IWEP SB RAS research capacity: integrated environmental investigations (under climate change conditions)

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Institute for Water and Environmental Problems, Siberian Branch of the Russian Academy of Sciences (IWEP SB RAS)
Institute for Water and Environmental Problems, Siberian Branch of the Russian Academy of Sciences was founded on September 1, 1987 on the base of laboratories of Academy institutes involved in natural-resources and environment research.
Major Trends of Research

• Natural processes in hydrosphere, atmosphere, cryosphere, the Earth surface and their evolution with due regard for anthropogenic impact

• Ecology and rational nature management. The environment monitoring. Decrease of risk and aftereffects of natural and industrial catastrophies
The scientists of IWEP deal with different hot ecological problems:

• elaboration of methods for complex assessment of state of natural environment development using mathematical modeling, digital mapping, geoinformation technologies, landscape, hydrological and other thematic investigations;

• complex research of functioning and evolution of aquatic ecosystems;

• research in the field of atmosphere physics and monitoring of ecological parameters of atmosphere;

• development and adaptation of net geoinformation technologies and processing of remote sensing data;
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- development of regional programs development, environmental-economic monitoring of regional systems;
- justification and elaboration of schemes for protected areas, tourist-recreational objects;
- environment and human health;
- planning of water protection zones and coastal shelter belts;
- ecological-geographic analysis and mapping using GIS technologies.
IWEP SB RAS is situated in Barnaul (Altai Krai).

- In 1996 the Novosibirsk Branch of IWEP was established on the basis of Novosibirsk complex laboratory of IWEP and research fleet of SB RAS.

- In 1999 the laboratory of geoecological and water problems was created jointly with the Research Center in Kemerovo.

- In 2002 the Gorno-Altaisk Branch of IWEP started its work in Gorno-Altaisk (Republic of Altai).
The Institute owns 3 research stations:

- the Teletsky limnological station on Lake Teletskoye in Republic of Altai
- the Kyzyl-Ozek soil-biological station in Republic of Altai
- the Nizhne-Obsky hydrological-hydrochemical and hydrobiological station in Karym-Kary, Tyumen oblast

IWEP is provided with research vessels on Novosibirsk Reservoir and Lake Teletskoye, Republic of Altai, and a fleet of cars including the specialized mobile laboratory for studying of atmosphere.
In laboratory carried out researches of biogeochemistry macro- and the microcells natural and artificial radionucleids, influence on an environment of space-rocket activity is estimated.

The structure of laboratory includes group morpholithogenesis reservoirs and their coasts.
Research Units

Chemical-Analytical Center

In the center the analysis of objects of an environment (superficial, underground and potable water, ground, fauna and flora) on the contents of toxic elements, mineral, organic and biogenic substances, chemical glaciology researches of high-mountainous glaciers of Altai for an estimation of global, regional and local carry and receipt of polluting substances on a surface of the water-modular area of the rivers of the central - Asian region is carried out.
Research Units

Laboratory of Hydrology and Geoinformatics

• *In laboratory carried out researches in the following directions: computer science and geoinformation systems; hydrological calculations and forecasts.*

Laboratory of Aquatic Ecology

• *The laboratory is engaged in carrying out complex studies of spatial-temporal organization of biohydrocenosis in the basin of Ob river and Ob-Irtyshinterfluvial area, biodiversity of aquatic ecosystems at the citogenetic, species, biocenotic and ecosystem levels.*
Research Units

Atmospheric Environment Laboratory

• The laboratory is involved in complex studies on influence of emission sources and atmospheric processes on the air quality; microphysical characteristics of tropospheric aerosol for the territory with various natural-climatic conditions as well as peculiarities of processes of energy and mass exchange between underlying surface layer and the atmosphere in natural and transformed geosystems
Research Units

Laboratory of Regional Nature Management

- In laboratory development of programs of regional development, economic-geographical and ecological-economic monitoring of regional systems, an estimation of influence of economic objects and linear constructions on an environment, an ecological substantiation of water use are carried out.
Research Units

Laboratory of Ecological-Geographical Mapping

- The researchers of the laboratory are engaged in the use and development of cartographic method under ecological-geographical analysis of natural-territorial complexes in West Siberia on the basis of the basin-landscape approach and GIS-technologies.
Major environmental Investigations

STUDIES OF WATER STRUCTURE AND CHARACTERISTICS. PHYSICAL INVESTIGATIONS

Changes in water structure and physical properties under electrochemical activation and the influence of magnetic and electrical fields, fast heating by high-intensity laser emission, ultrasonic treatment were analyzed.

