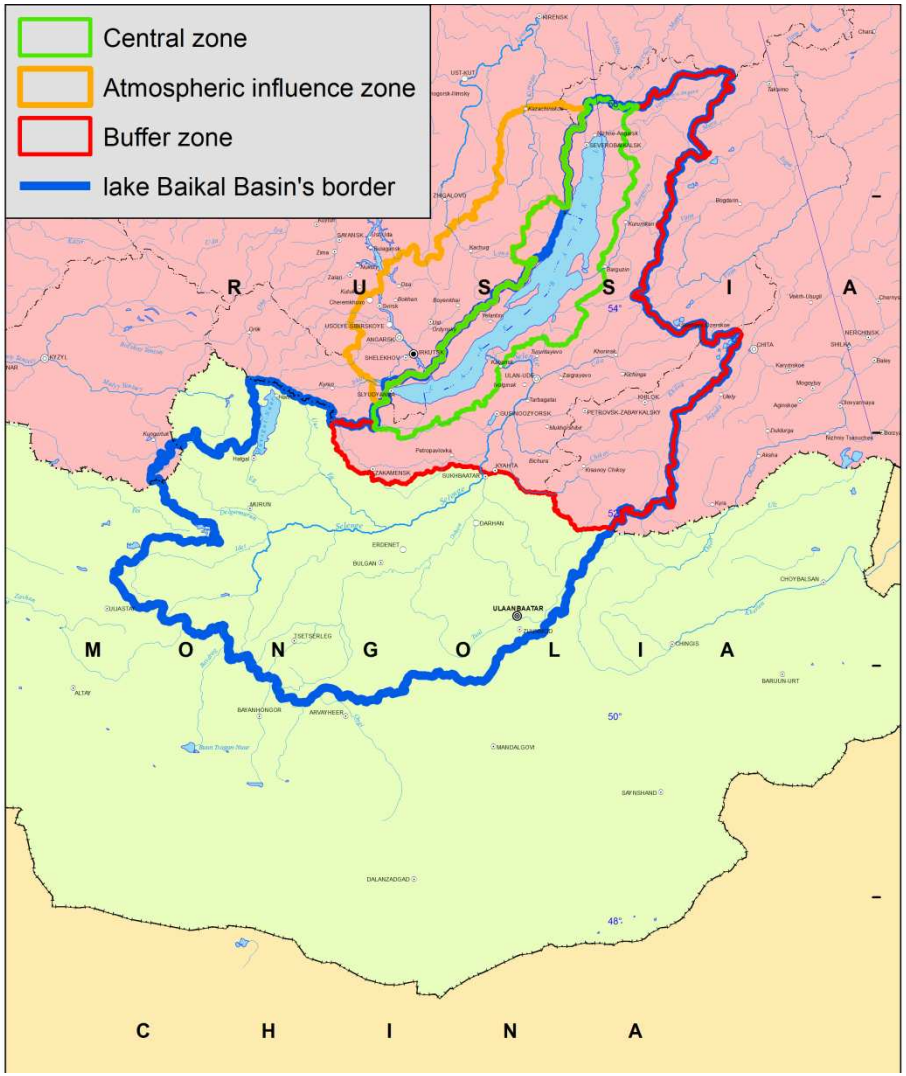
RUSSIAN ACADEMY OF SCIENCES
SIBERIAN BRANCH
BAIKAL INSTITUTE OF NATURE MANAGEMENT

International cooperation in transboundary rivers basins

Garmaev Endon Zh.
ScD (Geography), Professor of the RAS,
Director of the BINM SB RAS

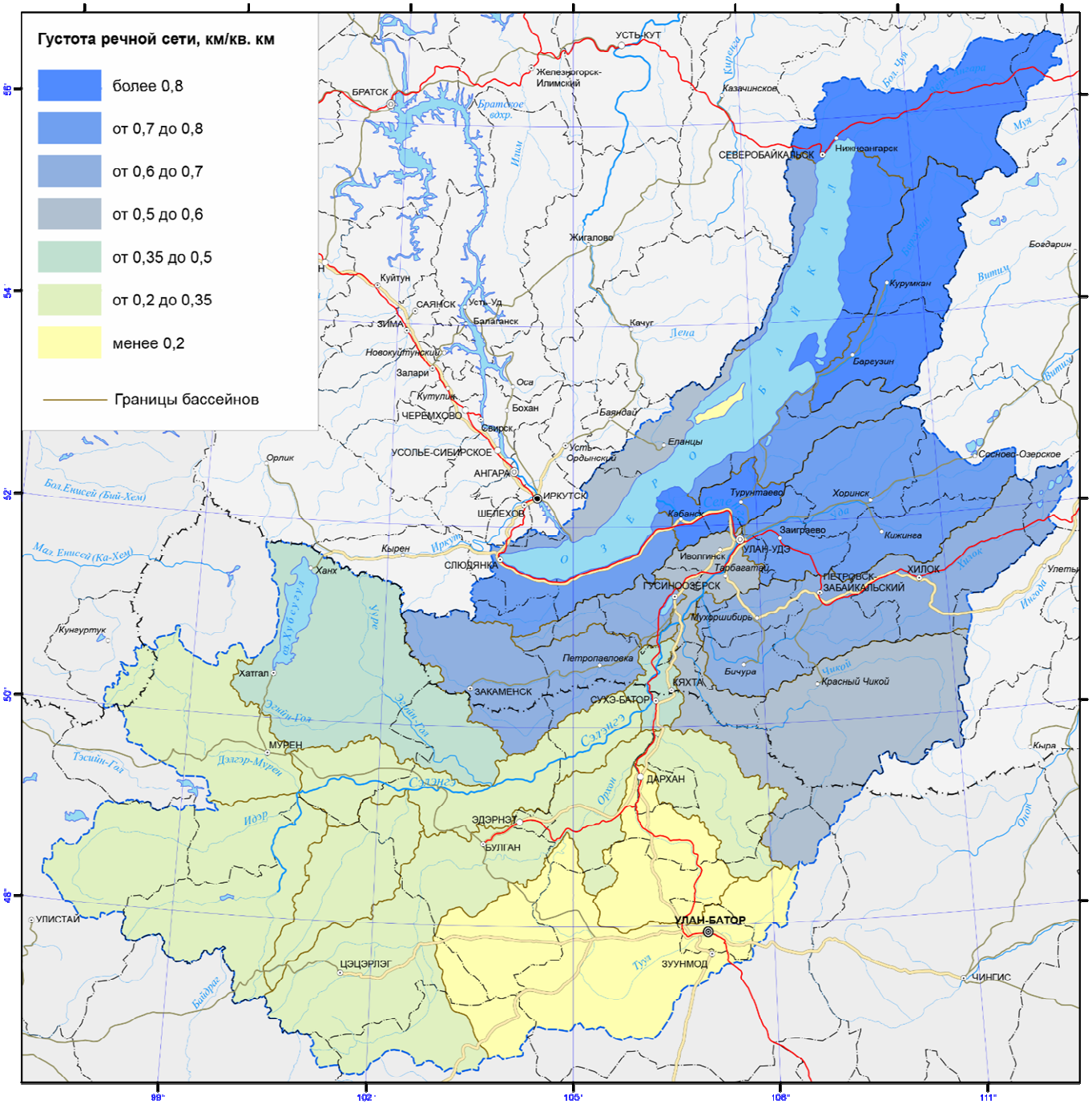
Istomino, Buryatia, Russia, 2017



Baikal Nature Territory and Lake Baikal Basin

Lake Baikal together with the adjacent territories in 1996 was included in the UNESCO World Heritage List. In connection with this, the problem of the protection and conservation of lake water resources is acquired exclusively acute. The Baikal Lake basin is located almost in the center of the vast Asian continent 45% of which lies within the Russian Federation, the rest is on the territory of Mongolia. About 73% of river waters are formed on the territory of Russia, 27% – Mongolia.

The Selenga river basin: 67 % - on Mongolian territory, 33 % - Russian.



