

CONCLUSION

1. On the condition of Lake Baikal according to indicators observed in 2020.

Lake level. In 2020, in order to regulate the water level of Lake Baikal, in general, favourable conditions for a useful inflow were formed, and therefore, the filling of the lake was high and sufficient to ensure domestic water supply in the downstream of the Irkutsk HPP in winter and to ensure winter loads 2019–2020 biennium. The limit values of the level determined by the Decree of the Government of the Russian Federation No. 1667 dated December 27, 2017 "On the maximum and minimum values of the water level in Lake Baikal in 2018-2020" were not reached.

As of 01.01.2020, the average water level in Lake Baikal was around 456.48 metres according to the Pacific system, i.e. 0.16 metres lower than on the corresponding date in 2018 (01.01.2019 - 456.64 m PO) and 0.5 m above the long-term average value of the level (456.43 m PO).

The average level of the lake has dropped to the mark of 456.17 m PO (22.04–24.04.2020).

Break-up of Lake Baikal from ice sheet occurred 9-23 days earlier than the standard schedule. Cleaning from ice occurred 12–32 days earlier than the long-term average timeframes. As a result, the increase in inflow to the lake occurred earlier than usual.

The filling of Lake Baikal began on May 25, 2020 and continued until October 2, 2020. The water level during the period of filling increased by 0.65 m to the mark of 457.12 m PO, which is 0.24 m higher than the maximum mark of 2019 (456.88 m PO).

The drawdown of the Lake Baikal water level began on October 3, 2020, and at the end of the year the level dropped to the mark of 456.48 m PO.

Observations of the surface layer and water column in 2020 were carried out:

Southern Baikal – in the area of sewage influence from treatment facilities of Baykalsk Pulp and Paper Mill (BPPM) closed in December 2013 (currently - the area of municipal wastewater outfall of Baykalsk town);

- in the Angara River source;

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

- in the area of the Selenga Shallow Waters;

- in Kultuk – Slyudyanka area;

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

- in the area of Barguzin Bay;

- 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 2019, 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, oil products, sulphates, chlorides, synthetic surface active substances, lead, manganese, nickel, cadmium, iron, copper, zinc, cobalt, vanadium, molybdenum, silver, aluminium, chromium, mercury 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 detected in the water of Lake Baikal.

Compared to 2019, the average silver content increased by 4.8 times, chromium - by 3.4 times, nitrite and ammonium nitrogen rose by 2.0 and 1.2 times respectively, cadmium and aluminium increased by 1.8 times, organic and total nitrogen - by 1.5 times, manganese and iron - by 1.4 times, nickel and beryllium - by 1.1 times. The average concentration of suspended solids decreased by 3.0 times, organic matter according to BOD₅ – by 1.4 times, zinc - by 1.3 times, sulphates, total phosphorus and cobalt - by 1.1 times. The average content of dissolved oxygen, mineral substances, oil products, chlorides, organic and mineral phosphorus, nitrate nitrogen, organic carbon, organic matter according to COD, copper and lead remained at the level of the previous survey.

In the observation points of Lake Baikal, where the degree of contamination was estimated by the SPECIFIC COMBINATORIAL INDEX OF WATER POLLUTION (Maritui station, cape Listvenitchny, cape Krasny Yar, HMS Uzur, HMS Solnechnaya. Cape Kotelnikovsky, HMS B. Ushkaniy), the water quality was characterized by the 1st class, "conditionally pure water". In comparison with 2019, the lake water quality remained at the same level.

In the year under review, in the area of Lake Baikal, adjacent to the territory of the Baikal Pulp and Paper Mill, the average concentrations of total sulphur, cadmium increased by 1.2 times, sulphates, manganese, nickel, beryllium - by 1.1 times compared to baseline values. The average concentrations of oxygen dissolved in water, suspended solids, mineral substances, silicon, oil products, organic carbon, chlorides, copper, zinc, iron, lead, vanadium, molybdenum, silver, aluminium, chromium and mercury were at the background level. Average values of non-sulphate sulphur concentrations in the water area of the landfill were 1.5 times lower than the background level and cobalt - by 1.3 times lower.

