

CONCLUSION

1. On the condition of Lake Baikal according to indicators observed in 2018.

L a k e l e v e l. In 2018, there were generally favourable conditions for the regulation of the Lake Baikal water level by the useful inflow, and therefore the filling of the lake was extremely high. In early 2018, an additional volume of water resources of Lake Baikal below the mark of 456.0 m was used to ensure household water supply to the population and economic facilities. The level limit values, determined in resolution No. 1667 of the Government of the Russian Federation dated December 27, 2017 “On Maximum and Minimum Water Level of Lake Baikal in 2018-2020”, have not been reached.

As of 01/01/2018, the average water level in Lake Baikal was around 455.98 metres according to the Pacific system, i.e. 0.17 metres higher than on the corresponding date in 2017 and 0.45 metres lower than the long-term annual average (456.43 m PO).

The drawdown of Lake Baikal was completed by April 17, 2018 at around 455.71 m PO.

Break-up of Lake Baikal from ice sheet occurred 2-5 days earlier than the standard schedule. The clearing from ice in the southern and middle parts of Lake Baikal occurred 3-8 days earlier than the standard schedule, of the northern part - 11-13 days earlier than the standard schedule and, as a result, an increase in the inflow into the lake occurred earlier than usual.

The filling of Lake Baikal began on April 18, 2018 and continued until November 01. The water level during the period of filling increased by 1.24 m to the mark of 456.95 m PO, which is 0.68 m lower than the maximum mark of 2017 (456.27 m PO).

The drawdown of the Lake Baikal water level began on November 02, 2018 and at the end of the year the level dropped to 456.64 m PO.

Favourable conditions in the summer-autumn period of 2018 in the Baikal basin allowed to restore the long-term reserve of its water resources.

The observations of the surface layer and water layer in 2018 were carried out by the Irkutsk Centre of Hydrometeorology and Environmental Monitoring of Roshydromet (Federal Service for Hydrometeorology and Environmental Monitoring of Russia) in June, March and September:

- In South Baikal - in the area of influence of waste waters from Baikalsk KOS (wastewater treatment facilities);

- in the area of ports of Southern Baikal (Bolshoye Goloustnoye settlement, Kultuk settlement, Baikal settlement and Vydrino settlement);

- at the Angara River source;

- in the area of the Selenga Shallow Waters;

- in the area of Barguzin Bay;

- in North Baikal – in the area of the Baikal–Amur Mainline route influence;

- at baseline deep-sea stations of benchmark section, running along Lake Baikal in its central part;

At baseline stations of benchmark section of Lake Baikal in 2018, the results of hydro-chemical observations showed that the average content of oxygen dissolved in the water, as well as mineral substances, nitrite nitrogen, nitrate nitrogen, ammonia nitrogen, phosphates, silicon, oil products, sulphates, chlorides, synthetic surface active substances, lead, manganese, nickel, cadmium, copper, zinc, cobalt, vanadium, molybdenum, silver, aluminium, beryllium, chromium and pH values were within the permissible limits. No organochlorine pesticides (p,p-DDT

(dichlorodiphenyltrichloroethane), p,p-DDD (dichlorodiphenyldichloroethane), p,p-DDE

(dichlorodiphenylethylene), α -HCH (alpha-hexachlorocyclohexane), γ -HCH (gamma-

hexachlorocyclohexane) were recorded in the water of Lake Baikal. Average concentrations of non-

volatile phenols were observed at the MPC level. Maximum MPC-breaching non-volatile phenol

values were recorded 3 times in the July survey at Elokhin-Davsha settlement; a level exceeding the

MPC by 2 times - at points on Cape Listvennychny, Cape Kadilny, Zavorotnaya - Cheremshannaya,

Tyya - Frolich; in September, non-volatile phenol levels exceeding the MPC by 2 times were

recorded at points at station Maritui, Cape Kadilny, Cape Oblom, Baikalskoye settlement. Compared

to 2017, the baseline stations of the benchmark section recorded that the content of phosphates

increased by 5 times, nitrate nitrogen by 2.6 times, organic carbon and readily oxidizable organic

substances (according to BOD₅) by 1.2 - 1.3 times. The average content of total phosphorus, total

nitrogen, organic nitrogen decreased by 1.2 - 2.3 times. At observation points Maritui, work settlement Listvyanka, Cape Krasny Yar, M-11 Uzur, M-11 Solnechny, M-11 B. Ushkany and Baikalskoye settlement Lake Baikal water quality has not changed compared to 2017 and is characterized as “conditionally clean”.

In 2018, in the Baikal region adjacent to the territory of the former Baikal PPM the average concentrations of non-sulphate sulphur, as well as other determined indicators were at the level of the previous year as compared to the baseline values, with the exception of iron (a 1.3-fold increase was recorded). At a control 100-meter station, the average content of minerals, sulphates, and chlorides did not reach the MPC level throughout 2018. The average phenol concentration exceeded the MPC by 2 times (August and October), in February, March, April, June, and September it was at the MPC level; suspended solids breached MPC by 1.3 times in June. Violation of water quality was observed by maximum concentrations of phenols (2-4 MPC) and suspended substances (up to 2.5 MPC). The range of pH values was within the permissible limits. In 2018, compared with 2017, the average annual concentration of suspended solids in water increased by 1.4 times, total phosphorus - by 1.6 times, readily oxidizable organic substances (according to BOD₅) - by 1.5 times, nitrate nitrogen - by 1.4 times, organic phosphorus - by 1.3 times. The average annual concentration of non-sulphate sulphur decreased by 1.5 times. A steady downward trend in non-sulphate sulphur has been observed since 2014.