Density of rivers network of Lake Baikal basin

Problems of the lake Baikal

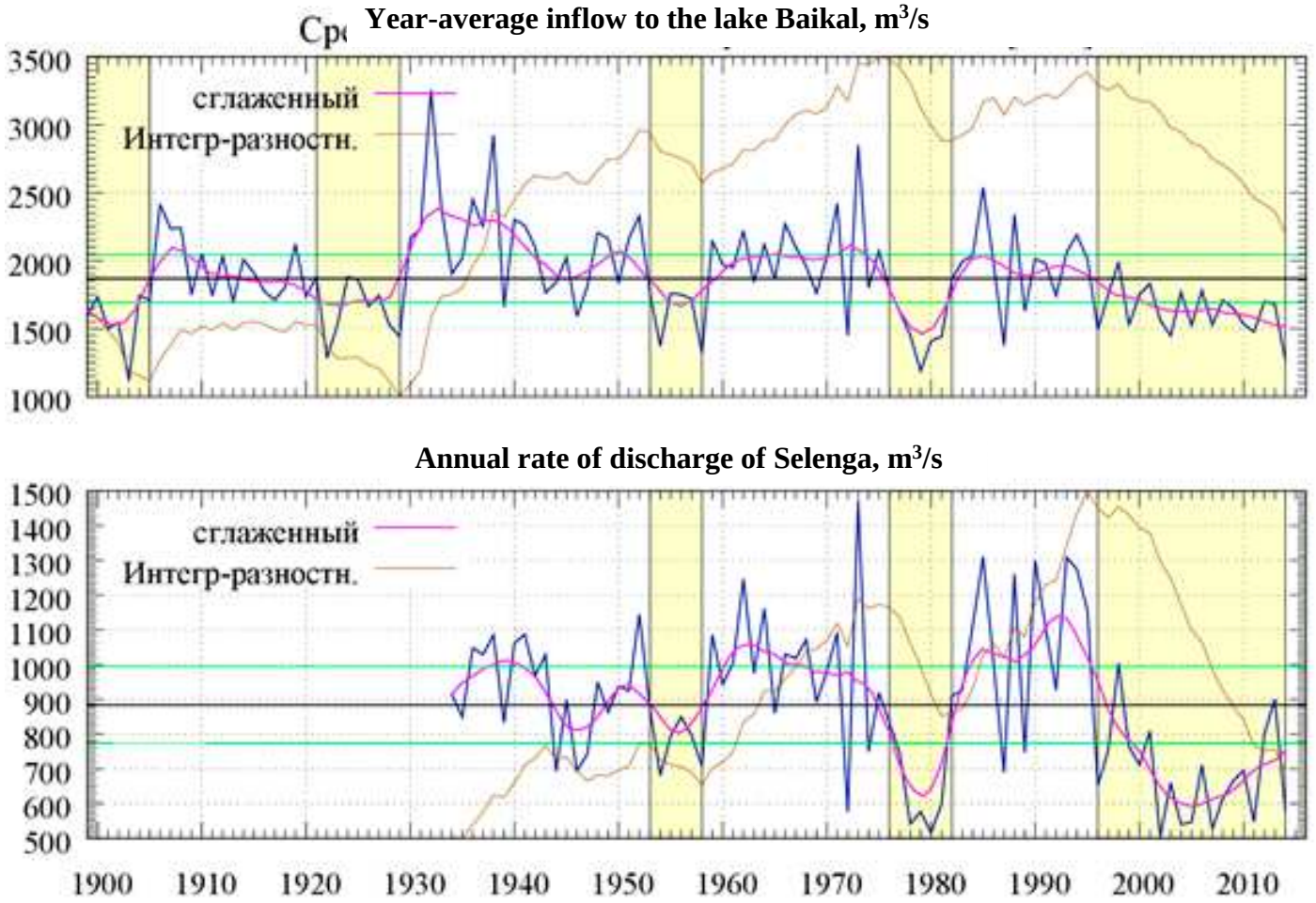
Ecological problems:

•**Absence of an effective system of waste management** (landfills, utilization, processing of solid waste, discharges of liquid waste and oil pollution by water transport);
•**Poor quality of wastewater purification** (obsolete purification facilities or their complete absence);
•**High level of air pollution** (wind rose, boiler houses, transport, dirt roads);
•**Forest and peat fires** (climate, human factor, fire prevention measures, fire monitoring and forecasting center);
•**Deforestation** (illegal woodcutting in the Lake Baikal basin and prohibition of sanitary felling in forests located in the central ecological zone);
•**The level regime of the lake Baikal** (climate, activities of Irkutsk hydro electric power station, legal and regulatory framework;
•**Spirogyra (pond scum)** (use of detergents containing chlorine, phosphate, anionic surfactant, etc.);
•**Reduction of biodiversity, poaching** (poverty, low level of ecological culture, laws);
•**Transboundariness of the basin** (plans for the construction of hydro electric power station and its reservoirs for drainage of water for irrigation in Mongolia);
•…

Socio-economic problems:

•**Low level of employment of the population** (poaching, alcoholism, crime)**;**
•**Reduction of commercial fish stocks in Lake Baikal** (poaching)**;**
•**Low ecological and legal culture of the population of the Baikal region;**
•**Uncoordinated development of tourism** (no systematic approach, spontaneous tourist development of the territory, the presence of illegal tourist operators)**;**
•**Low entrepreneurial activity, poor investment climate;**
•**Illegal land development;**
•**Low energy efficiency,** small part of renewable and low-carbon energy;
•…

Role of the Selenga River to the tributary of Lake Baikal



Low water periods: *1899-1905, 1922-1929, 1954-1958, 1976-1982, 1996-2015 yrs.*

A good consistency in the vibrations of the inflow in the Baikal and the Selenga river runoff is observed, which is confirmed by the high values of correlation coefficients between these variables: during the period of observations (1934-2014 yrs.) – (0.85), during low-water periods 1954-1958 yrs., 1976-1982 yrs., 1996-2014 yrs. – (0.68).

General characteristics of long-term runoff of the largest tributaries of Lake Baikal (the Selenga runoff decreased by 1,2 км^3 during the second half of the observation period)

The Selegna					The Upper Angara					The Barguzin				
Observation period	n	$Q_{ср}$ м^3/с	C_v	W км^3	Observation period	n	$Q_{ср}$ м^3/с	C_v	W км^3	Observation period	n	$Q_{ср}$ м^3/с	C_v	W км^3
1934-2010	77	927	0,23	**29,2**	1939-2010	72	261	0,15	**8,22**	1933-2010	78	125	0,23	**3,96**
1934-1967	34	944	0,20	**29,7**	1939-1967	29	256	0,16	**8,06**	1933-1967	35	125	0,24	**3,94**
1968-2010	43	905	0,29	**28,5**	1968-2010	43	266	0,14	**8,36**	1968-2010	43	128	0,22	**4,01**

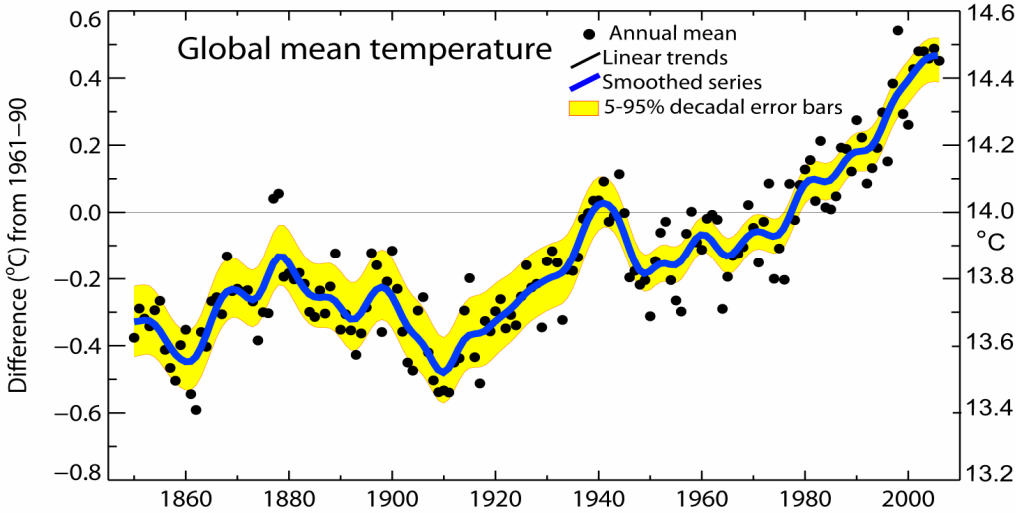
River Charecteristics	Catchment area, км^2	Annual run-off, Q м^3/с	Run-off during warm seasons сток (April-October)		Run-off during cold seasons сток (November-March)	
			Q м^3/с	% from annual	Q м^3/с	% from annual
Selenga – razyezd Mostovoy	440000	918	834	90,8	84	9,2

Averaged data Selenga runoff through the seasons of the year

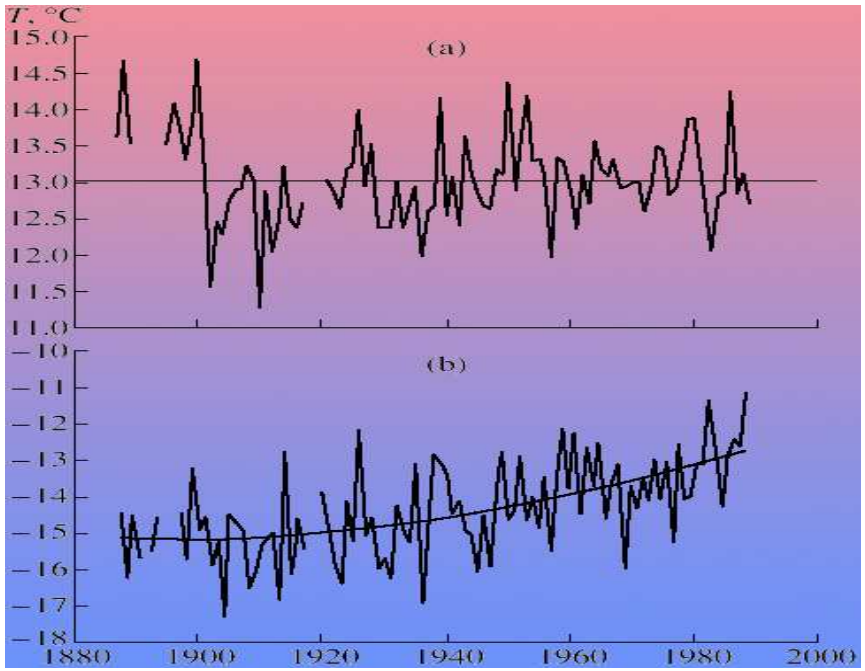
№ г.п.	River name	Station name	distance from the tributary, км	n, years of observation untill 2010г.	Absolut maximum water flow, м^3/с	A year of observation	Water flow probability, м^3/с	
							1%	5%
1	2	3	4	5	6	7	8	9
1.	Selenga	с.Хутаг -Khutag	811	60	3765	1993	2850	1975
2.	Selenga	с.Зуунбурэн - Zuunburen	503	30	3550	1993	3900	2700
3.	Selenga	с.Новосе-ленгинск - Novoselenginsk	273	72	6620	1973	6900	5300
4.	Selenga	razyezd Mostovoy	127	77	7620	1936	7750	6100