In the control 100-meter section during 2020, the average concentration of phenols corresponded to the MPC level. The average content of other observed substances (mineral and suspended substances, sulphates, chlorides) did not exceed the permissible limits. The maximum value of phenols exceeded the permissible limits by three times (in March, June and September). In addition, the maximum concentration of phenols was exceeded up to double MPC in February, May, August and October. The maximum value of suspended solids was at the MPC level (in May). The range of pH values was within the permissible limits.

Compared to 2019, in the area affected by the Baikalsk wastewater treatment plant, the average silver concentration in Lake Baikal water increased by 3.1 times, aluminium - by 2.3 times, chromium - by 1.9 times, iron and cadmium - by 1.4 times, nickel and beryllium - by 1.1 times, oil products - from zero values to 0.01 mg/dm³. Concentrations of zinc decreased by 2.8 times, cobalt - by 1.8 times, lead and manganese - by 1.3 times, silicon and chlorides - by 1.2 times, sulphates and organic carbon decreased by 1.1 times. The average content of mineral substances, suspended solids, dissolved oxygen, non-sulphate and total sulphur, and copper remained at levels of 2019. The range of pH values has not changed significantly.

In 2020, the average concentrations of regulated substances in the areas of South Baikal ports did not exceed the established water quality standards for water bodies of fishery significance, with the exception of phenols. The average annual content of phenols exceeded the MPC by 2.0 times in the port of Baikalsk, was at the MPC level - in the port of Bolshoye Goloustnoye.

In comparison with 2019, in the water of Lake Baikal near the source of the Angara River the average content of mineral phosphorus increased by 2.3 times, oil products and nitrite nitrogen by 2.0 times, ammonium nitrogen by 1.6 times, total and organic phosphorus by 1.5 and 1.2 times respectively, organic carbon by 1.1 times; the average content of suspended solids decreased by 3.0 times, nitrate nitrogen by 1.2 times, sulphates by 1.1 times. The average concentrations of dissolved oxygen, mineral substances, silicon, chlorides, organic and total nitrogen in water 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 established limits. The content of oxygen dissolved in the water and the range of pH values were within permissible limits. Compared to 2019:

- in the area of the Selenga shallow water, there was an increase in the average values of organic and total nitrogen concentrations by 2.0 times, ammonium nitrogen and nitrate nitrogen - by 1.6 and 1.3 times respectively, dissolved oxygen and organic carbon - by 1.1 times; reduction of organic phosphorus by 2.7 times, mineral phosphorus, silicon and oil products - by 2.0 times, total phosphorus - by 1.5 times, sulphates - by 1.4 times. The average concentration of suspended and mineral substances, chlorides and nitrite nitrogen were at the level of the previous year;
- in the area of the Barguzinsky Bay, the average content of mineral phosphorus increased by 3.0 times, ammonium nitrogen - by 2.1 times, organic and total nitrogen - by 1.3 times, nitrate

nitrogen - by 1.2 times, nitrite nitrogen - from zero to 0.003 mg/dm³. In 2020, a 4.0-fold decrease in suspended solids concentrations, 3.5-fold decrease in silicon concentrations, 1.4-fold decrease in organic phosphorus concentrations, 1.2-fold decrease in chloride concentrations, and 1.1-fold decrease in sulphate and total phosphorus concentrations were recorded. The average content of dissolved oxygen, mineral substances, oil products and organic carbon did not change. 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, oil products, sulphates, chlorides, lead, manganese, nickel, cadmium, iron, copper, zinc, cobalt, vanadium, molybdenum, silver, aluminium, chromium and mercury didn't exceed MPC. The maximum concentration of beryllium was at the MPC level. The content of oxygen dissolved in the water and the range of pH values was within the permissible limits.

Compared to 2019, concentrations of silver increased by 6.2 times, chromium - by 3.0 times, lead - by 1.6 times, aluminium - by 1.5 times, cadmium - by 1.4 times, mineral phosphorus - by 1.3 times, nitrate nitrogen and iron - by 1.2 times in 2020. There was a 2.7-fold decrease in concentrations of suspended solids, 1.3-fold decrease in concentrations of organic phosphorus, zinc and cobalt, 1.2-fold decrease in concentrations of total phosphorus, 1.1-fold decrease in concentrations of sulphates, manganese and nickel. The average content of dissolved oxygen, mineral substances, silicon, oil products, chlorides, nitrite nitrogen, ammonium nitrogen, organic and total nitrogen, organic carbon, copper has not changed.

