INSTITUTIONAL CHALLENGES TO TRANSBOUNDARY WATER USE (IRTYSH BASIN AS A CASE STUDY)

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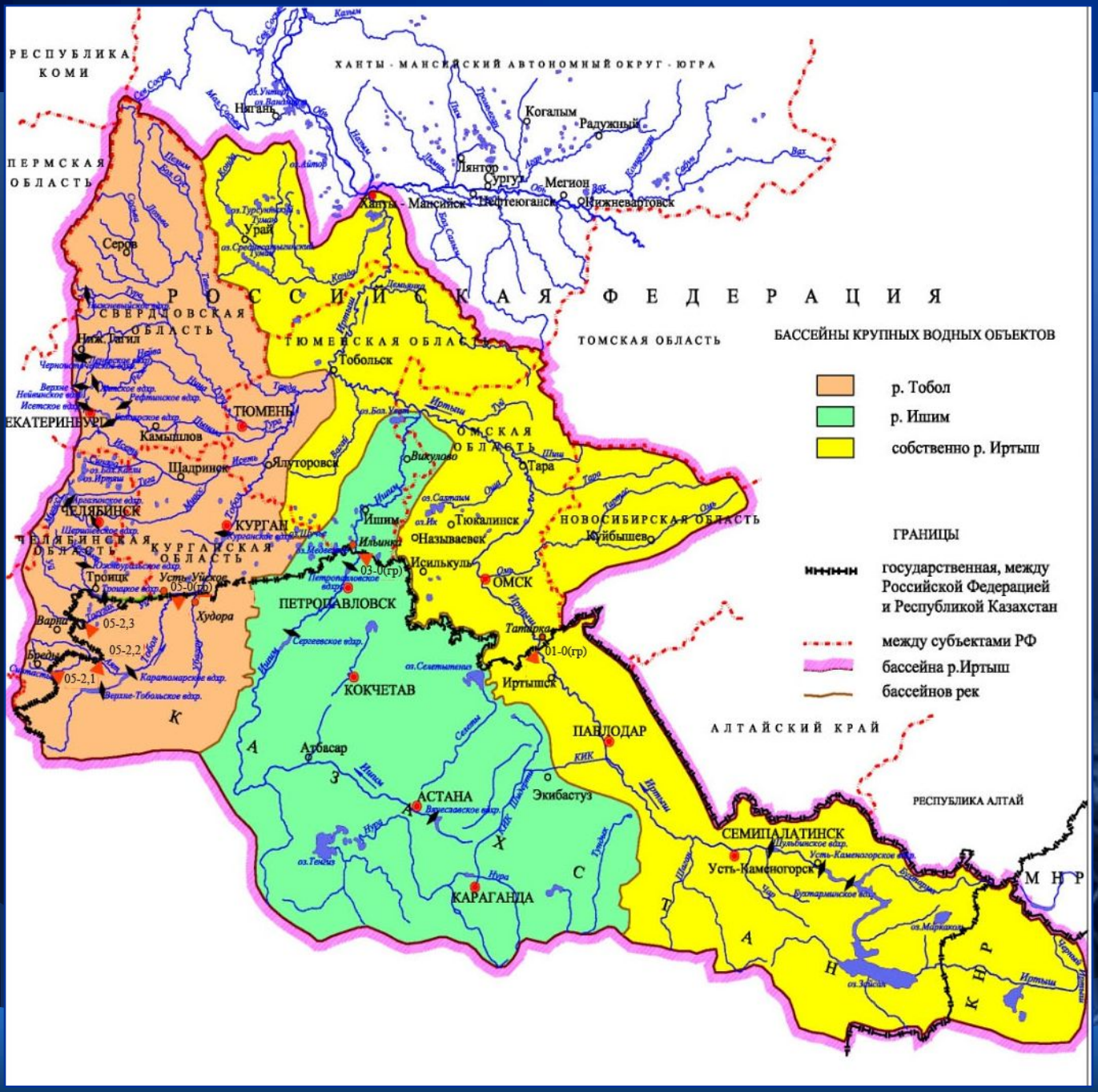
Irtysh river basin



The river length is 4248 km (in China – 525 km, Kazakhstan – 1835 km, Russia – 2010 km). The basin area is 1643 th km^2, the average water consumption below city Tobolsk – 2150 m^3/h