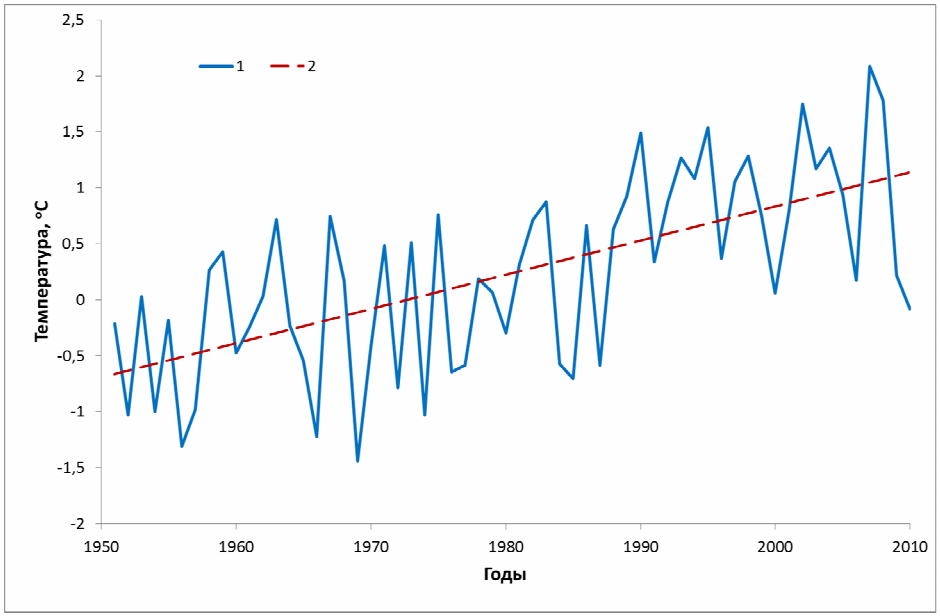
Maximum water flow at the Selenga river

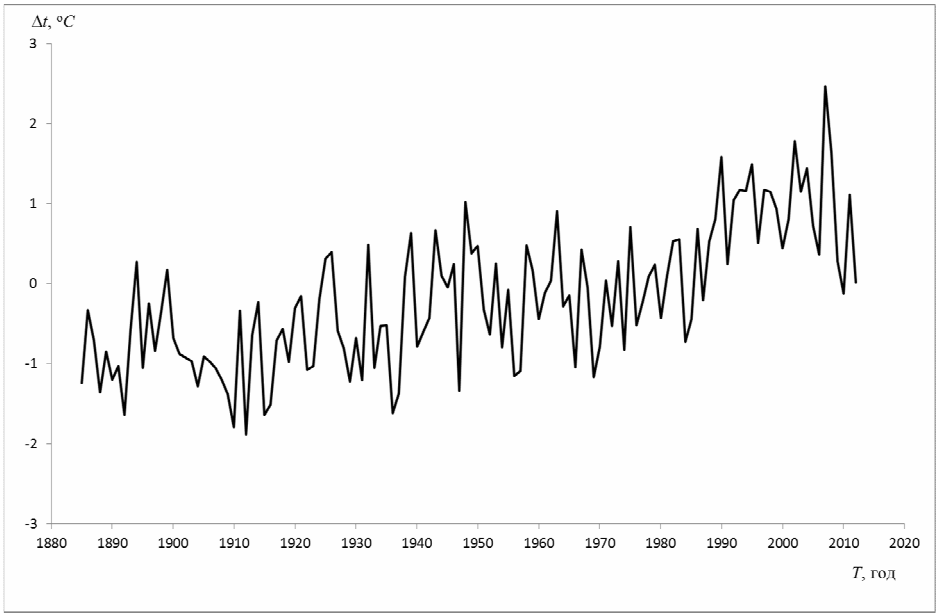
Global changes in the average temperature over the past 150 years.
Third Assessment Report (TAR) of the IPCC Working Group I (Intergovernmental Panel on Climate Change, IPCC).



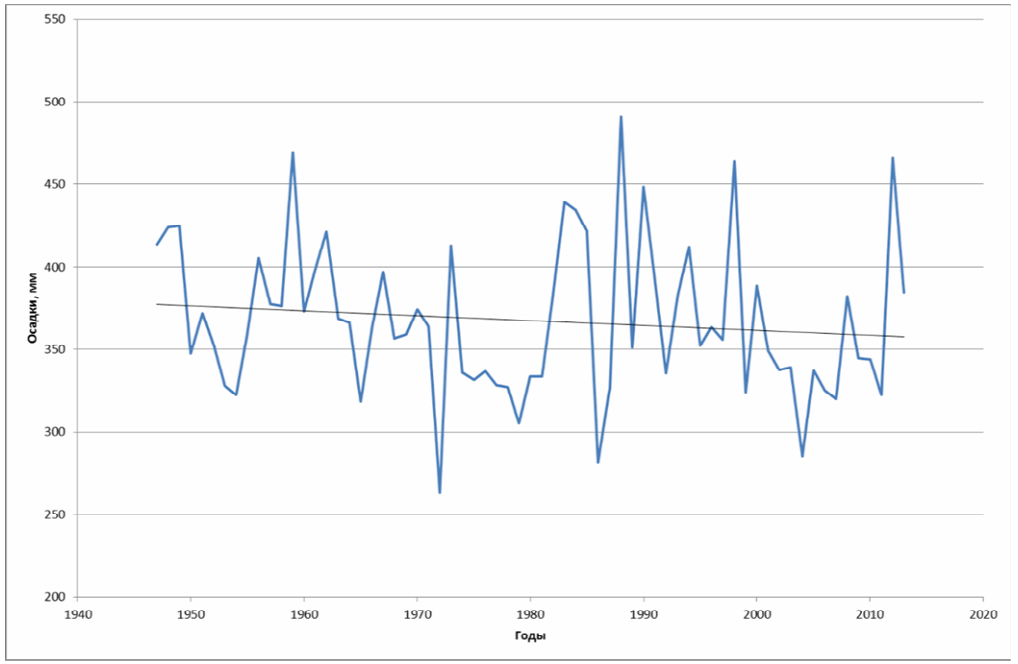
Long-term dynamics of summer (a) and winter (b) temperatures according to the weather station in Ulan-Ude





