

3<sup>rd</sup> Session for WMO Regional Association II Working Group on Hydrological Services (WGHS)  
and Workshop on the Dynamic Water resources Assessment Tool

Seoul, Republic of Korea

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# Water Resources Assessment by State Hydrological Institute (SHI)

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# The SHI structure

## 1. Department of Monitoring and Research Expeditions

- 1.1. Sediment and Erosion Laboratory
- 1.2. Laboratory Digital Cartography
- 1.3. Expeditionary group

## 2. Department of Hydrological Instruments

## 3. Department of Metrology and Standardization

## 4. Department of River Runoff and Water Problems

## 5. Department of Experimental Hydrology and Modeling of Hydrological Processes

- 5.1. Group of Marsh Hydrology
- 5.2. Laboratory of Hydrological Processes Simulation
- 5.3. Zelenogorsk Field Experimental Facility

## 6. Department of Hydro-ecological Research

- 6.1. Water Quality Laboratory

## 7. Climate Change Research Department

- 7.1. Laboratory for Study of Regional Climate Change
- 7.2. Laboratory for Study of Climate Change Impact

## 8. Department of Channel Processes

- 8.1. Laboratory of Forecasting and Monitoring of Channel Deformations
- 8.2. Channel Laboratory
- 8.3. Laboratory of Methods of Calculations and Forecasting of Channel Deformations

## 9. Department of Hydrophysics

## 10. Laboratory of Water Resources and Water Balance

## 11. Laboratory of Remote Sensing Methods and GIS

## 12. The Information-analytical Center for Maintenance of the State Water Cadastre "Surface Water"

## 13. Unit on Implementation of International Obligations

## 14. Department of Hydrometry and Hydrological Network

## 15. Laboratory of the State Hydrological Network Development

## 16. Department of Scientific and Technical Information

- 16.1. Scientific and technical Library
- 16.2. Scientific and Technical Archives
- 16.3. Editorial and publishing team

# SHI's website main page (www.hydrology.ru)

Russian Federal State Budgetary Organization  
"State Hydrological Institute" (SHI)

Home Activity Education Contacts

Shortly about SHI

Milestones

The SHI structure

- Русский
- English

The main SHI functions and responsibilities are:

- Studying surface water bodies of the Russian Federation (rivers, lakes, reservoirs, wetlands), their regimes and resources.
- Carrying out theoretical and experimental research to improve methods for assessing and forecasting changes in the status of surface water bodies in terms of quantitative and qualitative indicators of water resources.
- Developing the theory and modelling of river runoff.
- Developing methods for calculating the basic hydrological characteristics for the design, construction and exploitation of various engineering structures on water bodies.
- Studying the formation of dangerous hydrological phenomena and developing methods for its assessment, calculation, prediction and control.
- Studying hydrological and ecological processes in water bodies.
- Studying water quality, water and chemical balances, including consideration of anthropogenic impact.
- Developing scientific principles for monitoring water bodies, constructing the hydrological network and the technology of collecting, processing and disseminating information on the status of surface water.
- Developing methods and means for the measurement of hydrological parameters, as well as specialized software.
- Assessing the impact of climate change on the natural conditions, the hydrological characteristics and water resources.
- Performing theoretical and experimental studies of the formation of river sediments, soil erosion and channel processes in order to develop methods for its calculation and prediction under the influence of anthropogenic activities and climate change;
- Providing scientific and methodological support for work on the management of the Water Cadastre of the Russian Federation under the heading "Surface water".
- Creating and developing technologies for the maintenance of databases, and developing automated technologies for data collecting and processing.
- Preparing highly qualified personnel for postgraduate and doctoral studies;
- Participating in international cooperation through WHO, UNESCO, and others;
- Organizing the All-Russia Hydrological Congress and international events.

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РОСГИДРОМЕТ

<http://www.hydrology.ru/en/structure/shi-structure>

# The Information-analytical Center for Maintenance of the State Water Cadastre "Surface Water" (in compact notation: Water Cadastre)

**Head:** Dr. V.S. Vuglinsky, Deputy Director of SHI



## **Structure of Center:**

- Development department of methods, technologies and software facilities;
- Information products department;
- Hardware and software environment support department;
- International Data Centre on Hydrology of Lakes and Reservoirs (HYDROLARE) under the auspices of the WMO.

## **History:**

The center was established in 2003.