In 2018, the average concentrations of determined substances in the areas of South Baikal ports did not exceed the established water quality standards for water bodies of fishery significance. The maximum concentrations of resistant to oxidation organic substances (by COD) exceeded the MPC by 2.3 times in Bolshoye Goloustnoye settlement (a port), at the gauging station (June); volatile phenols in Baikal settlement were two times above the MPC (August), in Vydrino settlement (September), in Kultuk settlement (August), in the port of Baikalsk (March) the level remained at the MPC.

In comparison with 2017, the average content of nitrate nitrogen at the Angara River source increased by 13 times, ammonium nitrogen by 1.4 times, mineral phosphorus by 4 times, silicon by 1.5 times, sulphates and suspended solids by 1.3 times; the average content of organic phosphorus decreased by 1.6 times, organic carbon by 1.2 times. Average concentrations of minerals, oil products have not changed.

In the middle part of Lake Baikal in the area of the Barguzinsky Bay and the Selenginsky shallow water, the average and maximum concentrations of mineral substances, nitrite nitrogen, nitrate nitrogen, ammonia nitrogen, phosphates, silicon, oil products, sulphates, and chlorides did not exceed MPC limits. The content of oxygen dissolved in the water and the range of pH values were within permissible limits. Compared to 2017:

- in the Selenginsky shallow water area, there was a decrease in the maximum and average concentrations of total phosphorus, organic phosphorus, mineral substances, oxygen dissolved in water and an increase in silicon, sulphates, mineral phosphorus, nitrate nitrogen, organic carbon by average values. The average concentrations of suspended solids, oil products, chlorides, nitrite nitrogen, ammonium nitrogen remained at the level of 2017.

- in the Barguzinsky Bay area, the average content of silicon, sulphates, and organic carbon increased by 1.3 times; suspended solids by 3 times, mineral phosphorus went from zero to 0.002 mg / l. At the same time, the content of total phosphorus decreased by 1.2 times, organic phosphorus by 1.8 times, ammonium nitrogen by 2 times.

In the north of Lake Baikal (Baikal–Amur Mainline), both average and maximum concentrations of mineral substances, nitrite nitrogen, nitrate nitrogen and ammonia nitrogen, phosphates, silicon, oil products, sulphates, chlorides, lead, manganese, nickel, cadmium, iron, zinc, cobalt, vanadium, molybdenum, silver, aluminium, beryllium, chromium and mercury didn't exceed MPC. The content of oxygen dissolved in the water and the range of pH values were within the permissible limits.

Compared with 2017, the concentrations of suspended solids increased by 2 times, mineral phosphorus by 1.7 times, total phosphorus by 1.3 times, organic phosphorus by 2 times, ammonium nitrogen by 2.3 times, nitrate nitrogen by 1.8 times, silicon by 1.3 times, chlorides by 1.2 times, iron by 3.6 times, lead by 2 times, copper and zinc by 1.6 times. Concentrations of manganese decreased by 3.9 times, nickel by 1.5 times, chromium by 1.4 times, aluminium and silver by 1.3 times.

Bottom sediments. In 2018, an increase of 1.4 times in average values of iron, 2.9 times in cadmium, 2.2 times in cobalt and 2.9 times decrease in lead, 2 times in manganese, 11.9 times in

nickel, 6 times in copper, 1.2 times in zinc were recorded in the composition of bottom sediments in the area of discharge of municipal wastewater in the city of Baikalsk. There was also recorded an increase in readily hydrolyzable carbohydrates (RHC) by 1.2 times, lignin-humus complex (LHC) by 1.4 times, the total amount of organic substances by 1.3 times; a decrease in organic nitrogen by 1.5 times, organic carbon and hydrolyzation resistant carbohydrates (HRC) by 1.2 times. The state of bottom sediments deteriorated as noted based on the most representative indicator - sulphide sulphur content. In 2018, the average sulphide sulphur content increased by 12 times, compared with 2017. The area of sulphide sulphur contamination in 2018 was 4.1 m² (in March - 2.0 km², in August - 6.2 km²); the area of contamination calculated by the ratio of HRC + LHC to total organic matter is 14.9 m² (in March - 14.8 m², in August - 15.0 m²).

The composition of groundwater in 2018 showed an increase in the content of ammonium nitrogen by 1.8 times, nitrite nitrogen by 2.5 times, nitrate nitrogen by 1.5 times and iron II by 1.2 times. Iron III was noted to decrease by 3.1 times, non-volatile organic acids - by 2.6 times, volatile organic acids - by 1.3 times. The values of phosphate phosphorus remained at the level of last year.

In 2018, the content of organic nitrogen in the sediment on the Selenga River increased by 1.4 times, sulphide sulphur by 2.3 times, readily hydrolyzable carbohydrates (RHC), and hydrolyzation resistant carbohydrates (HRC) to 1.1 times; a decrease was observed for the lignin-humus complex (LHC) and the total amount of organic substances (HRC + LHC)— by 1.3–1.2 times, respectively.

The average dissolved oxygen content in groundwater decreased 1.1 times to a value of 6.50 mg / dm³; the average content of ammonium nitrogen increased by 10 times, phosphate - by 5 times, iron (II) - by 2 times, iron (III) - by 1.4 times, the pH level was in the range of 6.47-6.91 in the composition of groundwater in comparison with 2017.