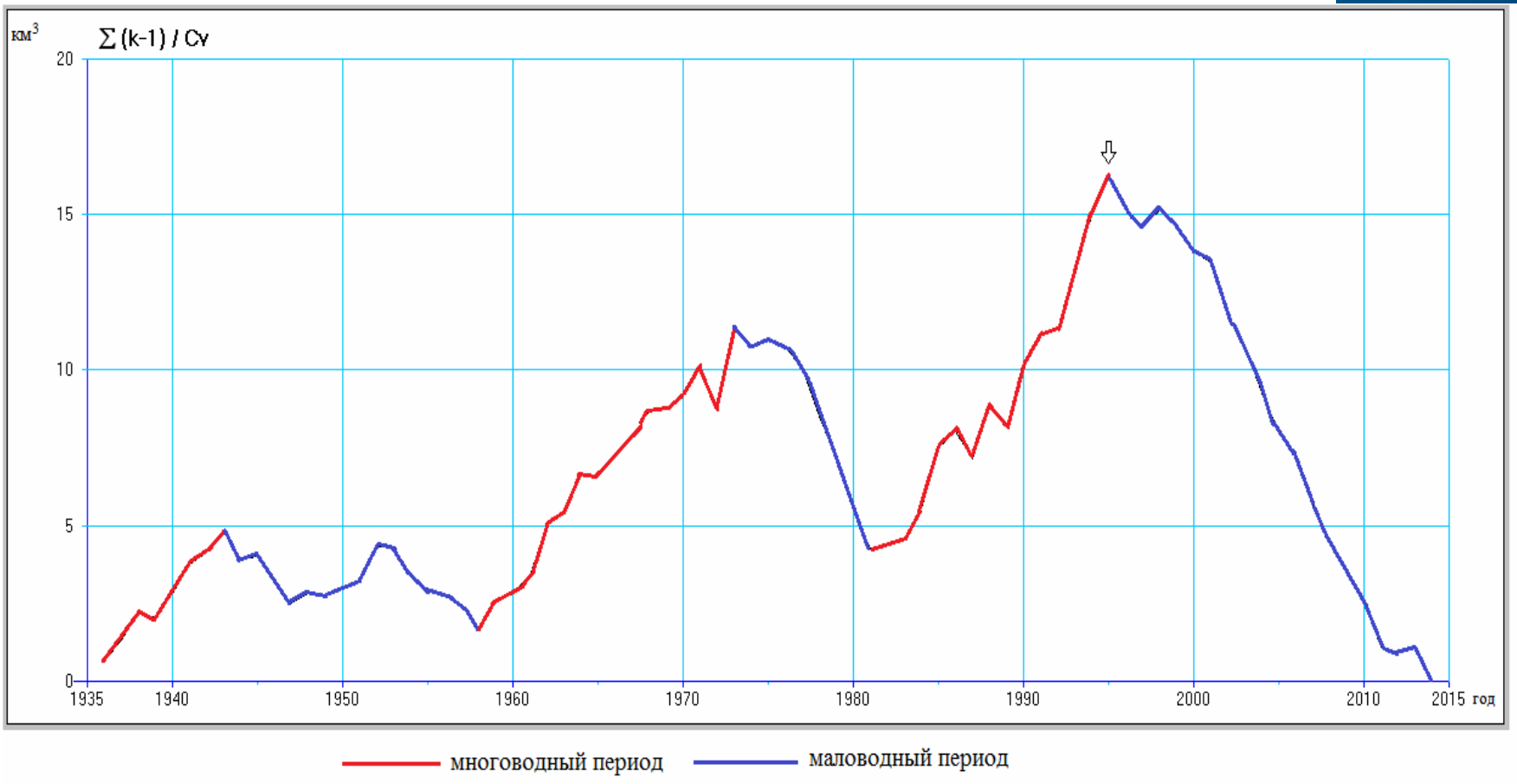


The average air temperature in the territory of Trans-Baikal



The average amount of precipitation on the territory of Trans-Baikal

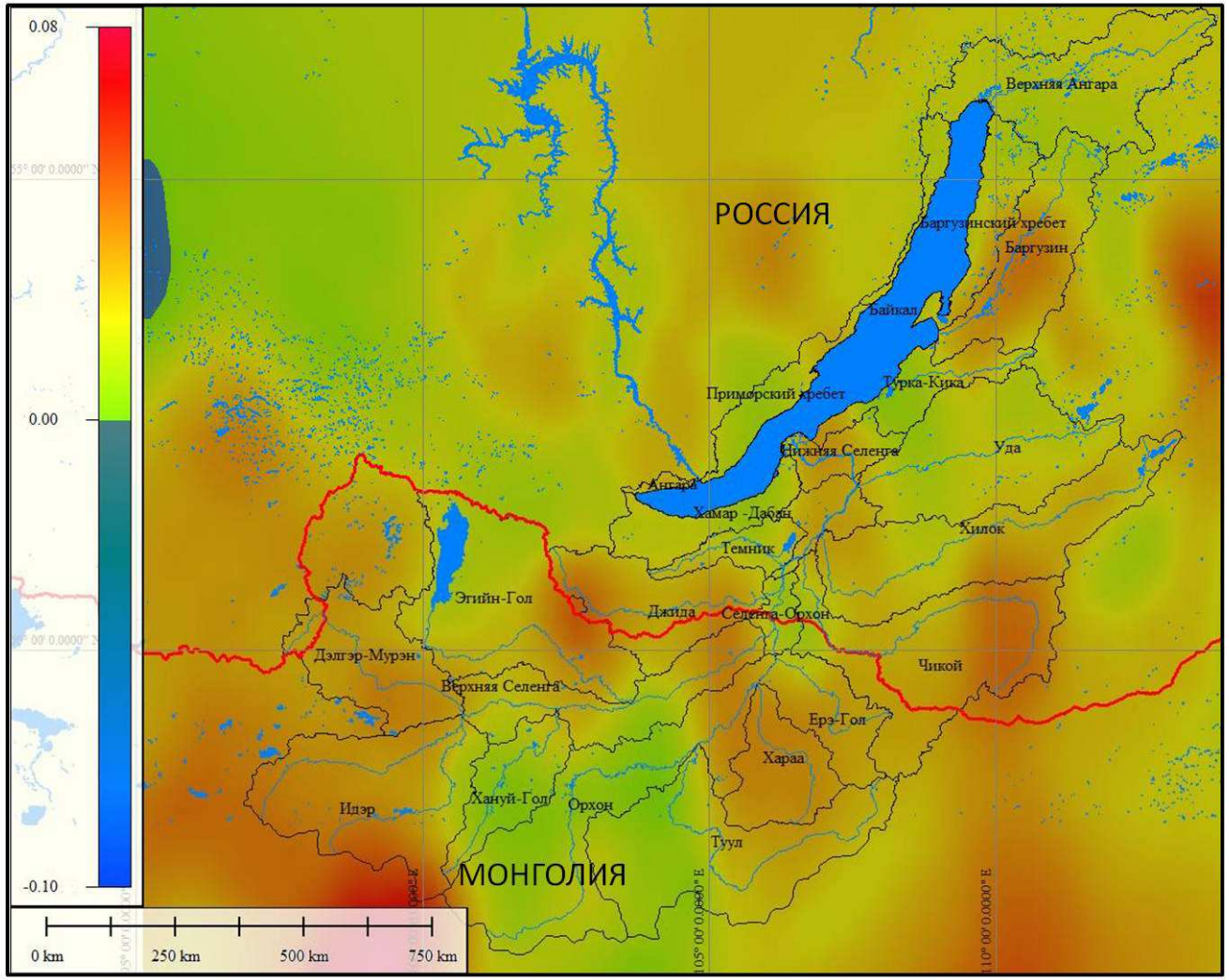
A difference-integral curve line of the volume of the Selenga runoff – razyezd Mostovoy



The average annual flow of the Selenga tributaries

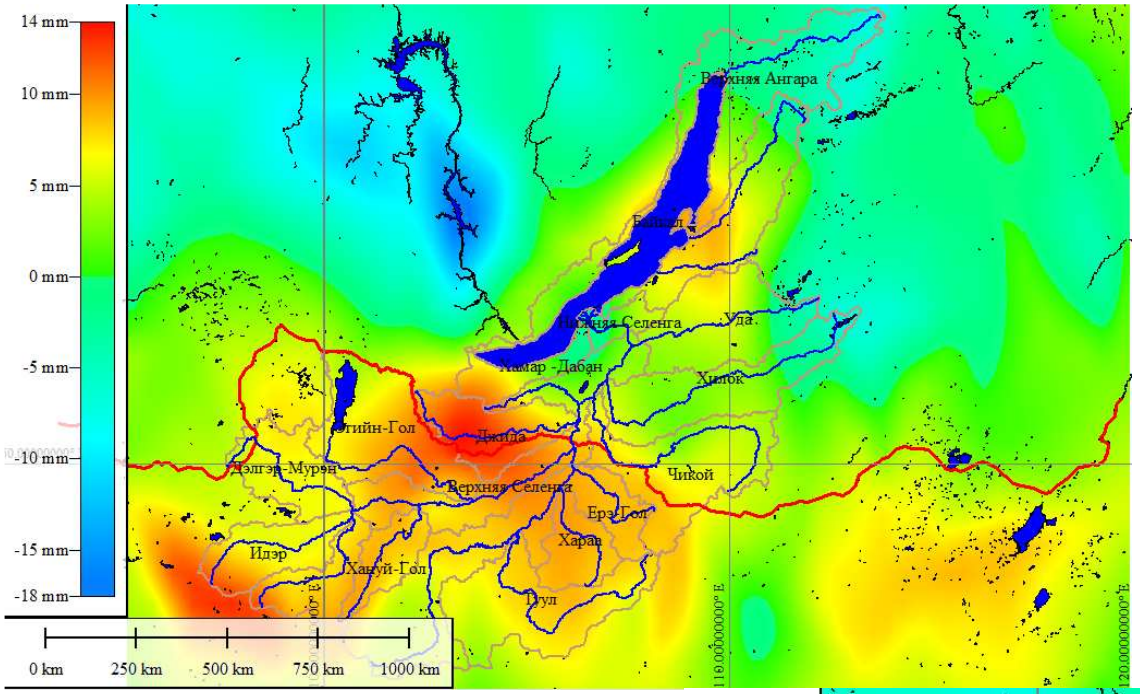
River – station	Average annual runoff, km³
The Chikoy – Povorot	8.01
The Khylok – squatting Khaylastuy	2.91
The Uda – Ulan-Ude	2.02
The Dzhida – Dzhida	2.54

Map of linear trends of surface air temperature
2000-2014 yrs. (Winter months), °C/yr



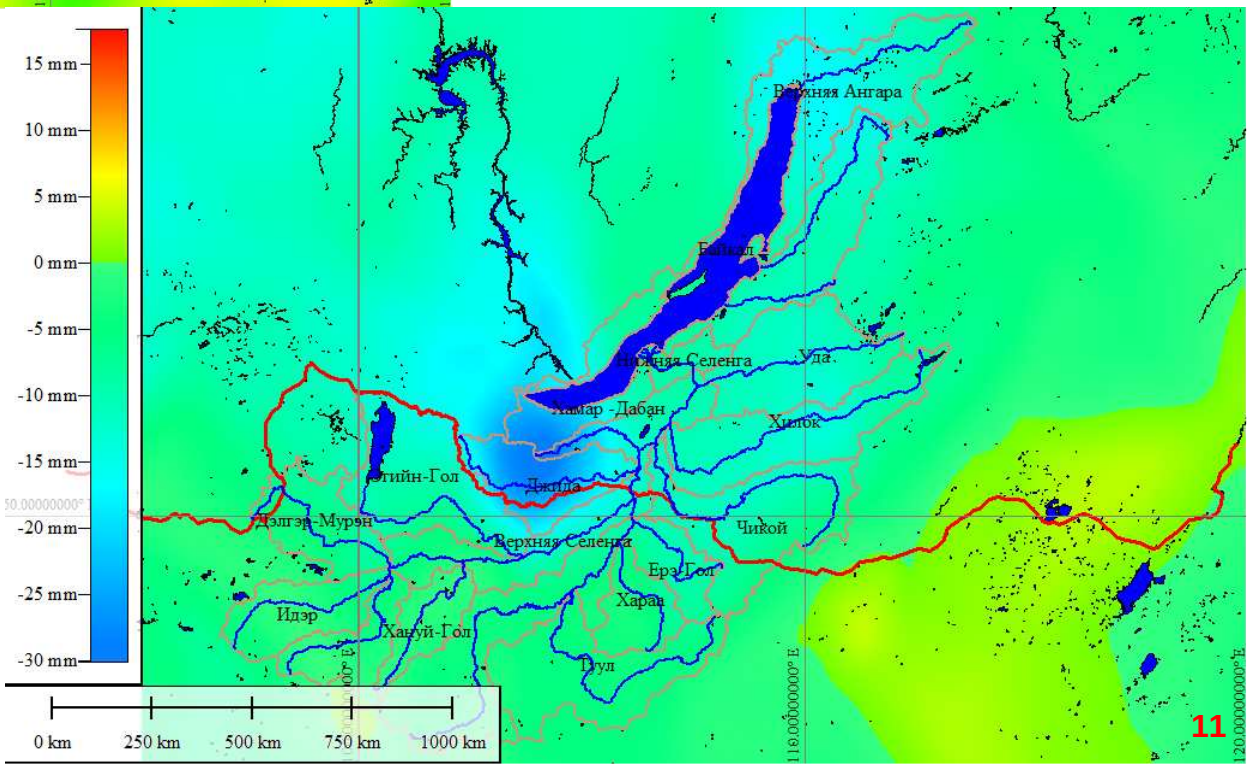
The temperature increase is observed for the entire area of Lake Baikal Basin. Areas with low growth rates of surface temperature are interspersed with areas with high growth rates, both in latitudinal and longitudinal directions.