Work on the subject of water cadastre has been carried out in the State hydrological Institute since 1978 (division > laboratory > department of the State Water Cadastre).

Starting with operation of the New Water Code of the Russian Federation in 2007 the Centre continuing to carry out its activities in the field of Water Cadastre has been also involved in the formation of the State Water Register and state monitoring of water bodies.

# Main activities of SHI's Water Cadastre Department

- Developing and improving of the overall concept, legal, scientific and methodological basis of the Water Cadastre of the Russian Federation.
- Developing, improving and maintaining computer technologies of the Water Cadastre in the section "Surface water", carrying out data analyses, processing and synthesis of information, and producing and distributing information products at the federal, regional and territorial levels.
- Implementing scientific and methodological guidelines for activities related to the Water Cadastre in the section "Surface water", performing critical analyses of data and information products on a territorial and regional levels, and preparing appropriate annual reports on the effectiveness of the standard hydrological network.
- Maintaining the unified database of "water resources", the database and computer archive data for the lake and reservoir regimes, the database for the wetland regime, and other information resources for the Water Cadastre of the federal level in the section "Surface Water".
- Assessing the current state of water resources, quality and their changes.
- Preparing the publication of information products at the federal level, the directory of observation points, reviews, reference papers and other material.
- Preparing and providing informational products at the federal level under the heading "Surface Water".
- Implementing information data exchange at the interdepartmental and international levels.
- Supporting the International Data Centre on Hydrology of Lakes and Reservoirs (HYDROLARE) under the auspices of the WMO (see. [www.hydrolare.net](http://www.hydrolare.net)).

# Annual information products

by Information-analytical Center for Maintenance of  
State Water Cadastre of SHI

1. Interagency yearbook «Surface and ground water resources, their use and quality»
2. Chapter «Water Resources» in annual «Review of condition and pollution of the natural environment in the Russian Federation»
3. Chapter «Water Resources» of «Statistical Yearbook»
4. Information on regime and quality of surface water for registration in the state water register and for management of state monitoring of water objects
5. The annual data archive of hydrometeorological observations on lakes and reservoirs of the Russian Federation
6. Review of the hydrological observations system, data processing and preparation of information products

# Interagency yearbook «Surface and ground water resources, their use and quality»

Annual «Review of condition and pollution of the natural environment in the Russian Federation»

МИНИСТЕРСТВО ПРИРОДНЫХ РЕСУРСОВ И ЭКОЛОГИИ РОССИЙСКОЙ ФЕДЕРАЦИИ

ФЕДЕРАЛЬНАЯ СЛУЖБА  
ПО ГИДРОМЕТЕОРОЛОГИИ И МОНИТОРИНГУ ОКРУЖАЮЩЕЙ СРЕДЫ

ФЕДЕРАЛЬНОЕ АГЕНТСТВО ВОДНЫХ РЕСУРСОВ,  
ФЕДЕРАЛЬНОЕ АГЕНТСТВО ПО НЕДРОПОЛУЧЕНИЮ

ВОДНЫЙ КАДАСТР  
РОССИЙСКОЙ ФЕДЕРАЦИИ

РЕСУРСЫ  
ПОВЕРХНОСТНЫХ И ПОДЗЕМНЫХ ВОД  
ИХ ИСПОЛЬЗОВАНИЕ И ЗАЩИТА

ЕЖЕГОДНОЕ ИЗДАНИЕ  
2010 год

МИНИСТЕРСТВО ПРИРОДНЫХ РЕСУРСОВ И ЭКОЛОГИИ  
РОССИЙСКОЙ ФЕДЕРАЦИИ

ФЕДЕРАЛЬНАЯ СЛУЖБА ПО ГИДРОМЕТЕОРОЛОГИИ  
И МОНИТОРИНГУ ОКРУЖАЮЩЕЙ СРЕДЫ

## ОБЗОР

СОСТОЯНИЯ И ЗАГРЯЗНЕНИЯ ОКРУЖАЮЩЕЙ СРЕДЫ  
В РОССИЙСКОЙ ФЕДЕРАЦИИ  
ЗА 2010 ГОД

МОСКВА  
2011


«Statistical Yearbook»