In the zone of Baikal–Amur Mainline influence in the north of the lake, among the geochemical indicators of the quality state of bottom sediments, an increase in the contents was noted at a landfill by indicators: lignin-humus complex (LHC) - by 1.2 times and the total amount of organic substances (HRC + LHC) by 1.1 times.

A 1.5-fold decrease in the average content of oxygen dissolved in water to 6.00 mg / dm³ was noted in groundwater in 2018 in comparison with 2017. In July 2018, the minimum content of dissolved oxygen in water - 0.57 mg / dm³ - was noted in groundwater at the Tompa River station and the Kichera River station 0.5 km away from the coast. An increase of phosphate phosphorus by 1.3 times, iron II by 3.6 times, iron III by 2.0 times was noted in water. Sulphide sulphur content increased by 1.8 times.

Hydrobiological societies. Hydrobiological observations in the area of the Baikalsk KOS (wastewater treatment facilities) have shown that the data on the number of bacteria groups detected in surface waters and soils are comparable to the long-term ones. Average heterotroph values, compared with 2017, increased from 1.5 times in February - March (18 cells / ml) to 10.7 times in June (172 cells / ml). In 2018, the area of contamination as a result of bacterial plankton varied from 5.3 km² during the ice survey to 11.8 km² in June.

The area of contamination based on the state of bottom sediment microflora varied from 1.0 km² during the ice survey to 2.6 km² in August.

In terms of phytoplankton development in June, similar to the previous four years, 2018 on Lake Baikal can be called a highly productive “*Synedra*” year (with the phytoplankton biomass of more than 1 g/m³). In terms of abundance at most stations and in terms of biomass - everywhere, large pennate diatom algae *Synedra acus* Kütz var. *acus* dominated the composition, similar to the "moderate water flowering" situation in 2014-2017.

In 2018, the area of Baikalsk KOS (wastewater treatment facilities) contamination varied from 5.7 km² in June to 9.5 km² in August based on the phytoplankton condition.

The filamentous green alga of genus *Spirogyra* Link was found in hydrobiological tests for the duration of the whole season, which is unusual for open Baikal. The frequency of spirogyra remained at the level of the previous year. During the ice survey, single filaments were found in zooplankton samples at two stations of the extreme western section located between the Bezmyannaya and Utulik rivers, 300 m and 2 km from the coast. In June, filament was found in a quarter of zooplankton samples. As the autumn approached, the number of spirogyra increased and was observed in almost half of zooplankton samples. Especially numerous aggregates were recorded in the coastal zone;

individual filament strands were found in samples taken both at a landfill and at western and eastern sections at a distance of up to 6.5 km from the coast.

In the area of Northern Baikal, the average of heterotrophic organisms, as compared with the 2017, decreased: by 1.6 times in summer, by 1.9 times in autumn. During the season, the average of heterotrophic organisms decreased from July to September by 1.4 times (from 254 to 182 c / ml). Phytoplankton abundance ranged from 159.5 to 7,490.0 thousand c / l, biomass ranged from 28.1 to 1,426.4 mg / m³. Compared with the data obtained in 2017, there was an increase in the total average number of phytoplankton by 2.8 times and a decrease in the average biomass of phytoplankton by 1.5 times in July, average values increased by 3 and 1.6 times, respectively in September.

Green filamentous algae *Spirogyra Link*. In July, it was found in zooplankton samples along the entire western coast and along the northernmost extremity of the lake - from the Tolstoy Cape to the centre of the Dagara Bay. The largest aggregate of spirogyra were recorded 1.0 km from the mouth of the river Kichera. By September its abundance had increased. Filamentous alga was found in most zooplankton and zoobenthos samples taken along the western coast, with the largest aggregate at stations from Cape Kotelnikovskiy to the mouth of the river Slyudyanka. In addition, spirogyra was found in zooplankton samples along the entire eastern coast - from the mouth of the river Tompuda (the most massive aggregate) to the mouth of the river Upper Angara, and at the northern end of the lake - 1.0 km from the mouth of the river Kichera and in the middle of the section Lower Angarsk - Dagara Bay.

The abundance indices of the zooplankton community varied in the range 2.4–65.9 thousand ind./m³, and biomass ranged from 13.0 to 1,447.4 mg / m³.

9 taxonomic groups of invertebrates are registered in the area of Baikal-Amur Mainline route influence. In addition to the main groups (chironomids, oligochaetes, amphipods, molluscs, nematodes, polychaetes, planaria), individual water mites and leeches were found.

In the area of the Selenga Shallow Waters, the abundance of heterotrophic bacteria in the surface water layer (2018 m) varied from 0.5 to 31 c / ml. As in the previous year, the maximum indicator was registered in the southern part of the shallow waters, opposite the Prorva Strait, while the minimum indicator was registered opposite the mouth of the Galutai canal. The average abundance (54 c/ml) is 3.8 times lower than last year.

Compared with 2017 data, the average phytoplankton abundance in the Selenginsky shallow area decreased by 1.2 times (to 974.8 thousand c / l), the average biomass - by 2.5 times (to 85.3 mg / m³). Green filamentous algae *Spirogyra Link* was found in the selection of zoobenthos in nine out of the twelve samples. Individual spirogyra filaments were observed in all zooplankton samples. The greatest amount of algae was found in the southern part of shallow water: opposite the Prorva Strait and the Gulf of Sor (50 m deep).