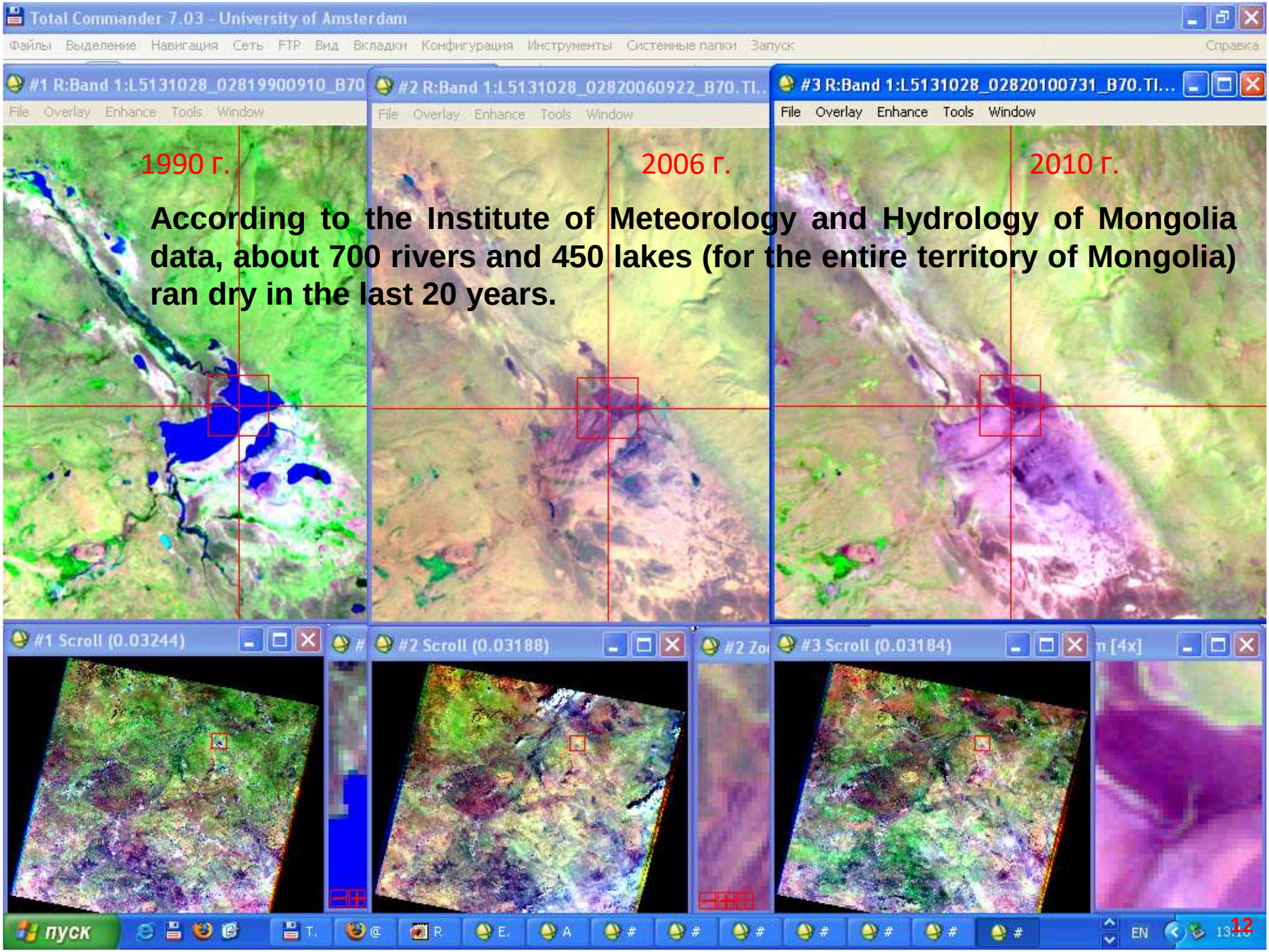
Source of data: a global database of meteorological parameters CRU (Climate Research Unit), resolution 0,5×0,5 degrees.



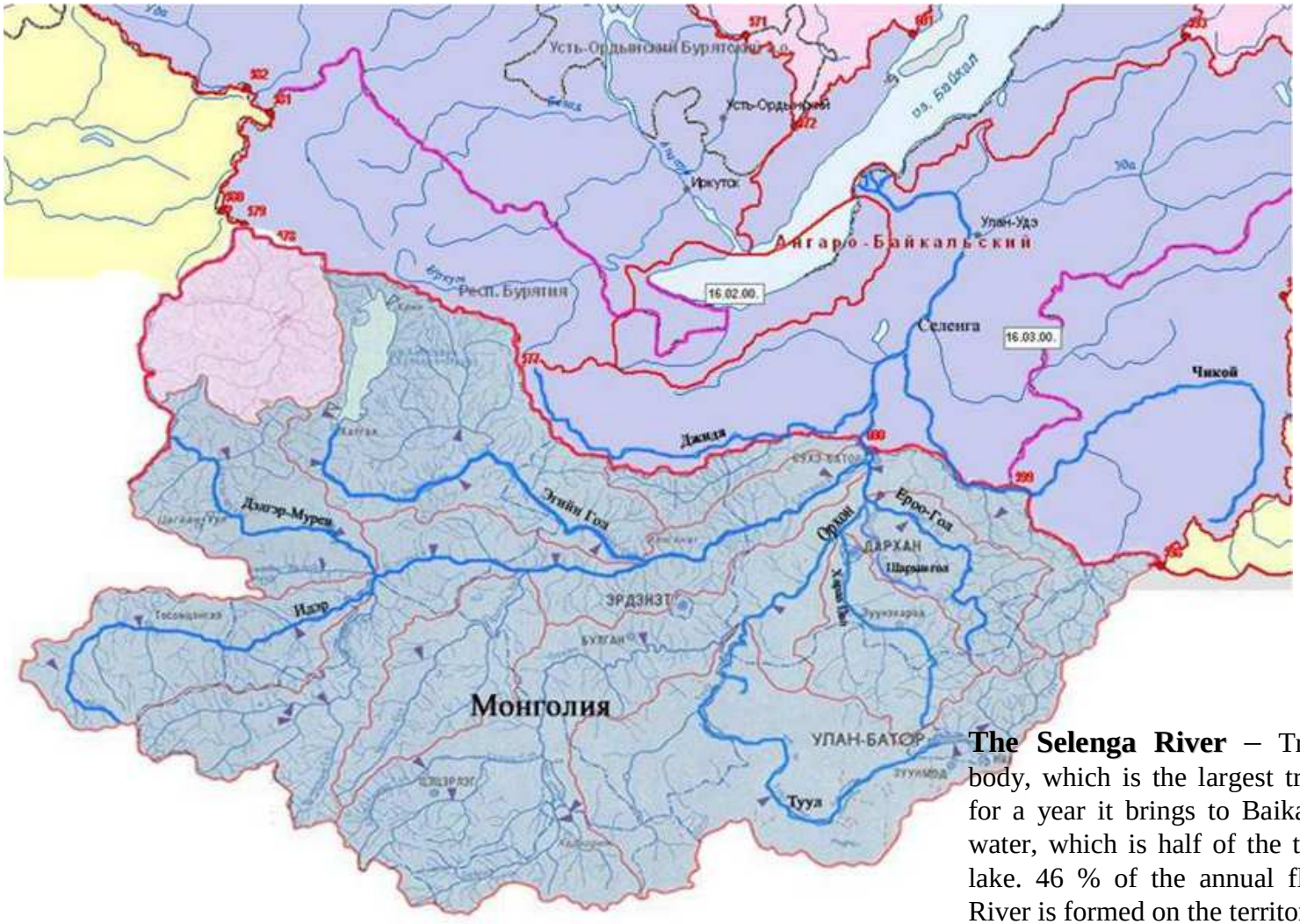
Two humidification periods are allocated:
1980-1997 yrs. - Wet;
1998-2016 yrs. - Dry.
The wet period is characterized by positive trends of precipitation totals for almost the entire basin of Lake Baikal, with the highest growth rate observed for the Khamar-Daban mountain ridge - 14 mm/year, and the area of Middle Baikal - 10 mm/year.

During the dry season 1998-2016 yrs. (Which continues till present time) there is a negative trend in the number of precipitation for the basin of Lake Baikal. Extreme reduction in moisture is marked for the Khamar-Daban and is -30 mm/year. In the basins of the Upper Angara and the Barguzin Rivers reduce rates reach values up to -18 mm/year.




Total Commander 7.03 - University of Amsterdam
1990 г.
2006 г.
2010 г.
According to the Institute of Meteorology and Hydrology of Mongolia data, about 700 rivers and 450 lakes (for the entire territory of Mongolia) ran dry in the last 20 years.

Implementation of the intergovernmental Russian-Mongolian agreement on the protection and use of transboundary waters as a strategic task to preserve the unique water body of Lake Baikal



In the basin of Lake Baikal the main transboundary water bodies are the Selenga, the Chikoy (border) rivers, the Geltura, the Kiran, the Kyakhtinka and the Menza. All transboundary water bodies flow from the territory of Mongolia to Russia, only the Kyakhtinka River carries its waters to the territory of Mongolia.

The Selenga River – Transboundary water body, which is the largest tributary, on average for a year it brings to Baikal about 30 km3 of water, which is half of the total inflow into the lake. 46 % of the annual flow of the Selenga River is formed on the territory of Mongolia. The River length is 1024 km. Catchment area – 447.1 thous. km^2, on the territory of Russia – 148.1 thous.km^2, on the territory of Buryatia – 94.1 thous. km^2.

