To the problem of the Torey lakes

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Abstract. The socio-ecological problem of the Torey Lakes, a UNESCO World Natural Heritage Site, which arose in connection with the construction of a dam on the Uldza River, which began by Mongolia, which is the main ground feeding artery of the lakes, is considered. An option is proposed to save the lakes on our own, by laying a water supply system with a length of about 40 km. from Onon River, with the preliminary construction of a reservoir here due to the confluence of the channels of the old, middle and new Onon, as well as options for groundwater budding. Examples of the transfer of river waters carried out in different regions are given.

In the south of Transbaikalia, in the border area with Mongolia, there are the largest lakes in terms of area, Barun-Torey and Zun-Torey. The water surface area of Lake Barun-Torey in the years of high water availability is 580 km$^2$, and the depth is 4–6 m. The water in the lake is muddy, the transparency is 5–10 cm, The mineralization reaches 10 g/l.

The lakes have received international recognition for their uniqueness and in 2017 were declared a common (with Mongolia and China) UNESCO World Heritage Site. Here is the natural biosphere reserve "Daursky", which practically has no analogues in the world and is included in the network of UNESCO biosphere reserves. The reserve is located in the center of the closed Torey basin, and the high level of biodiversity is explained by the good preservation of ecosystems and the location of birds in the narrowing area of the East Asian-Australian migration route. Of particular importance here for conservation are cranes, relic gulls (one of them is the only colony in Russia), as well as the only antelope habitats in Russia – gazelles.

And over this territory, a threat loomed, which over time is becoming more and more aggravated. The fact is that the Mongolian side has already begun and is building a dam on the transboundary Uldza River, which is the main land supply artery of the Torey Lakes. The river, 425 km long, for the most part flows through the territory of Mongolia, and only the mouth part (16 km) is located on the territory of Russia. The river flows into Lake Barun-Torey with the formation of an extensive delta, and the lake is connected by a small channel with the Zun-Torey, that is, it is a coordinated water system. The average annual flow of the river at the mouth is 0.28 km$^3$. The river freezes over, the duration of the freeze-up is 155–190 days. Ice cover usually sets in at the end of October and breaks down in mid-April. Torey lakes periodically dry up in waterless periods for several years, that is, there is a cyclical dependence of the water regime on the climate [1].

The construction of a dam in Mongolia is due to the lack of water in this part of the Uldza-Torey Basin, with an abundance of swamps and salt marshes, in order to revive agricultural activity. The Uldza River is said to pose a threat to the Torey Lakes. And at what level this "threat" is not discussed.
Here is an appeal - a complaint to UNESCO, to the International Ecological Coalition (rivers without borders), an appeal by the governor of the region A. Osipov to the Ministry of Natural Resources and Environment of the Russian Federation and the Ministry of Foreign Affairs of Russia with a request to prevent the threat of an ecological catastrophe – the disappearance of the Torey Lakes. State Duma deputy V. Pozdnyakov is also concerned about the same problem. It is argued that the construction of the dam will cause environmental and socio-ecological problems in the south of Transbaikalia. However, the Mongolian lands below the dam will also suffer from such construction.

Meanwhile, to save the lakes from disaster, in any case, to replenish the annual flow of the river Uldza, it is quite possible “with your own hands”. There are data for this: it is a favorable orohydrographic situation in the region and the technical means available in the country. Hilly-ridged relief, drainlessness, dry steppes prevail here, absolute elevations are 580–600 m (lake surface) and 700–750 m (Onon river coastline) from where it is recommended to conduct a water supply to the lakes (such hypsometry allows the water flow to be carried out by gravity). The distance of the aqueduct is about 40 km. The transfer of fresh water from Onon to the Torey Lakes is quite possible and realistic, and it is planned to create a reservoir in the Onon floodplain by merging the channels of the old, middle and new Onon, which can later be used for fishing. To do this, it is necessary to conduct a feasibility study (FS), geotechnical and hydrogeological surveys, public hearings, with the option of building a small dam in one of the Onon channels. However, it should be noted that the lake has a substantial supply of groundwater. In this regard, it is recommended to activate the earth's interior of the basin (explosions, vibration, etc.) in order to increase the inflow of groundwater and the timing (cyclical) of their inflow.

There are already some examples of the construction of water pipelines in Transbaikalia. So to save Lake Kenon from drying out, water has been pumped from the Ingoda River for about 30 years. As
reported on the website of the government of the Trans-Baikal Territory, the hourly planned flow of more than 2000 m³ of water, and the total volume of pumped through the pipeline (1.5 km) is more than 6 million tons per year. The pumping is carried out at the expense of TGK-14 funds and such an act, moreover, has a beneficial effect on the ecosystem of Lake Kenon. Of course, this volume is not large compared to the annual flow at the Uldza estuary (280 million m³ per year), but this capacity may well be increased, given the experience of building numerous gas and oil pipelines in Russia. So the oil pipeline "Eastern Siberia – Pacific Ocean", with a length of 4.7 thousand km, pumps about 80 million tons of oil per year.

Another example is the cooling reservoir of the Kharanorskaya GRES, filled with the waters of the Onon (the water regime of the river depends on precipitation), the old channel of the Turga River at the confluence with Onon and the floodplain lakes present here. The loading reservoir has an area of 4.1 km², a volume of 15.6 million m³, and an average depth of 3.8 m. The water supply system includes a supply, drainage, water intake canals and a coastal pumping station [2]. The construction was obviously carried out at the expense of the Kharanorskaya GRES, launched in 1995. Another thing should be added – the transfer of water through the pipeline from the river. Chitinka (about 4 km) can be carried out into the once existing lake Ugdan, thereby revitalizing the reservoir. In parallel, it is recommended to regularly clean up and deepen the river bed, as is done in many areas.