Bottom sediments. In 2020, in the area of Baikalsk municipal water outlet in the bottom sediments of Lake Baikal there was a 2.4-fold decrease in easily hydrolysable carbohydrates (LHC), 1.6-fold decrease in organic carbon and hard-to-hydrolysable carbohydrates (THC), 1.2-fold decrease in the value calculated as the ratio of THC + LHC to total organics. The average content of organic nitrogen has not changed. Compared to 2019, there was a 24.1; 19.2; 14.8; 2.8; 2.3 and 1.5-fold increase in average concentrations of copper, nickel, cadmium, iron, zinc and lead, respectively, and a 2.2 and 1.2-fold decrease in concentrations of manganese and cobalt, respectively. The content of non-volatile organic acids, volatile organic acids, iron (III), nitrite nitrogen and phosphorus phosphate increased by 1.7; 1.6; 1.4; 1.3 and 1.3 times respectively. There was a decrease in concentrations of iron (II) and ammonium nitrogen by 1.3 times, nitrate nitrogen - by 1.2 times. The average volatile phenolics content remained at levels of 2019.

In 2020, deterioration of state of bottom sediments was detected on the most representative indicator - sulphide sulphur content. The average sulphide sulphur concentration increased by 2.4 times compared to 2019.

In the Selenga River avandelta, the average content of lignin-humus complex (LHC) in bottom sediments increased by 3.3 times, THC - by 1.4 times, LHC - by 1.2 times, calculated by the ratio of THC + LHC to total organics - by 2.4 times. There is a 2.5-fold decrease in sulphide sulphur, 1.3-fold decrease in organic carbon and 1.2-fold decrease in organic nitrogen.

In the north, in the area of the BAM route influence, the average content of LHC in bottom sediments of Lake Baikal increased by 1.5 times, organic carbon and THC - by 1.2 times, organic nitrogen and the value calculated on the ratio of THC + LHC to total organics - by 1.1 times. The average LHC content remained the same as last year. The average content of sulphide sulphur in bottom sediments decreased by 3.7 times.

Hydrobiological communities Hydrobiological observations in the area of the Baikalsk KOS (wastewater treatment facilities) in 2020 have shown that the data on the number of bacteria groups detected in surface waters and soils are comparable to the long-term ones. The area of contamination by the state of bacterioplankton in 2020 varied from 0.9 km² during the ice survey to 8.4 km² in June; in August the area of contamination was 5.9 km². The area of contamination based on the state of bottom sediment microflora varied from 1.7 km² during the ice survey to 5.4 km² in August.

The phytoplankton structure remained poly-dominant throughout the season. 2020, as well as 2014-2018, can be called a highly productive “sinedrov” year in terms of phytoplankton

development in June (with the phytoplankton biomass of more than 1 g/m³). The area of pollution in accordance with phytoplankton condition in 2020 increased from 6.9 km² in March to 15.7 km² in June, by August it reduced to 4.7 km².

During the ice survey 63% of the macrozoobenthos samples were found to contain *Spirogyra* Link algae, which is not typical of Lake Baikal.

Compared to quantitative values in March 2019, average zoobenthos abundance (4,233 ex/m²) and biomass (3.52 g/m²) decreased by 2.6 and 2.7 times, respectively.

In the area of Northern Baikal, the average of heterotrophic organisms, as compared with the 2019 data, increased: by 2.9 times in summer, by 2.1 times in autumn. During the season, the average of heterotrophic organisms decreased from July to September by 2.4 times (from 1149 to 484 c/ml). In the surface layer of water, the total range of values of bacterioplankton groups was: heterotrophs - 4-2730 c/ml, phenol-oxidizing bacteria - 0-138 c/ml, hydrocarbon-oxidizing - 0-103 c/ml.

The range of phytoplankton abundance in the northern part of Lake Baikal was within 342.159-9-12629,388 thousand c/l, biomass 55,048-1470,062 mg / m³. Compared to last year's data, in June the average number increased by 2.6 times, while the average biomass decreased by 1.4 times; in September the number increased by 1.2 times, and the biomass - by 2.3 times.