Documents of international organizations on the protection and use of "Transboundary water bodies"

The first group of political documents of the organization of the United Nations and international organizations:

- The UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes, Helsinki, 1992;
- The UN Convention on the Law of the Non-Navigational Uses of International Watercourses, New York, 1997;
- The UNESCO World Heritage Convention; Protocol on Water and Health to the Convention on the Protection and Use of Transboundary Watercourses and International Lakes 1992, London, 1999;
- Rules for the use of waters of international rivers, Helsinki, 1966;
- Rules on water resources, Berlin, 2004.

Documents of the Russian Federation

The second group of documents of the Russian Federation:

- the Constitution of the Russian Federation in 1993;
- The concept of national security of the Russian Federation in 2000;
- The national security strategy of the Russian Federation until 2020;
- Water Code of the Russian Federation, 1995;
- Water Code of the Russian Federation in 2006;
- Water Strategy of the Russian Federation for the period until 2020;
- The Concept of the Federal Target Program "Protection of Lake Baikal and the Social and Economic Development of the Baikal Natural Territory for 2012-2020".

Documents of Mongolia

The third group of political documents of Mongolia:

- The Constitution of Mongolia, 1992 (Монгол Улсын Үндсэн Хууль);
- The National Security Concept of Mongolia, 1995 (Монгол Улсын Үндэсний Аюулгуй байдлын узэл баримжал);
- The Foreign Policy Concept of Mongolia, 1995 (Concept of Mongolia's Foreign Policy);
- Development strategy of Mongolia in the new millennium, 2008 (Монгол Улсын мянганы хогжлийн зорилтод суурилсан үндэсний хогжлийн цогц бодлого);
- Mongolia Law on Water 1995 (Монгол Улсын Хууль «Усны тухай» 1995 он);
- Law of Mongolia "On Water", 2004 (Монгол Улсын Хууль «Усны тухай» 2004 он);
- National Program on Water 2009 («Ус» үндэсний хотолбор батлах тухай).

Documents of interstate cooperation between the Russian Federation and Mongolia

The fourth group of political documents in the field of interstate cooperation between the Russian Federation and Mongolia:

- the Treaty on Friendly Relations and Cooperation between the Russian Federation and Mongolia, 1993;
- Ulaanbaatar Declaration, Ulaanbaatar, November 14, 2000;
- Moscow Declaration, Moscow, December 08, 2006;
- Declaration on the development of strategic partnership between the Russian Federation and Mongolia, 2009;
- Agreement between the Government of the Russian Federation and the Government of Mongolia on protection and use, agreement between the Government of the Russian Federation and the Government of Mongolia on environmental protection, 1994.

Implementation of the Agreement between the Government of the Russian Federation and the Government of Mongolia on the Protection and Use of Transboundary Waters

Cooperation of the Parties with respect to the protection and use of transboundary waters is carried out in the following areas:

1. Organization of work on the preparation and accident-free passage of high water and summer-autumn floods, assessment of the water management situation in the basins of transboundary water bodies, planning of flood risk management aimed at their prevention, protection from them and readiness for them.

2. Organization of work on monitoring the quality of transboundary water bodies for hydrochemical and sanitary-epidemiological indicators. Assessment of the impact of transboundary transport of pollutants with the runoff of the Selenga River to Lake Baikal.

3. Assessment of the impact of business entities on water bodies located in basins of transboundary water bodies.

4. Implementation of water management activities in the basins of transboundary water bodies.

5. Provision of water-ecological safety of Lake Baikal and its transboundary water basin with a possible territorial redistribution of water resources in the basin of the Selenga River (construction of reservoirs, hydropower plants, water resources transfer).

Large industrial sites that have a negative impact on water resources in Mongolia

Ulaanbaatar Industrial unit

The economic and infrastructure facilities of Mongolia's booming capital of Ulaanbaatar, as well as the satellite towns of Nalaikh and Gachuurt

Darkhan Industrial unit

The second largest center of the country for the production of building materials, food and light industry products, as well as coal mining in the Sharyn-Golsky section

Erdenet Industrial unit

The largest Russian-Mongolian enterprise for the processing of copper-molybdenum ores "Erdenet"

Zaamar and Sukhebator Industrial units

In Zaamar there are about 40 gold mining companies at a distance of 60 km along the Tuul River.
In Sukhe-Bator woodworking and food industry develops

Large industrial sites that have a negative impact on water resources in Russia

Nizhneselenginsk Industrial unit

OJSC «Selenginsk Pulp-and-Cardboard Plant»
OOO Timlyuysky Cement Plant;
OOO Timlyuysky Zavod (slate plant);
Branch of JSC «TGC-14» Timlyuiskaya TPP

Ulan-Ude industrial unit

Aviation plant, locomotive repair plant (LVRZ), instrument-making plant, enterprises of fuel power of CHP-1, CHP-2, food factories, woodworking industry,
LLC "Vodokanal" (99.65%) of oil depots and numerous filling stations

Gusinoozersk Industrial unit

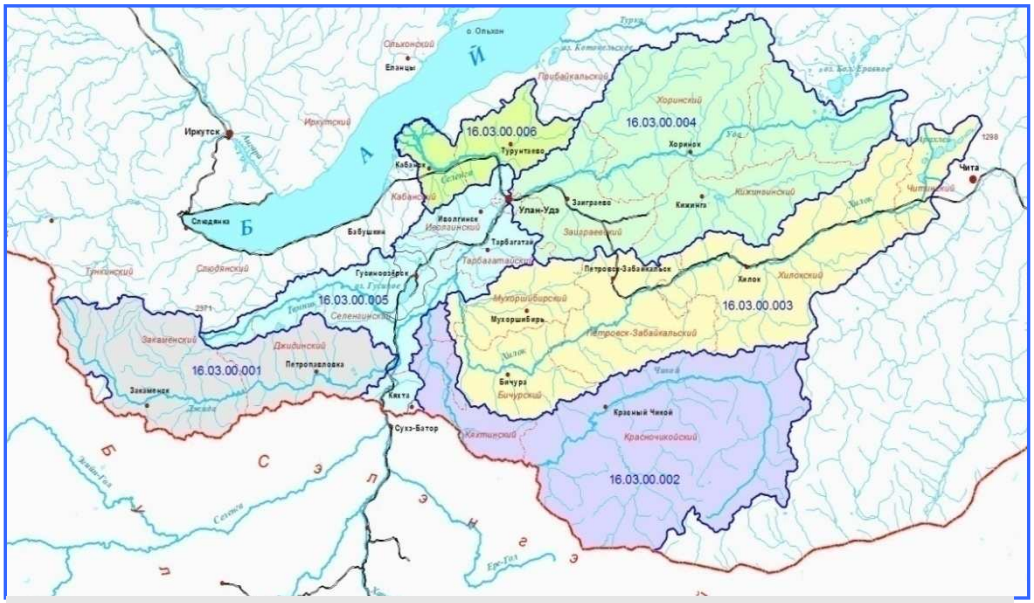
Гусиноозёрская ГРЭС (потребляет более 94% суммарного водоотбора поверхностных вод Республики Бурятия», объекты угледобывающих предприятий, карьеры глин, кирпичный завод, военные объекты