The average values of the zooplankton abundance and biomass for the study area were 32.7 thousand ind./m³ and 662.4 mg / m³, which is 1.7 and 2.7 times respectively more than last year.

Compared with 2017 data, the average abundance of zoobenthos increased by 1.6 times - up to 17,517 ind./m², biomass decreased by 1.2 times - up to 12.50 g / m².

The fish fauna and population of Baikal seal (nerpa). In 2018, the total number of spawning Baikal omul species coming into spawning streams amounted to 1.8 million specimens, i.e. higher than the 2017 level (1.3 million specimens), but significantly lower than the long-term annual average (4.3 million specimens). In the Angara River, the number of spawning population (0.83 million specimens) was 2.8 times lower than the long-time annual average. 0.074 million specimens of omul producers were caught in the rivers of the Posolsky Sor (the Bolshaya River and the Kultuchnaya River) for the purposes of reproduction.

The total biomass of omul decreased from 20.5-26.4 thousand tons (1982-2005) to 14.2-16.9 thousand tons in 2011-2014, 11.3-13.6 thousand tons in 2015-2016; omul biomass was estimated at 7.4-7.6 thousand tons in 2017-2018. The total allowable catch of omul in 2019 was approved in the amount of 150 tons (220 tons in 2018). In accordance with the order No. 450 of the Ministry of Agriculture of Russia dated August 29, 2017, amendments to the fishing rules for the Baikal fishery basin, providing for a ban on industrial catch of the Baikal omul and additional restrictions for traditional fishing of small indigenous peoples, have come into force since October 1, 2017.

The reserves of other wild-caught fish remain fairly stable. The total allowable catch of whitefish and grayling for 2019 is set at 30 tons for each species. The recommended catch of less valuable ordinary

fish (common roach, common dace, perch and crucian carps) amounted to 1200 tons in 2018 (1295 tons in 2017) and has been approved in the amount of 1170 tons for 2019.

The total Baikal seal population in 2018, compared to 2017, increased by 9.3 thousand specimens and amounted to 137.6 thousand specimens. The allowable annual seal harvesting amounts to 5-6 thousand. Taking into account the ban on industrial hunting, the allowable harvest was approved in the amount of 3,000 specimens for 2019.

Rivers flowing into Baikal. Hydro-chemical monitoring was carried out by the organisations of the Irkutsk and Zabaykalsky UGMS (Hydrometeorology and Environmental Monitoring Department) of Roshydromet (Federal Service for Hydrometeorology and Environmental Monitoring of Russia).

Observations of the surface water quality of the Baikal basin in the Republic of Buryatia are carried out on 25 rivers and 1 lake at 42 stations.

The excess of MPC in the waters of the rivers of Lake Baikal basin was registered for 12 (in 2017 - 11) ingredients of the chemical composition out of 17 recorded when examining the quality of water. Compared to 2017, there is an increase in average concentrations of suspended solids, resistant to oxidation organic substances (by COD), ammonium nitrogen, nitrite nitrogen, phosphorus phosphates, total iron, copper, zinc, nickel, manganese, and oil products. At the same time, the concentrations of readily oxidizable organic substances (according to BOD₅) and fluorides has slightly decreased.

In general, the Baikal water contamination by copper, zinc, manganese is defined as characteristic; resistant to oxidation organic substances (by COD), and general iron are stable; readily oxidizable organic substances (according to BOD₅), volatile phenols, oil products and fluorides are unstable; sulphates, nitrite nitrogen and aluminium are found in individual cases.

In 2018, the quality of Lake Baikal surface water hydro-chemical indicators were mainly affected by hydrological and climatic conditions. The exception was the Modonkul River and the Gusinoe Lake, where the contamination level forms as a result of anthropogenic impact.

Groundwater. In 2018, as compared to 2017, there were no significant changes in the state of the underground hydrosphere in the Republic of Buryatia. A decrease in the level below permissible levels was not detected; no signs of depletion. The groundwater of exploited aquifers on most water intakes are formed in conditions of its natural vulnerability to contamination. In 2018, contamination of groundwater used for drinking water supply to the population at most water intakes was not recorded, with the exception of water intakes in the private sector in Ivolginsk settlement, PAO "Buryatzoloto" Samarta village, OOO "Spetsindustriya", Tarbagatai settlement, Zaigraevo Housing and Utilities Sector, Zaigraevo Township, Ulan-Ude Instrument-Making Production Association OAO and TPP-2, Ulan-Ude. The groundwater contained an increased content of heavy metals, oil products, phenols.

The baseline condition of the Irkutsk region groundwater in 2018 was at the level corresponding to the previous years and was in its natural state. As in 2017, the contamination was observed only in local areas within the territories of fuel filling stations, within the area of influence of the Baikal Pulp and Paper Mill facilities (industrial site, deposits of sludge lignin and ash-disposal areas of thermal power plant), where an excess of manganese and iron has been registered. In general, there is a progression of groundwater contamination.

The Trans-Baikal Krai groundwater conditions were not monitored in the reporting year.

Endogenous geological processes. The 2018 level of seismic activity was below the level of the previous year. The maximum shock intensity in 2018 did not exceed the level of 12.3 energy class and remained below the levels of previous years (compared with 13.6 EC in 2014, 13.2 EC in 2015, 12.7 EC 2016 and 2017).