The chara algae *Spirogyra* Link were found in zooplankton samples throughout the season. The largest accumulations were detected 0.5 km from the mouths of the Sliudyanka and Verkhnyaya Angara rivers, 1 km from the mouth of the Kicher River, and in the middle of the Nizhny Angarsk - Dagarskaya Bay reference section.

The abundance indices of the zooplankton community varied between 4.01 and 52.18 thousand spec/m³, and biomass ranged from 43.1 to 1094.5 mg/m³. The minimum values were recorded in September in the centre of the Dagarskaya Bay, the maximum - in June 0.5 km from the mouth of the Kichera River. Compared with last year's data, the total average abundance indices in June (22.021 thousand spec/m³) and in September (23.698 thousand spec/m³) changed insignificantly, the average biomass in summer (503.22 mg/m³) increased by 1.3 times, in the fall (257.20 mg/m³) – decreased by 1.2 times.

The number of zoobenthos varied in the range of 650-53425 spec/m², biomass - 0.84-40.55 g/m². The maximum number of zoobenthos was recorded 0.5 km from the mouth of the Kichera River, and the maximum biomass - 0.5 km from the mouth of the Tyva River. The minimum abundance indices were recorded 1 km from the mouth of the Rel River, and the minimum biomass - 1 km from the mouth of the Tyva River. The bottom community, both in shallow and deep waters, is formed by oligochaetes. Nematodes co-dominated at all depths.

In the area of the Selenga shallow water in 2020, the station opposite the Sor Bay (depth 17 m) stood out with the highest values for all identified groups of bacterioplankton and microflora of bottom sediments. The maximum amount of phenol-oxidizing bacteria was noted at the outlet from the Srednyaya (Middle) channel. The minimum amount of heterotrophs was recorded in the southwestern part of the shallow water opposite the Promoi channel. The average abundance (643 c/ml) is 1.6 times higher than that recorded in 2019.

In the area of the Selenga shallow water in September 2020, the amplitude of phytoplankton abundance varied from 601.610 to 1305.927 thousand c/l, and biomass - from 82.613 to 4853.085 mg/m³. The polydominant complex was composed of native small-celled algae of three groups: yellow-green algae (Chrysophyta), Cryptomonads, and green algae (Chlorophyceae).

The Chara algae *Spirogyra* Link were found in all zooplankton samples. Mass accumulations were found in the south-western side opposite the channels of Prorva and Sor. In the zoobenthos analysis, algae was detected in 58% of samples.

The average values of abundance and biomass for the surveyed water area were 31.906 thousand spec/m³ and 100.84 mg/m³. Compared to last year, the number increased by 1.3 times, the biomass decreased by 2.1 times.

Compared with the results of 2019, the average abundance of zoobenthos (19,137 spec/m²) decreased by 1.4 times, biomass (40.54 g/m²) increased by 1.3 times. The main abundance of benthos was formed by three groups of organisms: oligochaetes, amphipods and nematodes.

In the Maloye More area, the number of heterotrophic bacteria ranged from 267 to 955 c/ml. The average value was 513 c/ml, which is 2.8 times higher than last year. Hydrocarbon-oxidizing bacteria were not detected in the sample taken at the outlet of the Maloye More.

In the soil samples, the number of heterotrophs ranged from 4.0 to 11.70 thousand c/g in silt. The average abundance was 7.17 thousand c/g of silt, which is 1.3 times lower than last year. Amplitude of phytoplankton abundance was in the range from 545.289 to 931.819 thousand c/l, biomass - 193.271-244.744 mg/m³. All stations were dominated by native small-celled golden and cryptophytic algae. Cryptophytic, green, groups of indeterminate cocci and flagellate organisms subdominated. Chara filamentous algae *Spirogyra* Link were not detected in planktonic samples.

The total zoobenthos abundance varied between 4,481 and 13,855 thousand spec/m³, biomass - 50.83-192.83 mg/m³. The average values of zoobenthos abundance and biomass for the area of the Maloye More were 7.862 thousand spec/m³ and 102.39 mg/m³. In terms of abundance, all identified groups co-dominated: rotifers, cyclops, cladocerans and copepods.