ФЕДЕРАЛЬНОЕ АГЕНТСТВО ГОСУДАРСТВЕННОЙ СТАТИСТИКИ

## РОССИЙСКИЙ СТАТИСТИЧЕСКИЙ ЕЖЕГОДНИК

Официальное издание

2011



МИНИСТЕРСТВО ПРИРОДНЫХ РЕСУРСОВ И ЭКОЛОГИИ РОССИЙСКОЙ ФЕДЕРАЦИИ  
ФЕДЕРАЛЬНАЯ СЛУЖБА  
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ФЕДЕРАЛЬНОЕ АГЕНТСТВО ПО НЕДРОПОЛЬЗОВАНИЮ

*ВОДНЫЙ КАДАСТР  
РОССИЙСКОЙ ФЕДЕРАЦИИ*

РЕСУРСЫ  
ПОВЕРХНОСТНЫХ И ПОДЗЕМНЫХ ВОД,  
ИХ ИСПОЛЬЗОВАНИЕ И КАЧЕСТВО

ЕЖЕГОДНОЕ ИЗДАНИЕ

2013 год

MINISTRY OF NATURAL RESOURCES AND ECOLOGY OF RUSSIA  
FEDERAL SERVICE FOR  
HYDRIMETEOROLOGY AND ENVIRONMENTAL MONITORING  
FEDERAL AGENCY OF WATER RESOURCES  
FEDERAL AGENCY FOR SUBSOIL USE

*WATER CADASTRE  
OF THE RUSSIAN FEDERATION*

SURFACE AND GROUND WATER  
RESOURCES, THEIR USE AND QUALITY

ANNUAL PUBLICATION

2013

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# River water content by 6 Federal districts of Russia in 2012



# River water content by 6 Federal districts of Russia in 2013



# River water content by 6 Federal districts of Russia in 2014



# River water content of the Central Federal district in 2014

**WATER CONTENT  
GRADATIONS**

- ANOMALOUSLY LOW
- LOW
- MEDIUM LOW
- AVERAGE



# Table 1 River water resources (km<sup>3</sup>/year) in 2014

Таблица 1

## Водные ресурсы рек, км<sup>3</sup>/год

Территория	Многолетние характеристики общих водных ресурсов					Годовые характеристики водных ресурсов						
						местный сток	Приток		Общие водные ресурсы		Отток	
	среднее значение	наибольшее значение	год наибольшего значения	наименьшее значение	год наименьшего значения		всего	в том числе из-за границы РФ	значение	градиация водности	всего	в том числе за границу РФ
Российская Федерация в целом	4260.3	4709.5	1974	3760.5	1954	4424.7	198.3	198.3	4623.0	В	4623.0	55.4
<b>Central Federal District</b>												
Центральный ФО Области	126.0	177.1	1953	81.1	1975	78.8	16.6	0.3	95.4	Н	89.4	13.6
Белгородская	2.7	4.7	1942	1.2	1975	1.8	0.1	0.0	1.9	УН	1.9	1.4
Брянская	7.3	12.4	1970	4.1	1939	3.5	1.5	0.3	5.0	Н	5.0	5.0
Владимирская	35.2	49.4	1970	23.6	1949	3.2	30.6	0.0	33.8	С	33.8	0.0
Воронежская	13.7	23.5	1932	5.6	1972	1.4	7.3	0.0	8.7	Н	8.7	0.0
Ивановская	57.3	87.6	1953	35.1	1973	3.3	39.5	0.0	42.8	Н	41.1	0.0
Калужская	11.3	19.9	1933	6.9	1975	3.8	4.5	0.0	8.3	Н	8.3	0.0
Костромская	53.4	82.6	1953	31.6	1973	11.9	27.7	0.0	39.6	Н	39.6	0.0
Курская	3.8	6.4	1970	1.7	1975	2.1	0.0	0.0	2.1	Н	2.1	1.7
Липецкая	6.3	10.0	1979	3.1	1975	1.8	2.7	0.0	4.5	Н	4.4	0.0
Московская	18.0	27.2	1970	11.9	1930	9.2	8.2	0.0	17.4	С	17.3	0.0
Орловская	4.1	7.3	1970	2.0	1975	2.4	0.5	0.0	2.9	Н	2.8	0.0
Рязанская	25.7	37.2	1970	17.2	1930	6.7	18.8	0.0	25.5	С	25.5	0.0
Смоленская	13.7	22.8	1962	8.3	1939	6.5	1.6	0.0	8.1	АН	8.1	5.5
Тамбовская	4.1	8.5	1979	1.5	1972	2.8	0.4	0.0	3.2	УН	3.1	0.0
Тверская	25.2	42.9	1953	14.3	1939	7.5	6.1	0.0	13.6	АН	13.6	0.0
Тульская	10.6	17.1	1970	6.8	1930	3.1	5.2	0.0	8.3	Н	8.3	0.0
Ярославская	35.8	55.1	1955	19.9	1972	7.8	17.7	0.0	25.5	Н	25.5	0.0