In order to forecast potential earthquakes in the Baikal region, seismic activity monitoring was carried out as well as monitoring of recent tectonic movements by means of GPS geodesy as well as monitoring of hydrogeodeformation (HGD), gashydrochemical (HGC) and geophysical (natural impulse electromagnetic field of Earth) fields.

Exogenous geological processes. In 2018, no catastrophic EGP manifestations were observed. The processes of ravine formation proceed with varying degrees of intensity - in Irkutsk region the amplitude of this phenomenon in 2018 was characterized as low, while in the Republic of Buryatia the activity was average. The expansion of landslide-talus processes is related to the operation of industrial facilities and has been registered along highways. In 2018 a low degree of

the talus phenomena was observed. The abrasion process of the Lake Baikal coasts did not develop in 2018. In 2018, the manifestation of coastal erosion processes of the Selenga River was characterized by low activity. The activity of coastal erosion of the Irkut River was low and was observed during the summer river flooding. Private sector flooding due to warm and arid recent years has been characterized by a low degree of activity. Activity of the aeolian accumulation process was close to average in 2018.

Mineral resources and subsoil use. Overall, the scale of subsoil use in the Baikal Natural Territory in 2018 compared to 2017 remained at the same level. Coal production has noticeably decreased at the Sanginsky deposit of the Republic of Buryatia, coal production has increased at the Nikolsky deposit of the Republic of Buryatia

Lands. In the course of 2018 some insignificant redistribution of land between categories took place within the Baikal Natural Territory. The changes affected all categories of lands: - residential lands increased by 2.27%; reserve lands decreased by 0.51%; industrial lands decreased by 0.1%; agricultural lands increased by 0.02%; forest reserve lands decreased by 0.017%; water reserve lands decreased by 0.015%; lands of specially protected areas decreased by 0.002%.

Forests. In 2018, the area of the BNT covered with forest vegetation increased in total by 14.01 thousand hectares (by 0.06%) and amounted to 25,162.57 thousand hectares. The Irkutsk Region's and the Trans-Baikal Krai's area increased - by 8.7 thousand ha and 5.8 thousand ha, respectively. In the Republic of Buryatia the area decreased by 0.5 thousand ha.

In 2018 compared to 2017, the calculated felling rate of mature and over-mature forest stands in BNT increased by 9% and amounted to 17,397.7 thousand m³ (15,965. thousand m³). In 2018, the felling volume of mature, over-mature forest stands in BNT increased by 13% and amounted to 4,710.6 thousand m³ (in 2017 - 4,153.91 thousand m³). In the Irkutsk region, the felling volume increased by 3%, in the Republic of Buryatia by 40%, in the Trans-Baikal Krai - by 8.8%.

The felling volume has increased compared to 2017 by 6.1% and amounted to 34.28 thousand ha (in 2017 – 32.316 thousand ha). In the Republic of Buryatia, the felling volume decreased by 7.5%, while in the Trans-Baikal Krai, it increased by 32.8%. In the Irkutsk region, the tending felling volume decreased by 20.7%.

In 2018, sanitary felling was carried out on an area of 11.18 thousand hectares (in 2017 - 15.713 thousand hectares).

In 2018, the number of fires halved compared to 2017 and amounted to 589 fires (in 2017 - 1,273 fires). The total area affected by fires decreased by 85.5% compared to 2017 and amounted to 28.36 thousand hectares (in 2017 – 195.71 thousand hectares).

Ambient air In 2018, the level of air pollution in the city of Baikalsk increased in comparison with 2017 and was assessed as “high”; it did not change and was assessed as “low” in other settlements of the BNT's central ecological zone.

In 2018, compared to 2017, the quality of ambient air in the cities of Ulan-Ude, Petrovsk-Zabaykalsky, as well as in the township of Selenginsk, located within the BNT's buffer ecological zone, did not change and was characterized by a very high level of pollution. These settlements are included in the list of cities in Russia with the highest level of air pollution (Priority List). The air quality in Gusinozersk has not changed compared to the previous year and was characterized by a high level of pollution.

In the ecological zone of BNT atmospheric influence in the cities of Irkutsk, Shelekhov, Usolye-Sibirsky and Cheremkhovo, the quality of ambient air was characterized by a very high level of pollution as in 2017. In the city of Angarsk, the level of air pollution increased from high to very high. These cities are also included in the Priority List.

Climatic conditions. In 2018, the average annual air temperature within BNT exceeded the multiyear values by 1.0-2.3°C due to the significant positive temperature anomalies observed for the majority of the year. The largest positive anomalies were observed in March - May (2-4 ° C), June - August (1-3 ° C), September - October (1-3 ° C); in December, abnormally warm weather was observed in the Republic of Buryatia with average daily temperatures 7-12 ° C higher than the climatic norm. During the remaining period, the average monthly air temperature was close to the long-time annual averages. During the warm season, the combination of high temperatures, dry air and strong winds created favourable conditions for the spread of forest fires. In summer, a state of emergency was in effect in a number of districts in the Trans-Baikal Krai.

2. Anthropogenic impact. In 2018, 359.5 thousand tons of pollutants were released into the atmosphere on the Baikal Natural Territory.

The volume of wastewater discharges in 2018 decreased by 8.7% and amounted to 531.61 million m³ (in 2017 - 582.4 million m³).