Ichthyofauna and the seal population. The data obtained in the reporting year allow us to draw conclusions about a fairly stable state of stocks of commercial aquatic bioresources of Lake Baikal, with the exception of Baikal cisco. In 2020, the total number of spawning Baikal cisco species coming into spawning streams amounted to 2 million specimens, i.e. the same as the 2015 level (2 million specimens), but significantly lower than the long-term annual average level (4.3 million specimens). The positive dynamics of changes in the number of spawning stocks of cisco also remain in the Upper Angara River (about 1 million specimens), in the Selenga River (about 0.7 million specimens). The number of cisco spawning in the r. Barguzin and its tributary - r. Ina, in the r. Possolsky Sor, in 2020 remained at the level of 2019. The total allowable catch of cisco for 2021 is approved at the level of 2020 - in the amount of 150 tons.

The reserves of other wild-caught fish remain fairly stable. The total allowable catch of whitefish and grayling for 2021 is set at 30 tons for each species. The value of the recommended possible catch of small fish in Lake Baikal in 2020 exceeds the statistically recorded catch by 42-60%.

The total number of the seal population in 2020 was 133.2 thousand specimens. The increase in the total population number compared to 2019 is 3.4 thousand specimens. The increase in the total number is also confirmed by indirect data indicating the expansion of its habitat. The amount of possible annual allowable catch of seals is at least 5-6 thousand specimens. Total allowable catch for 2020 and 2021 is set at 3 thousand specimens.

Rivers flowing into Lake Baikal. Observations in the Lake Baikal basin in the Republic of Buryatia were made on 25 rivers, water samples were taken at 42 stations; in the Transbaikal Region - on seven rivers (eight sites) at 10 stations.

Exceedance of MPC in the rivers of the Lake Baikal basin in the Republic of Buryatia was noted for 12 ingredients of the chemical composition out of 17 counted ones; in the Transbaikal Region - for 10 ingredients out of 15 counted ones.

Compared with 2019 in the reporting year in the territory of the Republic of Buryatia there was an increase in average concentrations of easily oxidized organic substances (BOD₅), total iron, nickel, and a decrease in concentrations of nitrates, aluminium, manganese, and fluorides. The rivers of the Transbaikal Region in 2020 showed a decrease in the average concentrations of ammonia nitrogen, nickel, volatile phenols and oil products and an increase in the average concentrations of hard-to-oxidize organic substances (by COD).

Contamination of the waters of Lake Baikal basin in the territory of the Republic of Buryatia by manganese and copper was determined as a typical medium level. According to the content of total iron and zinc, there is a stable pollution; organic matter (COD, BOD₅), volatile phenols, petroleum products, fluorides - unstable; sulphates, nitrite nitrogen, ammonia nitrogen, nickel - single low level. In the Transbaikal Region, the common pollution of the average level is noted

for total iron and manganese; a common low level - for organic matter (by COD and BOD₅); stable medium level - for oil products; stable low level - for copper and zinc; medium level - for volatile phenols; low level - for ammonium nitrogen and nitrite nitrogen.

In 2020, the quality of Lake Baikal surface water hydro-chemical indicators were mainly affected by hydrological and climatic conditions, as well as the anthropogenic factor.

Groundwater. In general, no significant changes in the state of the underground hydrosphere were noted within the Baikal Natural Area in 2020. In the Republic of Buryatia in 2020 deterioration of the qualitative composition of groundwater in the multi-year section was not established at any of the studied objects. Contamination of groundwater was detected at 22 sites and two water intakes. The maximum technogenic load on groundwater is concentrated in the areas of industrial hubs, where mining enterprises, operating plants, large oil depots, fuel and lubricants warehouses, etc. are located.

On the territory of the Irkutsk region within the BNA CEZ, the baseline groundwater condition in 2020 was at the level of previous years and was in its natural state.

The local observation network, in terms of the number of observation sites and observation points, decreased significantly compared to previous years and consisted of two sites including four wells.

The Transbaikalian Region groundwater conditions were not monitored within the BNA in reporting year. According to the analysis results of the characteristics of the main deposits of groundwater, basic patterns of groundwater formation remain.

Endogenous geological processes. The level of seismic activity in 2020 had a high degree. Six earthquakes of energy class $K > 12.6$ (magnitude $M > 4.6$) were registered during the year, the maximum intensity of ground shaking of earthquakes was 6-7 MSK. The value of the annual total seismic energy released within the BNA was $\Sigma E = 533.7 \cdot 10^{12} \text{ J}$. Since the beginning of the 21st century, only the total seismic energy in 2008 exceeds this value. Two earthquakes were the strongest in 2020 - Bystrinskoye (21.09.20) with epicentre 22 km to the west from the southern tip of Baikal Lake and Kudarinskoye (09.12.20) with epicentre in the Selenga River delta area.