It is appropriate to recall the existing grandiose projects for the transfer of the Siberian rivers – the Ob, Irtysh in the southern direction, to provide water to the arid regions of Kazakhstan and Central Asia, as well as to stop the decrease in the level of the Aral Sea. The project was a truly grandiose engineering and construction decision of the 20th century. It was envisaged to transfer waters up to 25 km³ per year with the construction of a navigable canal here with a depth of 15 m and connecting the northern seas with the Aral and the Caspian Sea. The project was criticized as for soil erosion, disturbance of agricultural lands, economy, etc., but nevertheless in 1968, as part of the project, the irrigation and watering canal Irtysh–Karaganda, 458 km long, was put into operation. with a width of 20–50 m and a depth of 5–7 m. It is significant that only one pumping station (and there are 22 of them) pumps 18 m³/s. or 1.5 million m³ per day.

Subsequently, they returned to this project several times. So in 2006 ex-president of Kazakhstan N. Nazarbayev declared the need to turn the Siberian rivers into Central Asia due to the decrease in surface water resources here and their depletion. In 2010, ex-President of the Russian Federation D. Medvedev raised the issue of the need to restore the destroyed melioration system, built in Soviet times. And if the Taliban build a dam on the river. Amu Darya, which originates in the mountains of Afghanistan, then Central Asia will be even sadder.

However, as part of the project – the restoration of only the Aral Sea, it is possible to carry out without building canals, transferring the required (calculated) volume of northern rivers in a dosed amount through the pipeline. A dosed transfer of a part of the Siberian rivers to the south is possible along the routes previously laid by these rivers (the Turgai hollow, etc.), when these rivers flowed southward (traces of such movements were preserved in the form of Uzboi – dry channels) due to the blockage of their mouths by glaciers once descending from the ice continent of Hyperborea, which existed hundreds of thousands of years ago, on the site of the Arctic Ocean. Acad. V. Obruchev in the science fiction novel "Sannikov's Land".

It is appropriate to recall the Chinese project, which carried out the transfer from the south of the more full-flowing Yangtze River to the basins of the Yellow and Hai rivers, where the population suffered from a lack of fresh water. The length of the channel (there are three of them, eastern, central and western) is about 1300 km each. The northern regions are drier, and the Yangtze River also regularly caused floods in the southeast of the country. The scale of water transfer is impressive, only about 30 billion m³ passes through the central canal, while there is an improvement in the lives of 60 million Chinese in the north of the country. The capacity of the giant pumping station of the eastern channel, which is 12.6 billion m³, is also impressive, as well as the aqueduct (aqueduct) under the Yellow River, 70 m below the channel (material from Wikipedia).
Against the background of such tremendous movements, the project of transferring water from the Onon River towards the Torey Lakes seems to be very scanty and less costly. In general, many problems in the region should be solved on their own. This concerns, for example, the problem of gasification of the region (network), which has re-emerged in the administration. Particularly alarming in this regard is the suspension of work at the unique gas and coal deposit Apsat, which should have been developed comprehensively and there would be no need to export equipment now, and the rotational camp opened with fanfare is not planned to be put up for auction. If we take a broader view of the problem in Russia, the unfavorable situation also applies to the civil aviation industry (we fly on Boeings, etc.), as well as the automobile industry (the dominance of foreign cars on the roads) with its own production facilities successfully stopped.

And how can one fail to recall the words of the hero of the film "White Sun of the Desert" P. Vereshchagin – "I'm sorry for the state". And in order not to be offended and not to depend on sanctions, it is necessary to use the entire scientific research and intellectual resource in our country and we have enough of it if we do not allow a brain drain.

Conclusions
1. It is necessary to abandon reproaches against Mongolia, which is building a dam on the river. Uldza for the following reasons: the river does not save Lake Torey from periodic (about 30 years) drying up, and Mongolia itself may suffer from such construction.
2. Debit p. Uldza can be fully and abundantly replenished by constructing a pipeline about 40 km long, from r. Onon towards the lakes.
3. Orohydrography of the area fully contributes to the effectiveness of the pipeline: the relief allows for the flow of water by gravity, and the floodplain of the Onon River contributes to the construction of a reservoir (settling tank) here, which, moreover, will prevent the destructive activity of flood waters.
4. The main feeding of the lakes is carried out due to the activity of groundwater, which can be artificially enhanced either by vibration or by explosions on the shore, at the same time monitoring the level of aquifers with observation wells. Geological (fault-block structure, the presence of water-saturated fault zones) and hydrogeological conditions (the presence of water-saturated horizons, including fractured-vein waters, zones of tectonic disturbances, the presence of springs that operate year-round, according to hydrological studies, 2014) favor this.
5. The project certainly requires a preliminary feasibility study with engineering and geological research and a public hearing.
6. A similar transfer of water should be carried out from the river. Chitinka towards the dried up Lake Ugdan (about 4 km.), betraying the lake "second wind", such a transfer can prevent the destructive activity of the flood waters of the river. Chitinka, which must be periodically cleaned and deepened by her bed.

References
[1] Small encyclopedia of Transbaikalia: Natural heritage 2009 ed Geniatulin R F (Novosibirsk: Nauka) p 698
[2] Gorlacheva E P 2019 Ecosystems 18 118–124