In the Republic of Buryatia, the volume of wastewater discharges decreased by 51.9 million m³ mainly due to a decrease in the generation of electricity by "Gusinozerskaya GRES" AO "Inter RAO - Electric Power Plants".

In the Irkutsk region, Lake Baikal is contaminated by municipal unitary enterprise "Sewer Treatment Facilities of the Baikal Municipality". In 2018, 1.32 million m³ of contaminated sewage was discharged into Lake Baikal (1.34 million m³ in 2017).

In the Trans-Baikal Krai, the volume of wastewater discharges increased by 0.98 million m³ and amounted to 17.51 million m³ (in 2017 - 16.53 million m³).

The total mass of pollutants entering Lake Baikal amounted to 238.136 tons (228.828 tons), which is 9.308 tons or 4.07% more than in 2017. In 2018, pollutants contaminated Lake Baikal through sewage, such as full BOD - 9.164 t (12.113 t), sulphate anion 82.565 t (65.662 t), chlorides 33.573 t (34.938 t), suspended solids 14.522 t (16.627 t), nitrate anion 69.939 t (58.212 t), nitrite anion - 0.22 tons (0.23 t), phosphates - 1.06 tons (0.823 t), synthetic surfactants - 0.155 tons (0.144 tons), nitrogen - 0.164 tons (0.674 t), aluminium - 0.412 tons (0, 73 t), oil products (petroleum) - 0.025 t (0.037 tons), COD - 26.337 t (38.618 tons). The data for 2017 are shown in parentheses.

The volume of waste generation in 2018 amounted to 170,264.5 thousand tons.

The area of the Baikal Pulp and Paper Mill. In 2013 the Government of the Russian Federation adopted a resolution on the closure of OAO Baikal Pulp and Paper Mill. On September 14, 2013 the main production activities, associated with the production of sulphate viscose pulp, discontinued. After the closure of the Baikal Pulp and Paper Mill the main remaining environmental problem is waste disposal, remediation of sludge deposit areas, rehabilitation of the industrial site and elimination of contaminated groundwater mount.

The volume of water withdrawal from Lake Baikal by OAO Baikal Pulp and Paper Mill in 2018 amounted to 1.21 million m³ (2017 - 1.32 million m³, 2016 - 1.58 million m³, in 2015 - 2.23 million m³, in 2014 - 3.62 million m³). The decrease in water withdrawal from Lake Baikal is associated with a decrease in water transfer for the needs of utilities and heat power.

In general, the volume of water use in the area of the Baikal Pulp and Paper Mill, as compared with 2017, decreased: water withdrawal decreased by 0.11 million m³ (8.3 %); wastewater discharge decreased by 0.02 million m³ (1.5%).

In 2018, compared with 2017, there has been a decrease in the discharge mass of some pollutants, while wastewater treatment is not ensured to the level of Permissible Discharge Standards for nitrate anion, sulphates, COD.

Baikal-Amur Mainline Route Zone. In 2018, discharge of harmful substances into the atmosphere from stationary sources amounted to 4.006 thousand tons (in 2017 - 4.089 thousand tons), including 2.158 thousand tons in the city of Severo-Baikalsk (in 2017 - 2.632 thousand tons), The main contribution to air pollution from stationary sources is made by overland transport enterprises and enterprises for the production, transfer and distribution of electricity, gas, steam and hot water.

According to the form No. 2-TP (water management), the discharge of wastewater into the Baikal-Amur Mainline zone rivers in 2018 amounted to: - in the city of Severobaykalsk 0.95 million m³ of insufficiently treated sewage flow into the river Tyya; in the township of Nizhneangarsk 0.004 million m³ of insufficiently treated wastewater (previously, wastewater was not discharged) flow into a swamp; in Kichera settlement 0.03 million m³ of insufficiently treated wastewater flow into the river Kichera; in Angoya settlement 0.004 million m³ of insufficiently treated wastewater flow into the river Upper Angara; in Novy Uoyan settlement 0.08 million m³ of insufficiently treated wastewater flow into the river Upper Angara; in Yanchukan settlement 0.002 million m³ of insufficiently treated wastewater flow into the river Upper Angara; in Tonnely settlement 39.86 million m³ of partially clean wastewater flow into the river Itykit.

In 2018, according to form No. 2-TP (waste), 2.5 million tons of waste were generated in the Severobaikalsky district, including 11.05 thousand tons in the city of Severobaikalsk.

3. Measures aimed at conserving Lake Baikal taken in 2018 were as follows.

Statutory regulation and coordination of Lake Baikal conservation. The 13th session of the Interdepartmental Commission on Conservation of Lake Baikal was held on November 29, 2018 in Moscow. The following issues were considered at the session: sanitary and forest pathology condition of BNT forests and the necessary measures to improve their condition; the progress in the development of a territorial scheme to manage of production and consumption waste for the BNT, including solid municipal waste; the development of integrated schemes for the conservation and use of natural BNT resources; the progress of measures to eliminate the negative impact of waste accumulated as a result of the activities of OAO Baikal Pulp and Paper Mill; the development of tourist and recreational BNT potential, including protected areas of federal and regional significance.