Regions

# Table 2 Underground water storage and resources (km<sup>3</sup>/year) in 2014

Таблица 2

Ресурсы и запасы подземных вод, км<sup>3</sup>/ год

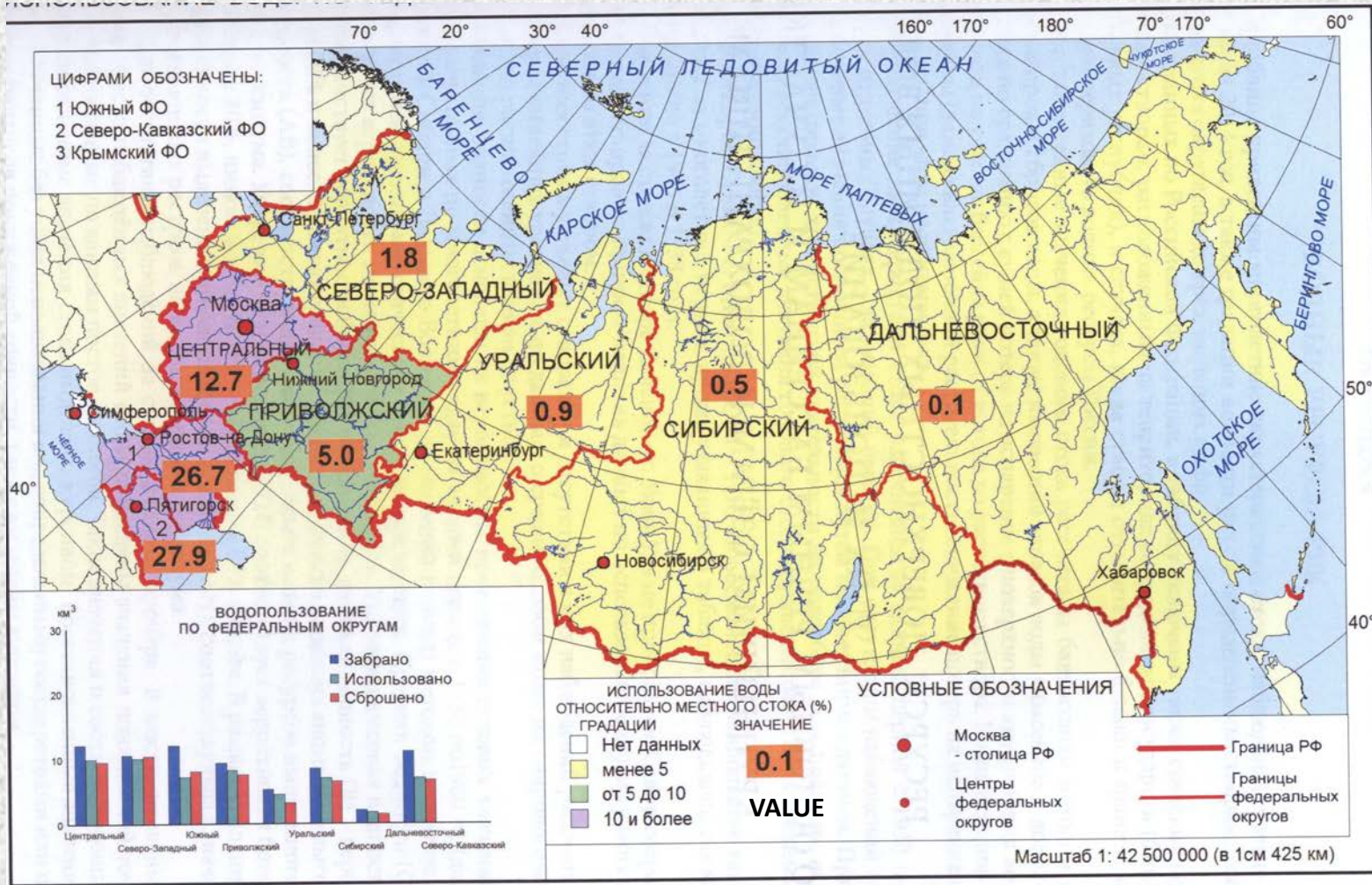
Территория	Прогнозные ресурсы	Запасы
Российская Федерация в целом	317.20	<u>31.40</u>
<b>Центральный ФО</b>	27.03	<u>9.99</u>
Области		
Белгородская	2.21	<u>0.58</u>
Брянская	1.89	<u>0.41</u>
Владимирская	1.19	0.60
Воронежская	1.52	0.62
Ивановская	0.89	0.25
Калужская	0.83	<u>0.38</u>
Костромская	0.45	0.14
Курская	1.20	0.45
Липецкая	1.56	0.59
Московская	2.74*	<u>3.74</u>
Орловская	1.28	<u>0.29</u>
Рязанская	1.43	0.20
Смоленская	2.32	<u>0.24</u>
Тамбовская	2.26	0.34
Тверская	2.82	<u>0.46</u>
Тульская	2.03	<u>0.53</u>
Ярославская	0.41	<u>0.17</u>
<b>Северо-Западный ФО</b>	42.96	<u>1.54</u>
Республики		
Карелия	0.05	0.04
Коми	25.30	<u>0.34</u>
Области		
Архангельская, в т. ч.	4.32	<u>0.40</u>
Ненецкий АО	0.99	0.08
Вологодская	2.84	<u>0.32</u>