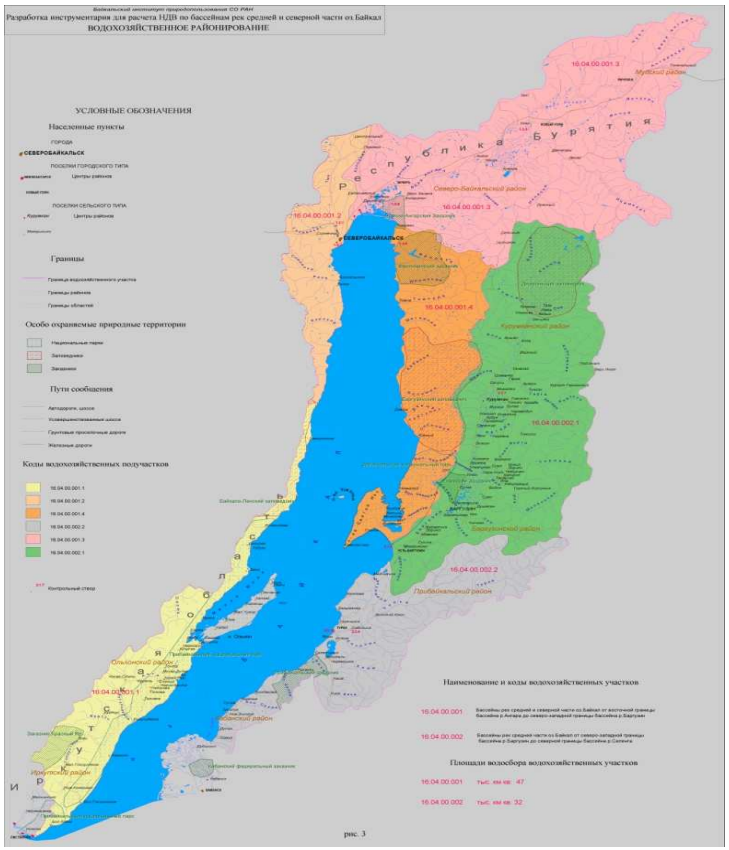
Zakamensk industrial unit

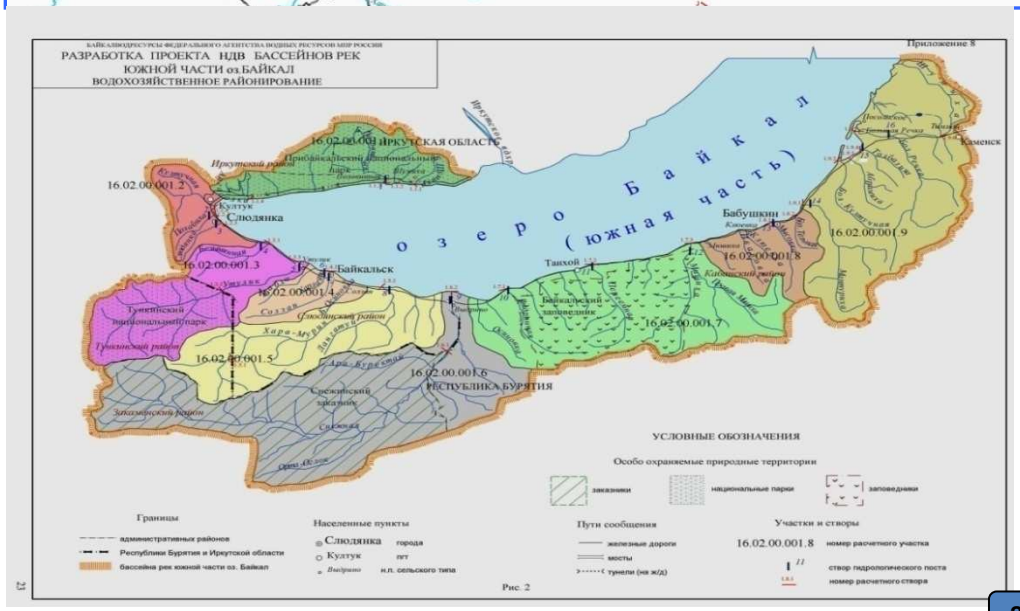
The abandoned dumps of the Dzhidokombinat are a powerful contaminant of the soil cover. Within a radius of 2-3 km from the plant, the content of lead, zinc, tin, copper, nickel, molybdenum, cadmium, tungsten, manganese and chromium in the soils exceeds the background level 2-3 times. Water from the tailing dump with a fluoride concentration of about 20 mg/dm^3, iron - more than 8 mg/dm^3, containing metals (Cd, Mo, Li, Pb) in amounts of 1-5 MPC contaminating surface and groundwater at the mouth of the Modonkul river.

Development of schemes for the integrated use and protection of water bodies and standards for permissible impacts on water bodies

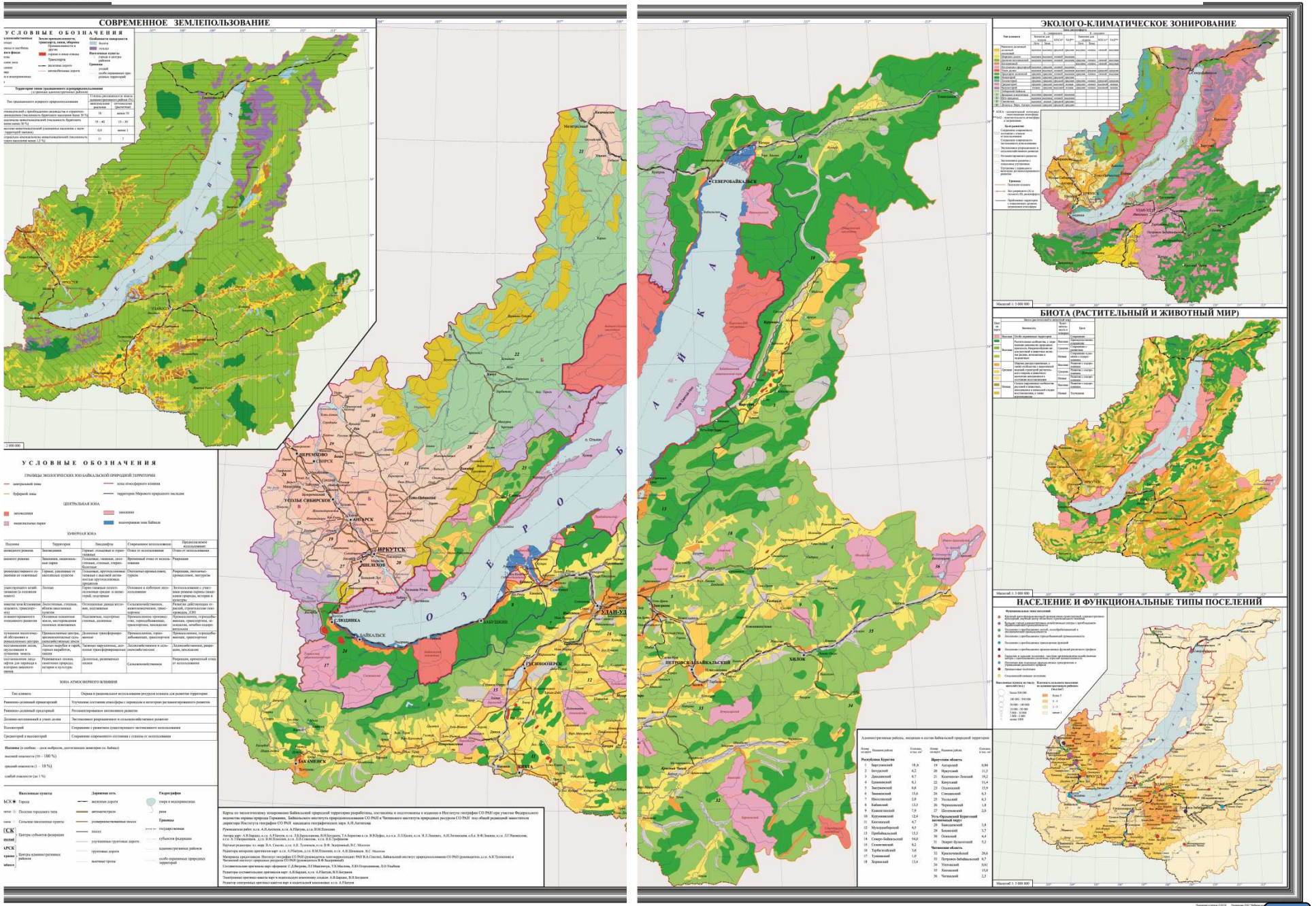
In the basin of Lake Baikal, in accordance with the hydrographic zoning, the Permissible Impacts Standards and the Schemes for the integrated use and protection of water bodies in the Selenga river basin (2010-2014), the river basins of the southern part of Lake Baikal (2010-2014), along the river basins of the middle and northern parts of Lake Baikal (2010-2014)