Dielectric properties of the water hydrated on the ions of dissolved salt were studied. The dielectric model of mineralized water was developed.

Optical spectra of water samples absorption in structural-phase transformation (water from the melted snow, water after boiling, before and after the influence of magnetic and electrical fields, high-intensity laser emission, ultrasonic treatment) were measured.
Glacial studies. Russian-Mongolian study of Tabyn-Bogdo-Ula mountain glacial knot and the Khovd catchment to investigate water balance in the closed regions of Central Asia was conducted. The glaciers’ boundaries were specified, and the single measurements of snow depth were carried out.
Hydrological investigations. The dependence of Altai low-mountain river runoff on meteorological characteristics was studied using the simulation model (where internal function of the catchment and meteorological characteristics, i.e. monthly precipitation and air temperature were taken as the input parameters).
The next topics were discussed:

- transboundary water resources state and their management;
- global water crisis, problems and prospects;
- regional experience on water problems solution in Central Asia, issues and management of transboundary water resources;
- ecological and economic aspects of water resources management.
Major environmental Investigations

WORKING OUT OF THE CONCEPT ON WATER RESOURCES MANAGEMENT IN THE ASIAN REGION

Austria-Netherlands-Uzbekistan-Russia Project

“The Rehabilitation of the Ecosystem and Biological Production of the Aral Sea under Conditions of Water Scarcity”
Major environmental Investigations

WORKING OUT OF THE CONCEPT ON WATER RESOURCES MANAGEMENT IN THE ASIAN REGION

Russia-Kazakhstan Project
“Transboundary Water Resource Management in the Irtysh River Basin”
Major environmental Investigations

WORKING OUT OF THE CONCEPT ON WATER RESOURCES MANAGEMENT IN THE ASIAN REGION

• Joint research of Altai Mountain Region role in water resources formation in Central Asia were carried out by experts from Russia, Mongolia, Kazakhstan and China.

• The map of water resources was prepared (1:500000; in traditional and electronic forms).
Major environmental Investigations

Landscape and thematic mapping
INCLUSION OF THE SPECIAL PROTECTED NATURAL WATER OBJECTS OF ASIA INTO THE LIST OF WORLD NATURAL HERITAGE

International Project “Conservation of Wetland and Wetland Species in the South of West Siberia”
Major environmental Investigations
TAJIKISTAN-RUSSIA PROJECT “HYDROGEOLOGICAL NMR-TOMOGRAPH “HYDROSCOPE”

1 – surface profile;
2 – touch probing of water level in stationary wells;
3 – remote measurements of water level.

Remote geoecological monitoring of water objects, salt soils and wetlands:

a) Method of remote estimation of salt mass concentration in water;
b) Method of remote microwave estimation of soil moisture;
c) Method of remote microwave sensing of underground water occurrence depth;
d) Aerospace mapping of soil moisture and underground water occurrence depth at the regional scale.
Major environmental Investigations

- development and adaptation of net geoinformation technologies and processing of remote sensing data;
Bilateral project
“Glacial-chemical investigations of the Belukha glaciers” (Institute for Water and Environmental Problems SB RAS, Russia and Paul Scherrer Institute, Switzerland)

Concentration of Hg in the ice core from Belukha in different periods of time
International GRANTES

- WWF RU005616/GLU – Conservation of Wetland and Wetland Species in the South of West Siberia
- INTAS-01-0511 – The rehabilitation of the ecosystem and bioproductivity of the Aral Sea under condition of water scarcity (REBASOWS).
- Project French Ministere de l'Education Nationale, de l'Enseignement Superieur et de la Recherche, programme ACCESS) “European Research Course on Atmospheres (ERCA-2007)”.
- NATO linkage project EST.NR.CLG 980809 – Contamination of Dacha Areas near of Industrial Complexes in Siberia.
- (JSPS) № P-03207
In 2009, the Russian government adopted a Climate Doctrine.

This fundamental text specifies climate change as one of the hottest international integrated interdisciplinary problems of XXI century which goes beyond the scope of science- it involves environmental, economic and social aspects of sustainable development of the Russian Federation.

The major trends of the RF environmental policy on climate change aim at fortifying and developing scientific, informational and human resources component ensuring the implementation of measures on reducing man-made effects on the climate and adaptation to these changes.
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Thank you for attention!