The Russian Federation  
as a whole

Central Federal  
District

Regions

# Water use by Federal districts of Russia in 2014



## WATER USE TO LOCAL RUNOFF (%) GRADATIONS

- NO DATA
- LESS THAN 5
- FROM 5 TO 10
- 10 AND MORE



МИНИСТЕРСТВО ПРИРОДНЫХ РЕСУРСОВ И ЭКОЛОГИИ РОССИЙСКОЙ ФЕДЕРАЦИИ

ФЕДЕРАЛЬНАЯ СЛУЖБА  
ПО ГИДРОМЕТЕОРОЛОГИИ И МОНИТОРИНГУ ОКРУЖАЮЩЕЙ СРЕДЫ

ФЕДЕРАЛЬНОЕ АГЕНТСТВО ВОДНЫХ РЕСУРСОВ  
ФЕДЕРАЛЬНОЕ АГЕНТСТВО ПО НЕДРОПОЛЬЗОВАНИЮ

**ВОДНЫЙ КАДАСТР  
РОССИЙСКОЙ ФЕДЕРАЦИИ**

**РЕСУРСЫ  
ПОВЕРХНОСТНЫХ И ПОДЗЕМНЫХ ВОД,  
ИХ ИСПОЛЬЗОВАНИЕ И КАЧЕСТВО**

ЕЖЕГОДНОЕ ИЗДАНИЕ

2010 год

**REFERENCE BOOK “SURFACE AND GROUND  
WATER RESOURCES, THEIR USE AND QULITY”  