Major transboundary problems of the Irtysh basin

- water resources depletion induced by increased water withdrawal in China and Kazakhstan, evaporative loss from the reservoirs of the cascade hydroelectric systems, e.g. Verkhneirtysh HPSs and other hydraulic structures;
- high level of water resources contamination with heavy metals and petroleum products emitted from the enterprises of a mining-metallurgical complex and heat power engineering systems operating in the upper reaches of the Irtysh;
- radioactive contamination of the territory caused by the Semipalatinsk (Russia) and Lop Nur (China) nuclear test sites, "Mayak" industrial association , etc.;
- critical state of hydraulic structures;
- lack of legal mechanisms for regulating water use in transboundary countries.

Water resources depletion

Increased water withdrawal by China;

- R. Kara-Irtysh (Black Irtysh) runoff formation in China (approximately 9.0 km^3/year);
- current water withdrawal makes up 1.0 - 1.5 km^3/year;
- In China:
- In the future water withdrawal will increase up to 4.0 - 5.0 km^3/year due to the oil –field development nearby Karamay town and water intake for other purposes.

In Kazakhstan:

- The construction of Bulaksk HPP (as a distribution reservoir of Shulbinskaya HPP) with a capacity of 68 MW; the restoration of Ulbinsk HPP (27 MW) by "LenGES"; the repair and installation of HPPs in Ust'-Kamenogorsk and Semey; the construction of 2 mini and 13 small HPPs, including Turgusun HPP.

Probable consequences:

- increased water scarcity in the mid reaches of the river (Kazakhstan), the problem of reservoirs (Bukhtarma and Shul'binskoye) filling;
- decreased water supply to the city-millionaire Omsk (Russia) because the Irtysh is the only source of drinking water;
- navigation worsening in the lower reaches of the river;
- probable sizeable (around 1 m/year) decrease in groundwater level generating river water percolation.

Pollution of river waters with heavy metals

***The** main reason **of water pollution** is functioning of energy enterprises and a mining - metallurgical complex within the large polymetallic province of Rudny Altai, Kazakhstan*

- expansion of energy enterprises, chemical and metallurgical industry in Pavlodar oblast;

- construction of NHP in Kurchatov town (Kazakhstan);

- water supply to Astana.

***As a consequence** , the rivers of the Irtysh basin are the most polluted water objects in Kazakhstan.*

Irtysh tributaries (i.e. rivers Breksa, Glubochanka and Krasnoyarka) are most polluted; with water pollution index of 10.18-28.17 they are referred to the 7th class of quality, i.e."extremely dirty".

Contamination by nitrogen ammonium (up to 1.8 MAC), nitrite nitrogen (5.7), copper (2.3-89.3) , zinc (39.7-60.3), oil products (up to 2.8) and manganese (7-13.1) is the highest.

Hydraulic structures safety

Major risks of emergency events:

- tear and wear of the equipment (for example, the Ridersky cascade of small derivation- type HPSs constructed in the 1920-1940s);
- repeated change of the ownership and the owners of hydroelectric systems as well as enterprises-consumers of electricity that significantly reduces the owners' responsibility for their exploitation;
- high probability of seismic events occurrence aggravates the problem. According to the experts' data, there is a tectonic fault along the Irtysh river fairway; in particular, up to a dozen of shocks is annually recorded nearby the Bukhtarma HPS.