Exogenous geological processes. In 2020, no catastrophic EGP manifestations were observed. In the reporting year, there was a medium degree of landslide processes, the activation of which was associated with the operation of technogenic objects. The level of activity of gully formation processes in 2020 was lower than the average annual values. The activity of landslide processes due to the significant amount of precipitation was higher than last year and the average annual values. In 2020, the manifestation of coastal erosion processes of the Selenga River was characterized by average activity, r. Irkut - low activity. The degree of the process of aeolian accumulation in the reporting year was below the average long-term value staying at an average level. Flooding in 2020 was characterized by low activity; the process manifested itself during the period of seasonal rise in the level of groundwater.

Mineral and raw material resources. In 2020, there were insignificant changes in the Baikal Natural Area compared to the indicators of subsoil use in 2019. In the BNA CEZ within the Irkutsk Region and the Republic of Buryatia, the number of valid licenses according to the State Balance of Mineral Reserves of the Russian Federation and the Collection of Consolidated Materials on Mineral Reserves of Common Minerals of the Russian Federation has not changed. The number of active licenses has increased in the BNA CEZ in the Republic of Buryatia.

Lands. In the municipalities located in the BNA, there was an insignificant redistribution of lands between categories during 2020. Industrial lands increased by 0.19%, lands of settlements - by 0.045%, agricultural lands - by 0.0013%, forest lands - by 0.0006%, lands of forestry fund - by 0.0006%, state reserve lands decreased by 0.43%, and lands of specially protected areas by 0.001%. The area of water fund lands has not changed.

Forests. In 2020, the area of the BNA covered with forest vegetation increased in total by 780.71 thousand ha (by 3%) and amounted to 26,205.2 thousand ha. In the Republic of Buryatia the area decreased by 2.2 thousand ha. The Irkutsk Region's and the Trans-Baikalian Region's area increased - by 777.2 thousand ha and 5.71 thousand ha, respectively.

In the reporting year, the calculated felling rate of mature and over-mature forest stands in BNA decreased by 3% compared to 2019 and amounted to 15 392,7 thousand m³ (in 2019 - 15 842,8 thousand m³). In 2020 the felling volume for mature and over-mature forest stands in BNA increased by 1.7 % and amounted to 4 658.2 thousand m³ (in 2019 - 4 579.2 thousand m³). In the Irkutsk region, the felling volume decreased by 4,5%, in the Republic of Buryatia it increased by 6.1%, in the Trans-Baikal Region it increased by 40.1%.

The volume of thinning in 2020 increased by 48% and amounted to 37 thousand ha (in 2019 - 24.97 thousand ha). In the Irkutsk region compared to 2019, the volume of thinning increased by 26% and amounted to 1.83 thousand ha (1.45 thousand ha in 2019), in the Republic of Buryatia the volume of thinning was 12.2 thousand ha (23.1 thousand ha in 2019), in the Trans-Baikal Region - 24.8 thousand ha (0.42 thousand ha in 2019). In the reporting year, sanitary felling was carried out on an area of 1.64 thousand ha (in 2019 – 5.43 thousand ha).

In 2020, the number of fires decreased insignificantly - by 4,5% compared to 2019 and amounted to 849 fires (in 2019 - 889 fires). The total area affected by fires decreased by more than 2,5 times compared to 2019 and amounted to 120.2 thousand ha (in 2019 - 311.23 thousand ha).

Ambient air In 2020 no extreme high or high pollution of atmospheric air was registered within BNA CEZ. The level of atmospheric air pollution in Baikalsk, Slyudyanka and w.s. Listvyanka was assessed as "low." Compared to 2019, the level of air pollution in Baikalsk city has changed from "increased" to "low"; in the w.s. Kultuk (approximately), in the w.s. Listvyanka and in Sliudyanka town - has not changed. The level of air pollution in BNA CEZ in 2020 was defined as "very high" in Ulan-Ude and Selenginsk, and "increased" in Gusinoozersk. Atmospheric air quality in Petrovsk-Zabaikalsky was characterized by a low level of pollution. The city of Ulan-Ude and the settlement of Selenginsk are included in the Priority list of cities in Russia with the highest level of air pollution. In the EZAV (environmental hazard area) BNA, in the cities of Angarsk, Svirsk, Usolye-Sibirskoye, Cheremkhovo, Shelekhov, as well as in the settlement of Meget, the level of atmospheric air pollution did not change. In Irkutsk, the level of atmospheric air pollution dropped from "very high" to "high" in 2020, compared to 2019.