HAS BEEN PUBLISHED ANUALLY SINCE 1981**

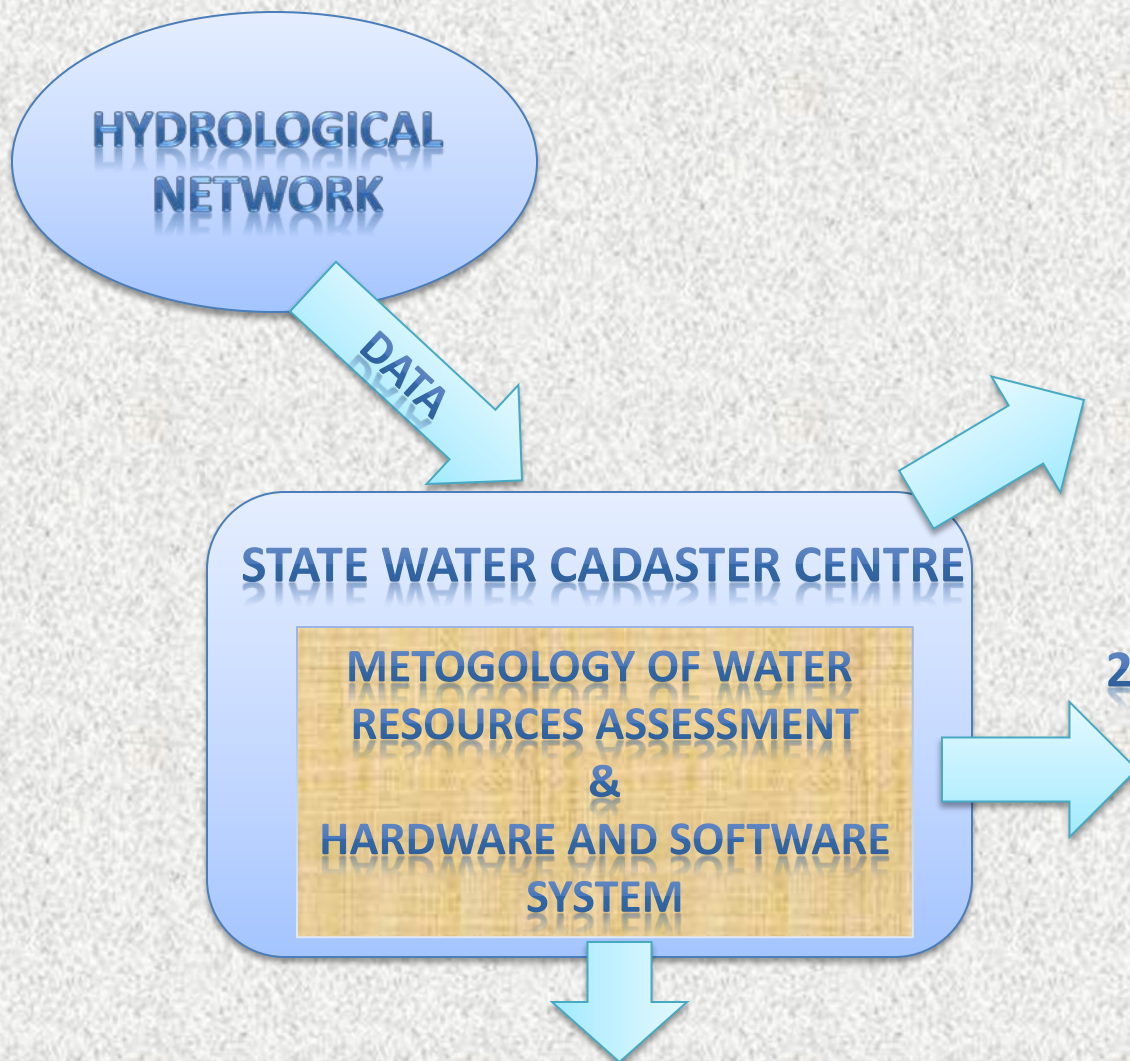
**LAYOUT OF THE PUBLICATION HAS  
CHANGED SEVERAL TIMES WITH THE  
PURPOSE OF INCREASING INFORMATIVENESS  
AND QUALITY**

**DATA ON WATER RESOURCES, PRESENTED IN  
THE PUBLICATION, REGULARLY REFINED IN  
SUBSEQUENT YEARS. IN THIS REGARD,  
IT IS NOT RECOMMENDED TO USE THIS DATA  
FOR GENERALIZATIONS OVER A LONG-TERM  
PERIOD**

**PUBLICATION IS INTENDED FOR FEDERAL  
AUTHORITIES, AUTHORITIES OF FEDERAL  
DISTRICTS AND CONSTITUENT UNITS OF  
THE RUSSIAN FEDERATION, AS WELL AS  
ORGANIZATIONS INVOLVED IN WATER  
MANAGEMENT AND ENVIRONMENTAL  
PROTECTION ACTIVITIES AT THE STATE LEVEL**