Water use regulation

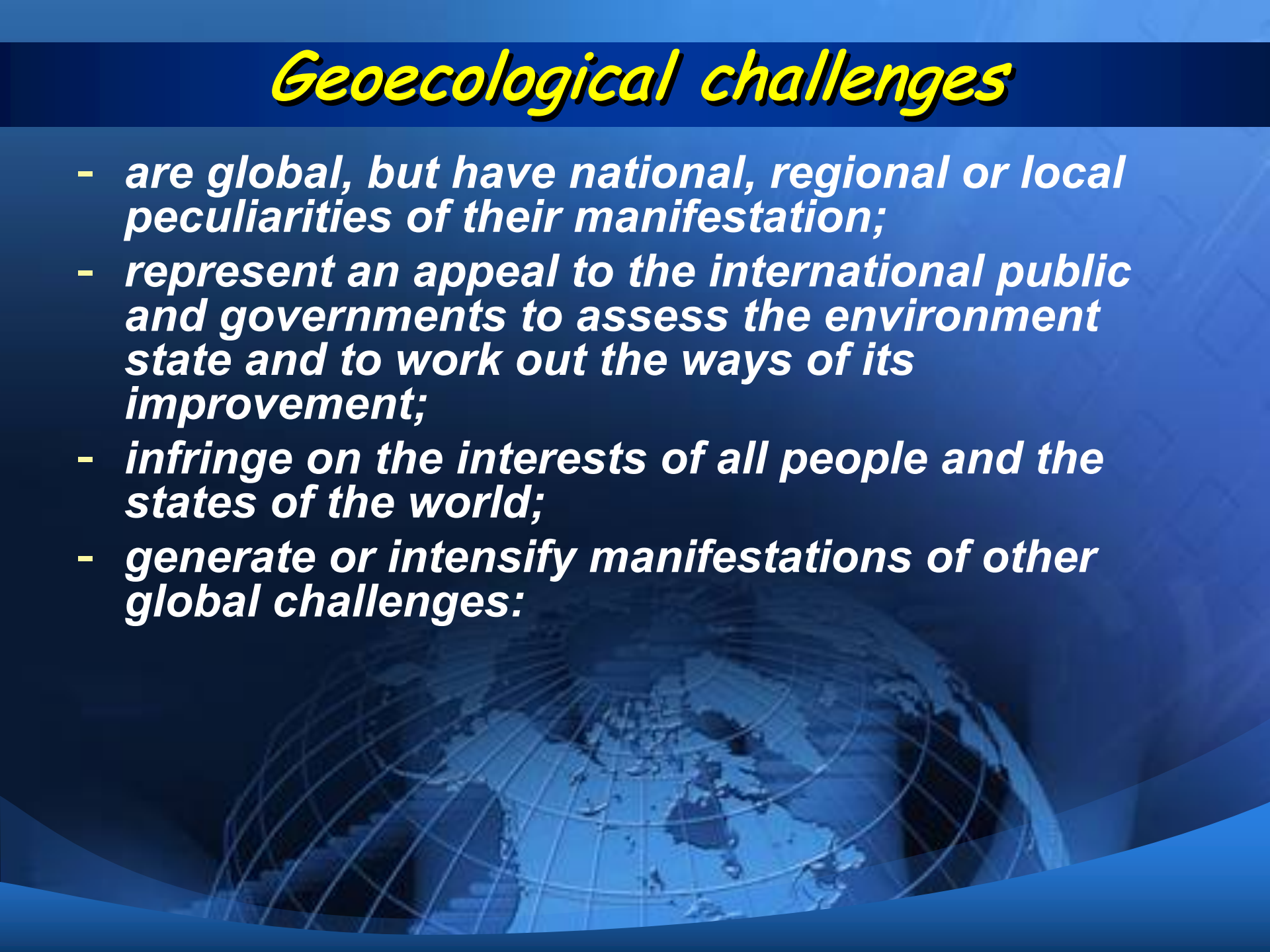
- Imperfect institutes of natural resources property in all countries of the basin;
- Lack of completely developed institutional structure of water management in cross-border basins;
- Lack of the tripartite contractual relations in the Irtysh basin;
- Refusal of China to sign the international documents on water use.

Concept of global challenges

- “Challenge impels growth. When a society faces a challenge, it solves the arisen problem and thus moves to a higher state of development in terms of structure.
- The lack of challenges means the lack of incentives to growth and development. The traditional opinion on contribution of favorable climatic and geographical conditions to social development is incorrect. On the contrary, historical examples are evidence that too good conditions, as a rule, encourage return to the nature, the termination of any development"
- [Arnold Dzhozef Toynbi, "Comprehending of history“, 2001].

Geoecological challenges

- *are global, but have national, regional or local peculiarities of their manifestation;*
- *represent an appeal to the international public and governments to assess the environment state and to work out the ways of its improvement;*
- *infringe on the interests of all people and the states of the world;*
- *generate or intensify manifestations of other global challenges:*



Other global challenges:

- *- demographic challenges : health of population in regions with water resources deficiency or poor quality of drinking water;*
- *- ecological challenges : pollution of atmosphere – hydrosphere - biosphere;*
- *- power challenges : energy in general and hydropower, in particular, including small-scale power systems;*
- *- socio-economic and socio-humanistic problems.*

Water- ecological challenges

- **The global level:** out of 1386*10*6km*3 of water resources of the biosphere 35*10*6km*3 or 2.5% falls on fresh waters; only 1% of fresh waters is available to the mankind [Rodda, 1997, Helmer, 1997].
- **Water supply to population** on the continents varies from 40 th.m^3/year (South America) up to 4.0 and 4.3 th.m^3/year (Europe and Asia), respectively [Dzhamalov, 2004].