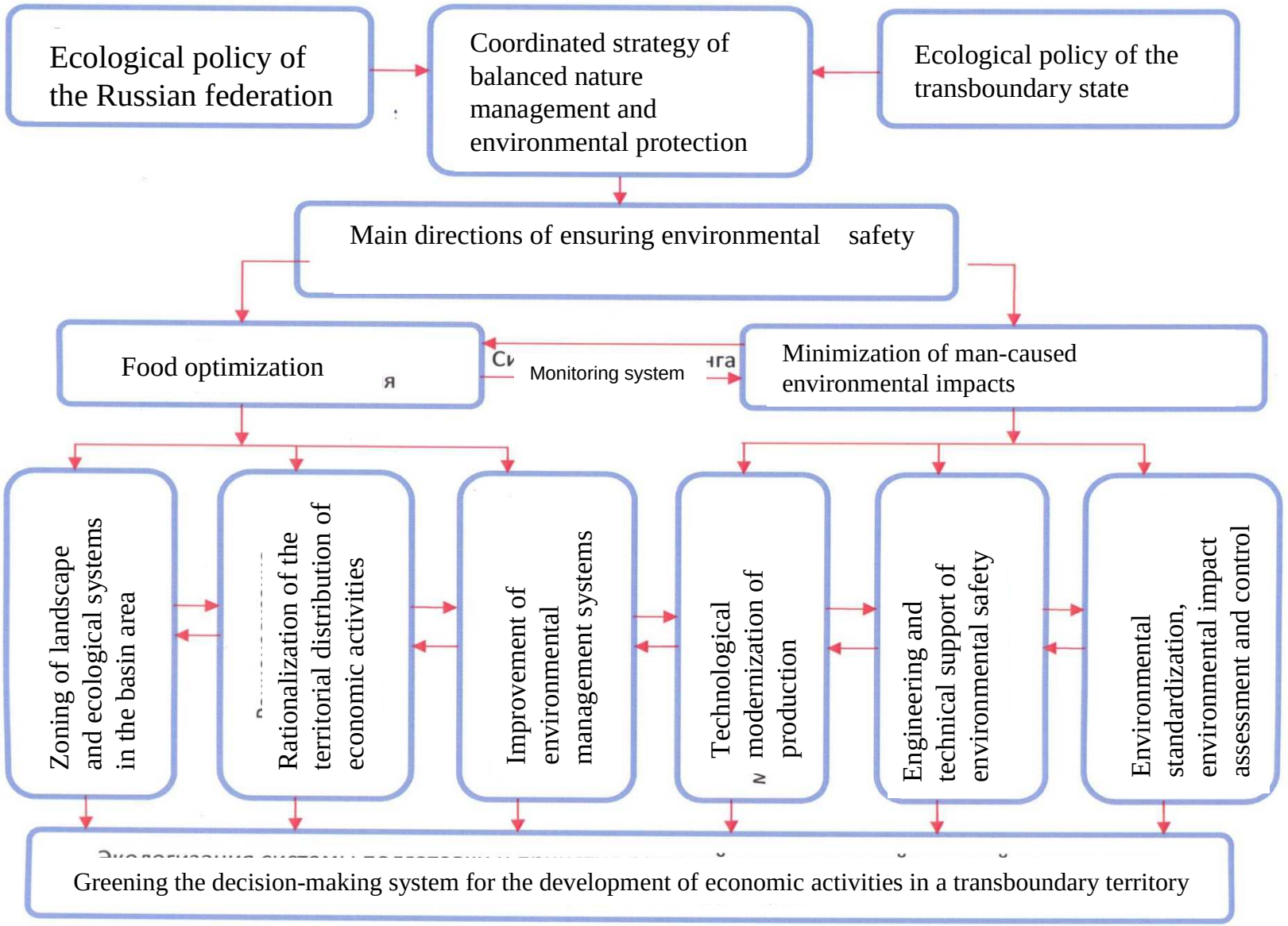




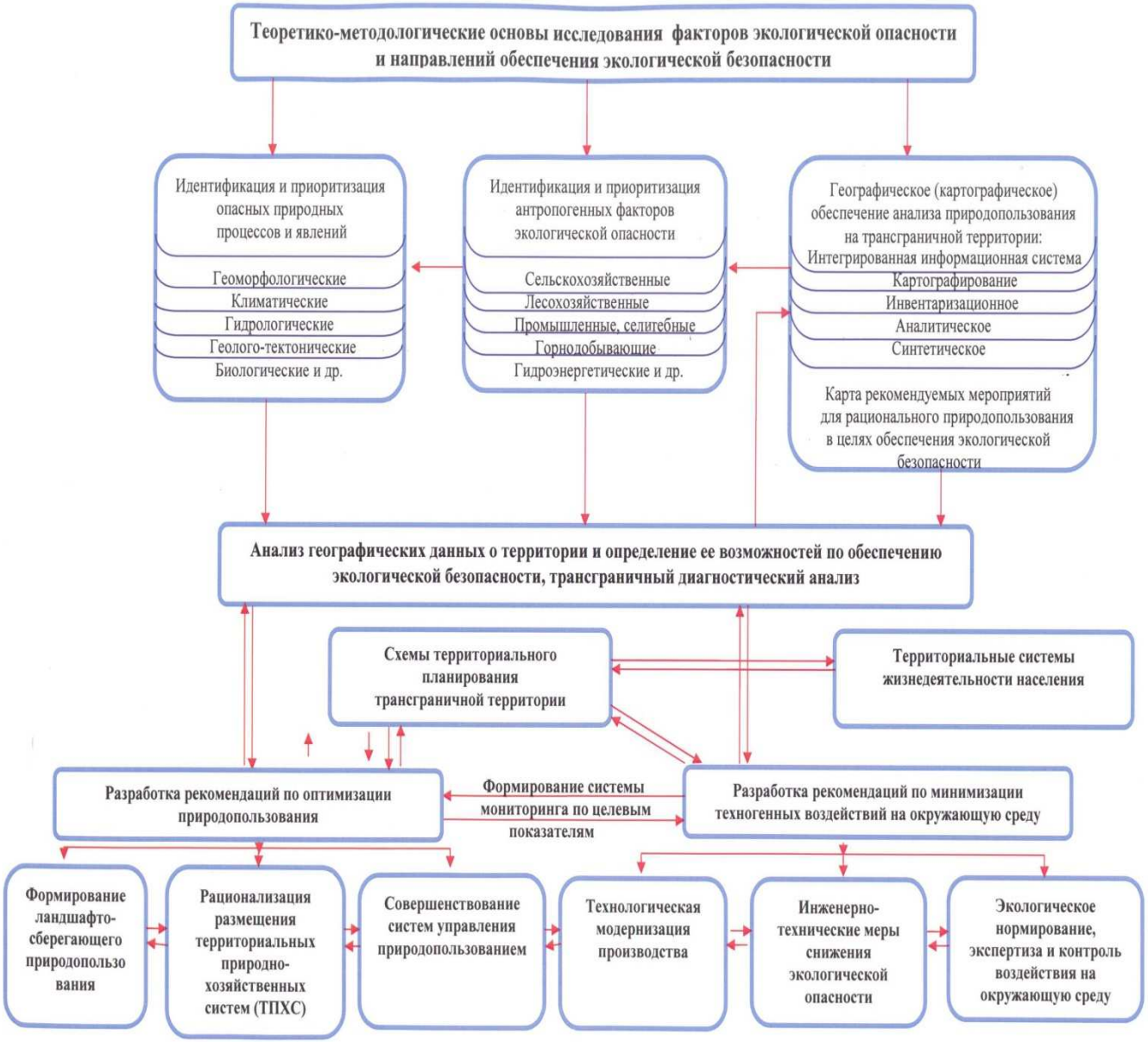
Ecological zoning of the Baikal Natural Territory



Model-scheme of the main directions of environmental safety of transboundary territories



Scheme of the main directions (algorithm) of research for the purposes of ensuring environmental safety



The phases of cooperation in the basins of transboundary water bodies

1. Assessment of national institutional and legal frameworks, resources and needs.
2. Development of appropriate legal and institutional frameworks for cooperation.
3. Development of a plan for the development and management of the basin.
4. Implementation of the development plan and management of the basin.
5. Monitoring of results and evaluation of implementation.

The main goal of international cooperation:

- **Prevention of transboundary adverse effects**
- **Increase of water and ecological safety of transboundary territories.**

Improvement of interstate cooperation to address transboundary problems is related to the harmonization of environmental concepts of neighboring countries on the basis of general principles that ensure water and environmental security of a single transboundary territory.

In the basin of the river on the territory of Mongolia the possibilities of 22 hydropower plants construction were examined.

The river EG

- Khatgal HPP, NWL 1645м
- Khengertein HPP, NWL 1475м
- Elstein HPP, 1060м
- Tsambin Hiidin HPP, NWL 955
- Khantain HPP, NWL 915м
- Egiin HPP, NWL 870м

The river Selenga

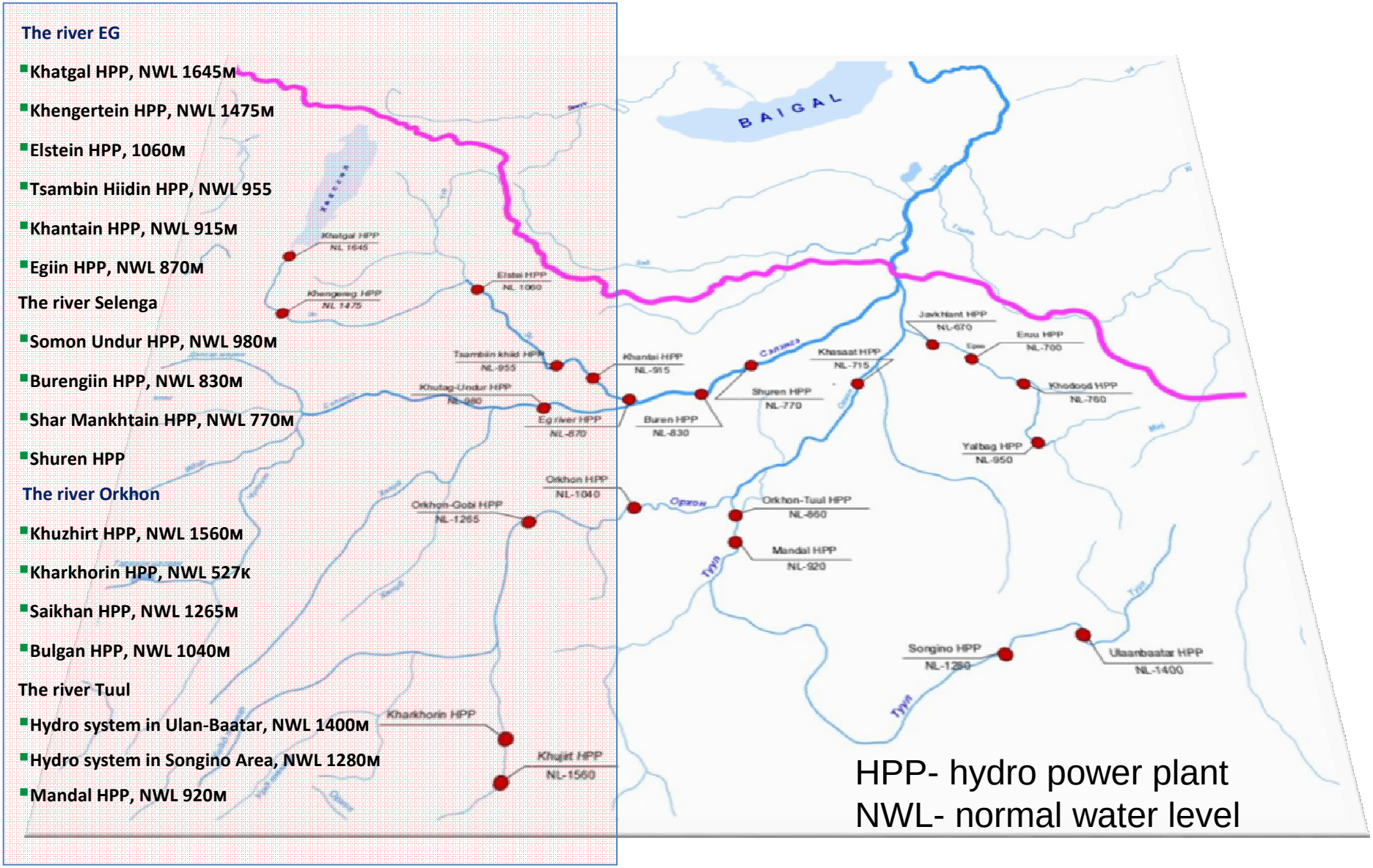
- Somon Undur HPP, NWL 980м
- Burengiin HPP, NWL 830м
- Shar Mankhtain HPP, NWL 770м
- Shuren HPP

The river Orkhon

- Khuzhirt HPP, NWL 1560м
- Kharkhorin HPP, NWL 527к
- Saikhan HPP, NWL 1265м
- Bulgan HPP, NWL 1040м

The river Tuul

- Hydro system in Ulan-Baatar, NWL 1400м
- Hydro system in Songino Area, NWL 1280м
- Mandal HPP, NWL 920м



HPP- hydro power plant
NWL- normal water level

Planned hydropower plants of Mongolia


The photo from the board of the ultralight, August, 2014
Thank you for your attention!