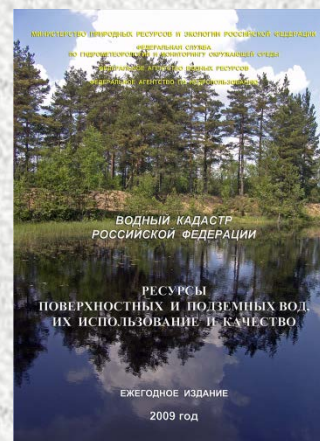


# THE SCHEME OF THE CENTRE'S OPERATION IN RELATION TO WATER RESOURCES ASSESSMENT

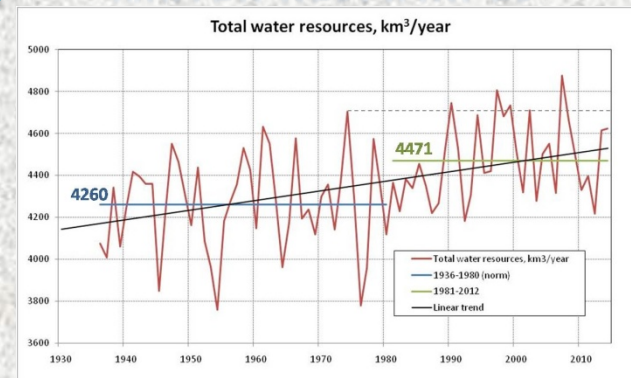


## 1. INFORMATION PRODUCTS

SURFACE AND GROUND WATER RESOURCES, THEIR USE AND QUALITY



## 2. MAINTAINING THE DATABASE "WATER RESOURCES"



## 3. ASSESSING THE CURRENT STATE OF WATER RESOURCES, THEIR QUALITY AND CHANGES

# METODOLOGY OF WATER RESOURCES ASSESSMENT

METHODOLOGY IS BASED ON RUNOFF LINEAR EQUATIONS METHOD

METHODOLOGY WAS DEVELOPED IN SHI BY V.I.BABKIN (HEAD OF LABORATORY OF WATER RECOURCES AND WATER BALANCE) AND K.P. VOZNESENSKY

METHODOLOGY HAS BEEN USING FOR LAST 30 YEARS FOR WATER RESOURCES ASSESSMENT OF DIFFERENT PARTS OF RUSSIA (RIVER, LAKE & SEE BASINS; FORMER SOVIET UNION REPUBLICS, FEDERAL DISTRICTS, SUBJECTS OF THE FEDERATION, ADMINISTRATIVE TERRITORIES)



# **METODOLOGY OF WATER RESOURCES ASSESSMENT**

**FOR ANY AREA (RIVER BASIN, ADMINISTRATIVE REGION AND SO ON) WATER RESOURCES ARE PRESENTED AS A SET OF SEVERAL CHARACTERISTICS (FOR EXAMPLE: LOCAL RUNOFF, WATER SUPPLY, LOCAL INFLOW, OUTFLOW, TOTAL WATER RESOURCES, INFLOW FROM OVERSEAS AND SO ON)**

**NUMBER OF CHARACTERISTICS CAN BE DIFFERENT FOR NEIGHBORING REGIONS DEPENDING ON AVAILABLE INFORMATION**

**MORE DETAILED DESCRIPTION OF METHODOLOGY IS PRESENTED IN “WORLD WATER RESOURCES AT THE BEGINNING OF THE TWENTY-FIRST CENTURY” (SHIKLOMANOV, RODDA, ED., 2003)**

# GENERAL EQUATION

In the general case for annual estimation of water resources of subjects of the Russian Federation  $\check{y}_i$ , the equation below is usually used

$$\check{y}_i = 3,154 \cdot 10^{-2} (\kappa_1 y_1 + \kappa_2 y_2 + \dots + \kappa_n y_n) + y_a - y_\beta + y_\gamma - y_\xi + y_\alpha' - y_\beta' + B + E + E',$$

where  $\check{y}_i$  – annual water resources of a federal subject of Russia;

$y_1, y_2, \dots, y_n$  – volumes of runoff at measuring sections on rivers which flow within territory;

$\kappa_1, \kappa_2, \dots, \kappa_n$  – parameters of runoff reduction to the boundary of a subject;

$y_a$  – volumes of runoff taken from riverbeds which form local runoff;

$y_\beta$  – volumes of water discharge after their usage in riverbeds;

$y_\gamma$  – diversion of runoff from a basin of the given river to other basins;

$y_\xi$  – diversion of runoff from other basins to the given basin;

$y_\alpha'$  – damage of runoff due to ground water;

$y_\beta'$  – artesian water release;

$B$  – measurement of water supply in reservoirs;

$E$  – extra (in comparison with land surface) evaporation from water surface of reservoirs;

