 1) rivers;
- 2) lakes;
- 3) transitional waters;
- 4) coastal waters;
- 5) artificial or significantly altered bodies of surface water.



## 2.10. Status of water bodies

● On the basis of the data and information obtained as a result of the state monitoring of water bodies of **surface and underground waters**, the following are determined:

- **ecological and chemical status of surface water bodies,**
- **the ecological potential of artificial or significantly altered bodies of surface water,**
- **quantitative and chemical status of groundwater bodies.**



● With this in mind, **river basin management plans** are developed and the level of achievement of the planned ecological status is assessed.

● For **marine waters**, their ecological status is determined, a marine strategy is developed and progress in achieving a "good" ecological status of marine waters within the exclusive marine economic zone and the territorial sea of Ukraine is assessed.

## 2.11. Five classes of ecological status of surface water bodies

Five classes (from "excellent" to "very poor") are used to classify the **ecological status of surface water bodies**. When graphically displaying, each class of ecological status of surface water masses is indicated by a **corresponding color**:

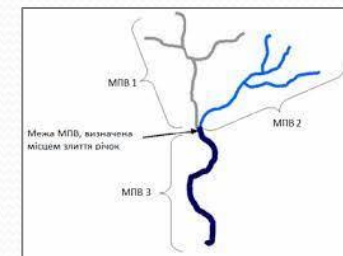
I class - excellent **(blue)**;

II class - good **(green)**;

III class - satisfactory **(yellow)**;

IV class - bad **(orange)**;

V class - very bad **(red)**.



A key aspect in determining the ecological status of a body of surface water is that **maximum permissible concentrations** are not used. Instead, the indicators obtained for "**reference conditions**" are used - conditions that reflect the state of the environment in the absence or minimal anthropogenic influence.



## 2.12. Criteria for assigning a body of surface water to one of the classes of ecological status, 2019

ECOLOGICAL STATUS				
excellent	good	satisfactory	bad	very bad
<p>The values of biological indicators correspond to the values characteristic of the massif of surface water in reference conditions, tending to very minor changes. There are no or very minor anthropogenic changes in values of hydromorphological, chemical and physico-chemical indicators compared to the values characteristic of the massif of surface waters in reference conditions</p>	<p>The values of biological indicators of the surface water body indicate low levels of anthropogenic influence and deviate little from the values characteristic of the surface water body under reference conditions. The concentrations of chemical and physico-chemical indicators do not exceed the environmental quality standards established for the ecological status "good"</p>	<p>The values of the biological indicators of the surface water body deviate moderately from the values typical for the surface water body under reference conditions. These values have a moderate tendency to deviate as a result of anthropogenic influence and have significantly larger deviations compared to the conditions of the "good" state. The concentrations of chemical and physicochemical indicators exceed the environmental quality standards established for the ecological state «задовільний»</p>	<p>There are significant changes in the values of biological indicators and significant deviations from the norms of the relevant biological populations, characteristic of the massif of surface waters in reference conditions</p>	<p>There are very strong changes in biological indicators, the absence of a large part of the relevant biological coenoses, characteristic of the massif of surface waters in reference conditions</p>

# Chapter 3

**Hygienic goals of water quality assessment  
water bodies**

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## 3.1. Hygienic goals of water quality assessment of water bodies. **Selection of water supply source**

For hygienic purposes, it is still relevant to assess the quality of water according to the **maximum permissible concentrations** of some harmful substances in the water of water bodies, which are contained in the relevant regulatory documents.

### Standardization of water quality when choosing a water supply source

Standardization of water quality when choosing a **water supply** source is carried out according to **DSTU 4808:2007** "Sources of centralized drinking water supply. Hygienic and ecological requirements for water quality and selection rules". Water bodies whose water quality meets a set of hygienic, epidemiological, ecological and technological requirements are used or can be used for centralized drinking water supply.



## 3.2. Hygienic goals of water quality assessment of water bodies

In 2022, the "Hygienic standards of water quality of water bodies to meet drinking, household and other needs of the population" was adopted. The characteristics of water bodies to meet the drinking, household and other needs of the population are given according to the following categories of water use: 1) for centralized or non-centralized drinking water supply, as well as for water supply of food enterprises; 2) for economic and domestic water use and for health, recreational, sports purposes, as well as for water bodies within the boundaries of settlements.

Norms are set according to the following indicators: suspended substances; floating impurities (substances); smells; color; temperature; pH; mineral composition; dissolved oxygen; causative agents of diseases; lactose-positive *Escherichia coli*; coliphages; viable eggs of helminths (ascaris, hairworms, toxocar, fasciola), oncospheres of taeniids and viable cysts of pathogenic intestinal protozoa.



## 3.3. Regulation of the quality of drinking water



**Drinking water** is water intended for human consumption (**tap, packaged, from pump stations, filling points, mine wells and catchment sources**), for use by consumers to meet physiological, sanitary and hygienic, household and economic needs, as well as for the production of products that requires its use, the composition of which meets hygienic requirements according to organoleptic, microbiological, parasitological, chemical, physical and radiation indicators.

Drinking water is not considered a food product in the drinking water supply system and in drinking water quality compliance points.

**The quality of drinking water** is regulated by two main documents: **DSanPiN 2.2.4-171-10** (approved in 2010); **DSTU 7525:2014** (effective from 02.01.2015).

According to DSanPiN 2.2.4-171-10, standards are established for the following groups of drinking water safety and quality indicators: a) **epidemic safety – 11**; b) **sanitary and chemical - 66**; c) **radiation - 8 indicators**.

## 3.4. Fisheries objectives of water quality assessment of water bodies



The water quality of water bodies used for the needs of fish farming is assessed using the "Standards of ecological safety of water bodies used for the needs of fish farming regarding the maximum permissible concentrations of organic and mineral substances in sea and fresh waters", approved by the order of the Ministry of Agricultural Policy of Ukraine dated 30.07.2012 No. 47.

Norms of environmental safety of water bodies used for the needs of fisheries are established for three positions: **1) sea waters; 2) natural fresh waters; 3) water of fish ponds.**

The following five indicators are normative: **biochemical oxygen consumption, chemical oxygen consumption, suspended matter, ammonium nitrogen, phosphates.**



# Conclusions

- During 2014-2022, there have been significant changes related to both water monitoring and regulatory methods of water quality assessment for various purposes, which is due to the course of the relevant Ukrainian environmental and water management organizations for integration with methodological approaches in this field in the European Union.
- Acts of sanitary legislation of the Ukrainian SSR and the USSR became invalid in Ukraine on January 1, 2017 (order of the Cabinet of Ministers of Ukraine dated January 20, 2016 No. 94-r).
- Modern regulatory methods are required to be used by relevant institutions that perform water quality assessment. They should also be used by researchers when studying issues related to water quality.

*Thank you for attention.*



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