By order of the Government of the Russian Federation No. 507-r dated March 26, 2018 “On Amendments to the Appendix to the Order of the Government of the Russian Federation of March 05, 2015 No. 368-r”, amendments were introduced that corrected the boundaries of the water protection zone of Lake Baikal. Newly drafted boundaries of the water protection zone of Lake Baikal were prepared using two approaches: 1 - for inter-settlement territories, 2 - for coastal settlements. On the inter-settlement territory, the boundaries of the water protection zone of Lake Baikal are established on the basis of an approach of maintaining the condition of coastal territories, self-cleaning and discharging abilities of rivers and landscapes on their catchments - along the coastal ridges that are located first near the lake, the watersheds of streams and temporary streams (primary river basins directly flowing into Lake Baikal). For territories with slopes of less than 3 °, the boundaries of the water protection zone were drawn along the contour of waterlogged soils and bog systems, taking into account their role in the formation of permanent watercourses. The boundaries of the water protection zone in coastal settlements are set as 200 meters in accordance with the coastal buffer zone of the lake, which has especially valuable fishery value (places of spawning, feeding, wintering of fish and other aquatic biological resources).

Decree of the Government of the Russian Federation No. 328 dated March 26, 2018 “On Amending the List of Activities Prohibited in the Central Ecological Zone of the Baikal Natural Territory” introduced amendments allowing blasting operations in the water protection zone related to the construction and reconstruction of public rail infrastructure for the period of construction and reconstruction of such facilities.

On December 24, 2018, the Presidium of the Russian Presidential Council for Strategic Development and National Projects approved the passport of the Ecology National Project. It included 11 federal projects, the total funding of which will exceed 4 trillion Rubles, including the Federal project “Preservation of Lake Baikal” with a timeframe of January 1, 2019 - December 31, 2024 (funding amount of 33,944.9 million Rubles, including 29,350.6 million Rubles from the federal budget).

Measures for conservation of Lake Baikal. Protective activities for Lake Baikal were funded from the Federal budget in 2018 in the amount of 2,903.39 million Rubles (in 2017 – 2,192.84 million Rubles), of which 2,839.24 million Rubles was allocated within the framework of the Federal Target Program “Conservation of Lake Baikal and Socio-economic Development of the Baikal Natural Territory for 2012-2020” and 64.15 million Rubles - from other sources. The distribution of funds by type of expenditure was as follows: the capital investments amounted to 2,115.85 million Rubles while R&D amounted to 18.38 million Rubles and 769.15 million Rubles were allocated for other purposes. The budgets of the constituent entities of the Russian Federation spent 645.13 million Rubles on the projects and activities associated with Lake Baikal conservation, Funds raised from extrabudgetary sources amounted to 396.1 million Rubles. The environmental monitoring in 2018 was carried out by the organisations of Roshydromet (Federal Service for Hydrometeorology and Environmental Monitoring of Russia), Rosprirodnadzor (Russian Federal Service for Supervision of Natural Resource Management), Rosvodresursy (Russian Federal Water Resources Agency), Rosnedra (Russian Federal Subsoil Resources Management Agency), Rosrybolovstvo (Russian Federal Agency for Fishery), Rosreestr (Russian Federal Service for State Registration, Cadastre and Cartography) as well as by the competent authorities of federal constituent entities - the Republic of Buryatia, Irkutsk region and Trans-Baikal Krai. In addition, some accounting and control records acquired by Rostekhnadzor (Russian Federal Service for Ecological, Technological and Nuclear Supervision), Rospotrebnadzor (Russian Federal Service for Supervision of Consumer Rights Protection and Human Well-Being),

Rostransnadzor (Russian Federal Service for Supervision of Transport), Rosstat (Russian Federal State Statistics Service) and the Russian Ministry of Emergency Situations were used for the purpose of BNT monitoring.

The existing system of monitoring of the unique environmental system of Lake Baikal and Baikal Natural Territory is in need of the reconstruction of the monitoring network of Roshydromet (Federal Service for Hydrometeorology and Environmental Monitoring of Russia), restoration of the full scheme of hydro-chemical and hydro-biological monitoring, improvement and replenishment of laboratory facilities with up-to-date devices, rehabilitation of Lake Baikal research fleet, further development of aerospace monitoring, optimisation of statistical reporting and improvement of interaction of competent authorities in the sphere of state environmental monitoring.

The 2018 data on water quality of the surface layer indicate that there are areas with a stable negative impact of human activities on the ecosystem. They suffer anomalies in the composition of the aquatic environment; the anomalies are caused by the unsatisfactory condition of water treatment facilities of the settlements of Kultuk, Babushkin, Listvyanka, Slyudyanka, etc. and, accordingly, the discharge of insufficiently treated wastewater into the lake, expressed as increased concentrations of nitrogenous substances.

E n v i r o n m e n t a l s u p e r v i s i o n . In 2018, the federal supervisory bodies conducted 146 inspections in the Baikal Natural Territory, which is 19.3% fewer than in 2017 (181 inspections). The number of revealed violations decreased by 3 times compared to 2017 and amounted to 175 violations (in 2017 - 565 violations).

Based on the results of regional supervision in the Baikal Natural Territory in 2018, compared with 2017, the number of inspections (by type of supervision) decreased by 28% and amounted to 667 inspections (in 2017 - 927 inspections). There were 563 detected violations (in 2017 - 593 violations). In 2018, the state control and supervision over inland water transport on Lake Baikal was carried out by the East-Siberian Directorate of the State River Supervision of Rostransnadzor (Russian Federal Service for Supervision of Transport). During 2018, 43 inspections were conducted in relation to legal entities doing business on Lake Baikal, including that related to the operation of hydraulic structures (in 2017 - 54 inspections). The inspections revealed 452 violations of the mandatory legislative requirements in the field of inland water transport, therefore 35 orders to rectify the violations were issued. Based on the results of considering case on administrative violations, 12 legal entities and 20 officials were subject to administrative liability in the form of fines for a total amount of 247 thousand Rubles.