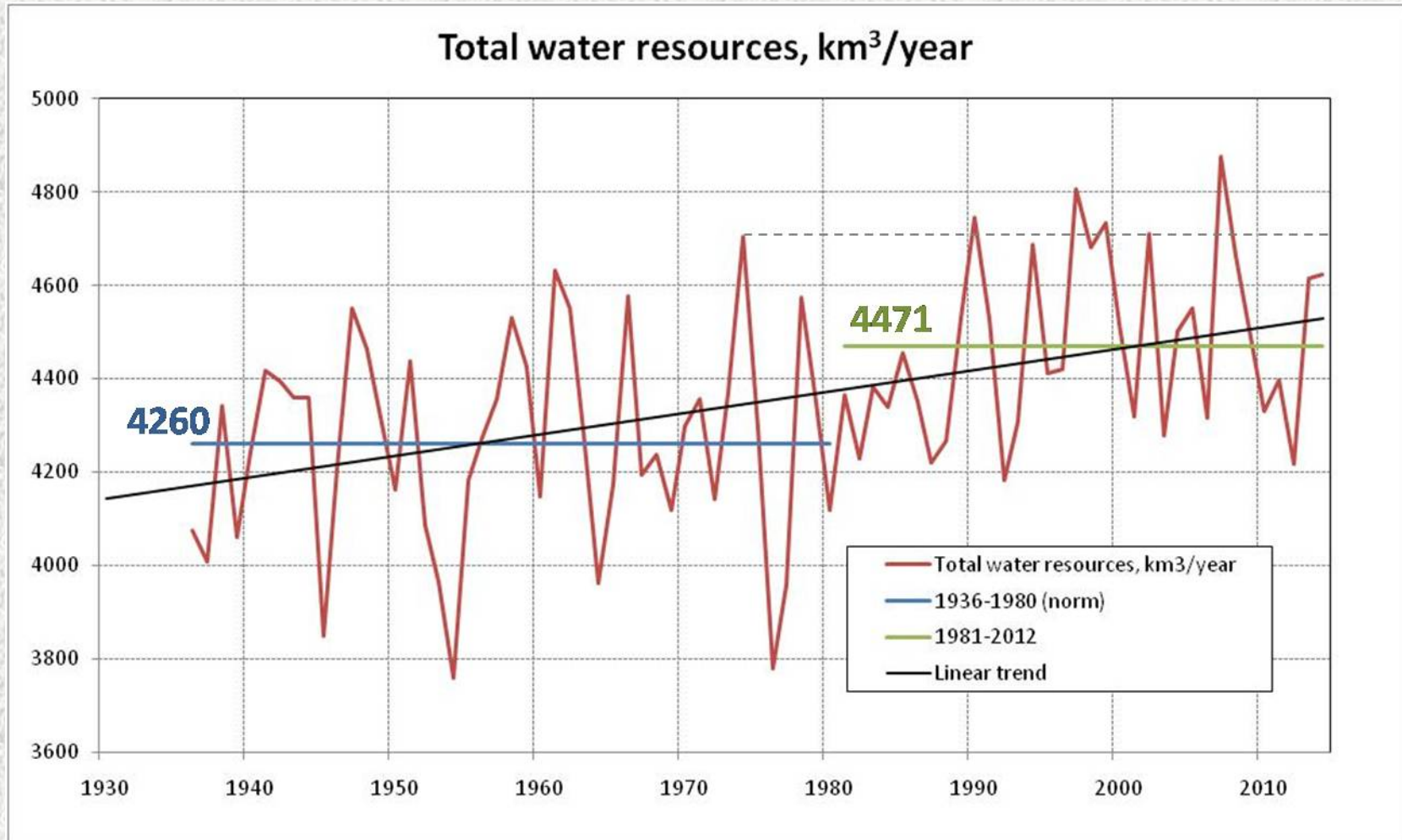
$E'$  – evaporation and infiltration losses in natural conditions from volume of water which equals consumptive (water) use.

# **INTERNATIONAL COOPERATION IN WATER RESOURCES ASSESSMENT**

**IN SOME CASES, DATA OF THE AUTHORIZED STATE INSTITUTIONS OF ESTONIA, BELARUS, UKRAINE AND KAZAKHSTAN ARE USED FOR THE ASSESSMENT OF WATER RESOURCES:**

- ENVIRONMENTAL AGENCY OF THE REPUBLIC OF ESTONIA;**
- REPUBLICAN HYDROMETEOROLOGICAL CENTER OF THE REPUBLIC OF BELARUS;**
- CENTRAL GEOPHYSICAL OBSERVATORY OF UKRAINE;**
- REPUBLICAN STATE ENTERPRISE "KAZGIDROMET".**

# The long-term dynamics of renewable water resources of the Russian Federation



The total increase in the Russian water resources for 1981-2012 period amounted to the average of 211 km<sup>3</sup>/year, which is 5,0% higher than it was during 1930-1980. The water resources increase was representative for all federal districts of Russia.

# Thank you for your attention!

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