Water-ecological challenges

- **The national level**
- The total water intake in Russia in 2008 made up 79.08 km*^{3} that is less than 2.0% of available water resources [Water cadastre of the Russian Federation, 2008].
- **Water availability** of the territory and the population is widely differentiated.

Water-ecological challenges

Macro-regional level

In Asian Russia, water availability is high, except for some steppe areas of Kurgan and Omsk regions, Altai and TRANS-Baikal territories, etc.) .

Water intake (of annual runoff) in basins :

the Ob – 1.93%;

the Tom' – 8.63%;

the Irtysh – 2.65%;

the Yenisei – 0.44%;

the Angara- 1.06%;

the Lena – 0.02%;

the Selenga – 2,62%;

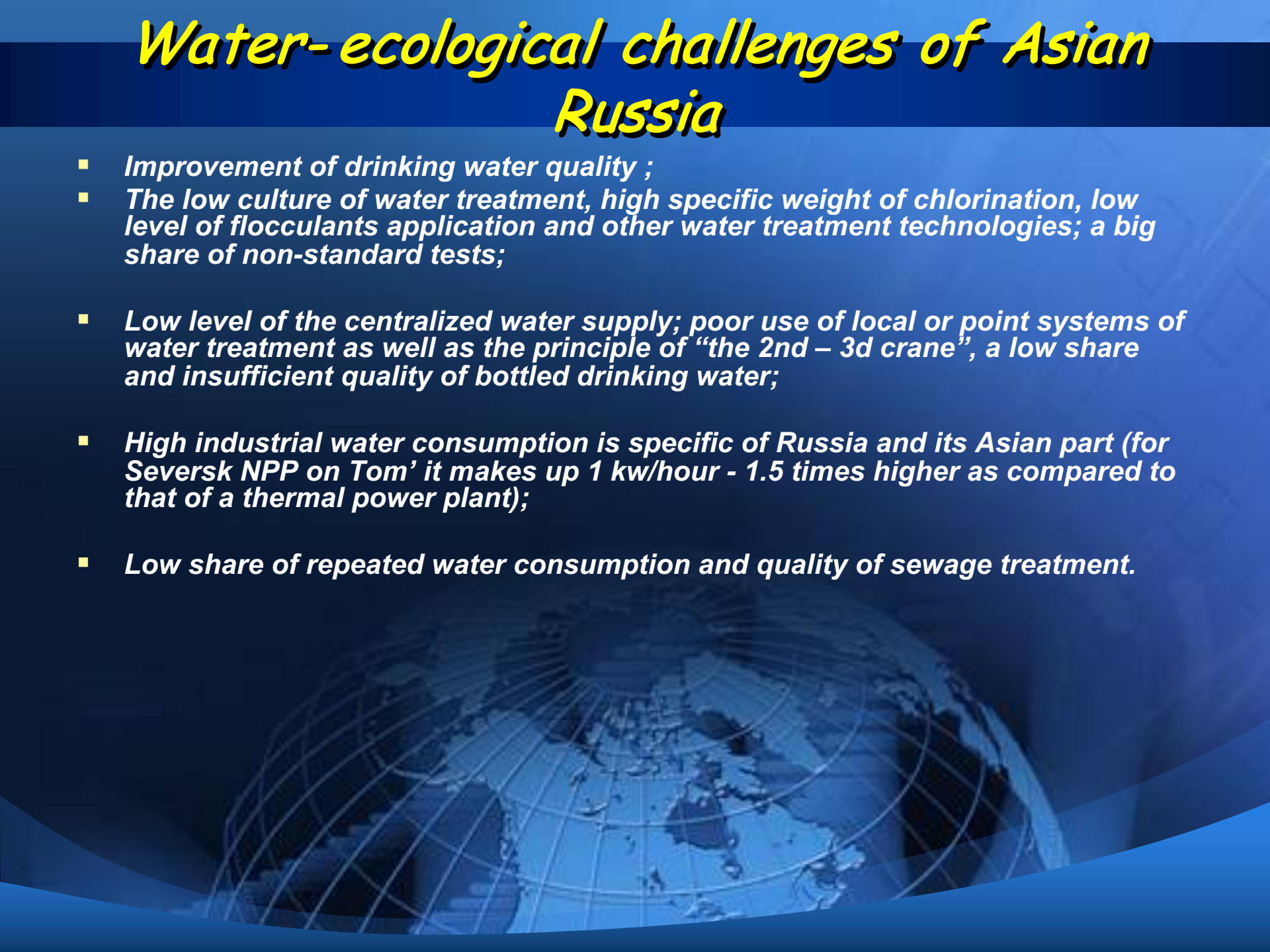
the Kolyma – 0.2%;