E n v i r o n m e n t a l v i o l a t i o n s . In 2018, the number of administrative violations recorded at the BNT in the field of environmental protection and nature management decreased by 32.8% compared with 2017 and amounted to 2,364 violations. The main violations recorded within the BNT in 2018 were:

- violation of fire safety rules in forests (47.9% of the total number of detected violations);
- violation of rules on hunting, fishing and other uses of wildlife (11.4%);
- illegal felling, damaging woodland or unauthorized digging of trees, shrubs, vines in forests (9.4%).

In 2018, the number of environmental crimes recorded at BNT, compared with 2017, decreased by 1.6% and amounted to 3,534 crimes. The main environmental crimes in 2018 were related to illegal woodland felling (more than 86% of the total number of detected crimes).

I n t e r n a t i o n a l c o o p e r a t i o n . The following events were considered the most significant in 2018.

From June 24 to July 07, 2018, the 42nd session of the UNESCO World Heritage Committee was held in Manama (Bahrain). By a draft decision (42 COM 7B.76) regarding the “Lake Baikal” facility, the Committee expressed serious concern, noting the decision to increase the allowable fluctuation amplitude of the maximum and minimum water levels in Lake Baikal for 2018-2020, and also noting serious concerns regarding reports about a decreasing water level in the area of the Lake Baikal water conservation zone.

In 2018, as part of the Agreement between the Government of the Russian Federation and the Government of Mongolia on the protection and use of transboundary waters, the following events took place:

- a meeting of the Joint working group on the fulfilment of the Agreement between the Government of the Russian Federation and the Government of Mongolia on the protection and use of transboundary waters (June 21-22, 2018, Erdenet, Mongolia).

- the XIV Meeting of the Plenipotentiaries of the Government of the Russian Federation and the Government of Mongolia on implementation of the Agreement on Protection and Use of Transboundary Waters between the Government of the Russian Federation and the Government of Mongolia (October 15 - 16, 2018, Ulaanbaatar, Mongolia).

Mutual obligations of the Parties were fulfilled in full, the water management situation did not require emergency alerts. According to hydro-chemical indicators, the water quality of transboundary rivers remained stable, the sanitary and epidemiological situation was characterized as satisfactory, annual and seasonal fluctuations in the concentration of pollutants in the surface waters of transboundary water bodies were determined mainly by natural factors.

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Compared to 2017, the total salinity of water decreased in northern and middle Baikal and increased in southern Baikal in 2018.

For the observation period of 2014-2018, maximum concentrations (7.3 - 9.2 mg / l) of sulphates were recorded in the middle part Baikal in 2016. In 2018, an increase in the content of sulphate ions was noted in all the basins of the lake. Baikal is almost up to the level of 2016; in southern Baikal, the concentration of sulphates varied between 5.3 and 7.3 mg / l.

In 2016 and less frequently in 2018, a series of earthquakes were recorded in the Baikal region (February 7, March 18, August 29, from October 26 to November 1 and December 6, 2016 and March 2018), which caused increased concentrations of sulphate ions and total salinity in Lake Baikal.

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The power of the ambient dose equivalent (MAED) ranged from 7 to 19.10–2 $\mu\text{Sv} / \text{h}$ and was within the range of fluctuations of the natural radiation background. No noticeable deviations from the background range were recorded.

The average monthly total beta activity of atmospheric precipitation in 2018 compared to 2017 in the Trans-Baikal Krai and the Republic of Buryatia remained practically unchanged (1.12 and 1.18 Bq / m² * day), as well as in the Irkutsk Region (3.34 and 3.38 Bq / m² * day). Within the Irkutsk region, the concentration of radioactive aerosols decreased (by 13%).

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2018 hydrobiological observations in the area of the Baikalsk KOS (wastewater treatment facilities) have shown that the data on the number of bacteria groups detected in surface waters and soils are comparable to the long-term ones. Average heterotroph values, compared with 2017, increased from 1.5 times in February - March (18 cells / ml) to 10.7 times in June (172 cells / ml).

In the area of Northern Baikal, the average of heterotrophic organisms decreased in 2018 as compared with 2017: by 1.6 times in summer, by 1.9 times in autumn. During the season, the average of heterotrophic organisms decreased from July to September by 1.4 times (from 254 to 182 c / ml).

In the area of the Selenga Shallow Waters, the abundance of heterotrophic bacteria in the surface water layer (2018 m) varied from 0.5 to 31 c/ml. As in the previous year, the maximum indicator was registered in the southern part of the shallow waters, opposite the Prorva Strait, while the minimum indicator was registered opposite the mouth of the Galutai canal. The average abundance (54 c/ml) is 3.8 times lower than last year.

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The fish catch in Lake Baikal in 2018 amounted to 817.0 tons (in 2017 - 979.8 tons). In 2018, with 1,583 tons of fish permitted by regulatory documents, only 51.6% of the allowable catch was produced by users according to official statistics. The decrease in the total catch occurred due to a decrease in catches of the main commercial species - omul and roach. The catch of other fish species as a whole remained at the level of previous years, with a tendency towards a gradually increasing catch of large fish in the last 5-8 years.

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