the Amur – 0,34%

[Water cadastre of the Russian Federation, 2010]

Water-ecological challenges of Asian Russia

- *Improvement of drinking water quality ;*
- *The low culture of water treatment, high specific weight of chlorination, low level of flocculants application and other water treatment technologies; a big share of non-standard tests;*
- *Low level of the centralized water supply; poor use of local or point systems of water treatment as well as the principle of "the 2nd – 3d crane", a low share and insufficient quality of bottled drinking water;*
- *High industrial water consumption is specific of Russia and its Asian part (for Seversk NPP on Tom' it makes up 1 kw/hour - 1.5 times higher as compared to that of a thermal power plant);*
- *Low share of repeated water consumption and quality of sewage treatment.*



Water-ecological challenges of Asian Russia

- Cross-border aspects of Irtysh, Selenga and Amur basins.
- Here, there is the need of interests coordination in
- Water allocation between states located in the transboundary river basin;
- Transboundary pollution transport;
- Redistribution of runoff;
- Relationships concerning prevention and elimination of accidents consequences;
- Coordination of water users' interests in the transboundary river basin;
- Protection of unique water bodies;
- Monitoring.

Current challenges

- *The first group consists of natural and anthropogenic challenges with a natural component as a cornerstone, often complicated by the irrational environmental management and the use of outdated technologies distinguished by high resource and water consumption.*

Current challenges

- **The second group includes "challenges of formal and institutional character“** ***generated by the following factors:***
- ***imperfectness of institutes of natural resources property in all countries of the basin of the Irtysh River , which are at a stage of a transition from socialist to capitalist forms of relations. In all countries, water resources belong to the state. Water management is also carried out by the state. As for consumers, they are certain economic subjects, the interests of which are often poorly represented at the state or interstate level.***

Current challenges

- signing of international agreements and establishment of commissions on joint use and protection of cross-border waters. Unfortunately, China refuses tripartite cooperation in the Irtysh basin . Thus, only bilateral cooperation is implemented here;
- innovative activity of the countries located in the basin differs.

Proposals for solving water problems

Proposals for solving water problems in Kazakhstan:

- 1. Transfer of R.Tikhaya waters to the Irtysh basin (the Katun river basin)
- 2. Turning of rivers AK-Kaby and Kara- Kaby
- 3. Construction of TransKazakhstan canal with water intake from the Shulbinskoye reservoir with one main canal and four additional branches – Astana, Petropavlovsk, Kostanay and Aktobe

Proposals for solving water problems in Russia:

- 1. Construction of a low-head dam and reservoirs nearby Omsk (the Krasnogorsk HPS)
- 2. Creation of artificial underwater thresholds to raise the water level near Omsk due to the low river flow

Transboundary cooperation

Common basin interests:

- The Irtysh river basin is a zone of interests of three states; the cross-border cooperation is carried out on a 2-party basis;
- It is necessary to implement the integrated environmental management within the common Irtysh basin;
- The development and implementation of Schemes of territorial planning (adjacent to/on border territories); interests' coordination;

Russian interests:

- It is necessary to revise the regional water policy in the Tobol river basin;
- Search for optimal solutions for coordination of water use practices in Ishim and Irtysh basins with Kazakhstan partners: objective (natural-climatic) and subjective (China with its strategic interests) challenges ensure the preservation of watercourses and should not restrict the development of Russian regions

Thank you for attention!