Precipitation, snow cover. The amount of precipitation that fell in the Baikal Natural Area in 2020 was near or above the long-term average values. In January, October-December, the amount of precipitation in most areas was below the long-term average values. In the spring, summer, and fall seasons, precipitation was near or above the long-term average values. Snow depth was below the long-term average values for most of the BNA territories. Destruction of stable snow cover occurred in late March-early April, and snow cover formation was observed from mid-September. According to the results of monitoring of snow cover pollution in 2020, average concentrations of oil products increased in the area of the BPPM, concentrations of sulphur non-sulphate and chlorides, suspended and mineral substances decreased. There was an increase in the average values of the total deposition densities of cadmium, zinc, cobalt, nickel, copper, and manganese compounds. The average deposition density of iron compounds decreased. In the area from Kabansk to Baikalsk, the average concentration of suspended solids and oil products increased, the concentrations of chlorides, sulphates and mineral substances decreased. There was an increase in the average values of the total deposition densities of lead, copper, cobalt, iron, zinc, nickel, manganese and cadmium compounds. In the area of w.s. Kultuk and Sliudyanka city the highest average concentrations of suspended and mineral substances, phenols, oil products, sulphates, and chlorides were recorded.

Climatic conditions. In 2020, the average annual air temperature within BNA exceeded the multiyear values by 1.8-3.5°C due to the significant positive temperature anomalies observed for the majority of the year. The largest positive temperature anomalies were observed in February, March and April. In the Republic of Buryatia on April 11, April 26-27, April 30, June 15 and July 22, the maximum number of cases of exceeding the daily maximum temperature was recorded. During the remaining period, the average monthly air temperature in the BNA was close to the long-time annual averages. During the warm period of the year, frequent cyclone

shifts caused the prevalence of warm, unstable, rainy weather. Active thunderstorm activity was observed, as well as increased wind.

In 2020, the radiation situation in the settlements of the Baikal Natural Area remained stable, and the levels of radiation contamination of environment did not pose a danger to the population.

2. Anthropogenic impact. In 2020, 421.8 thousand tons of pollutants were released into the atmosphere on the Baikal Natural Area, which is 1.7% less than in 2019 (429,100 tons). The volume of wastewater discharges in 2020 decreased by 3.1% and amounted to 891.8 million m³ (in 2019 - 920,5 - million m³).

In 2020 in the Republic of Buryatia, the volume of wastewater discharges decreased by 14.85 million m³ and amounted to 495.16 million m³. The decrease was mainly due to a decrease in electricity generation by INTER RAO Electric Power Plant, the Gusinoozyorskaya TPP branch.

In the Irkutsk region, the source of pollution of Lake Baikal is the municipal enterprise Sewage Treatment Facilities of Baikalsk Municipality. In 2020, 1.87 million m³ of contaminated sewage was discharged into Lake Baikal (in 2019 – 1.56 million m³).

The total mass of pollutants entering Lake Baikal amounted to 209.87 tons (in 2019 – 228.23 tons), which is 18.36 tons or 8.7% less than in 2019. In 2020, such pollutants as BOD_{compl.} – 7.5 t (2019 - 7.27 t), sulphate anion - 62.79 t (2019 - 63.35 t), chloride anion - 35.6 t (2019 - 37.78 t), suspended solids - 10.07 t (2019 - 11.91 t), nitrate anion - 58.82 t (2019 - 66.14 t), nitrite anion - 0.32 t (2019 - 0.23 t), phosphates - 0.66 t (in 2019 - 0.51 t), non-ionic surfactants - 0.07 t (in 2019 - 0.09 t), ammonium ion - 0.7 t (in 2019 - 0.36 t), aluminium - 1.12 t (in 2019 - 1.62 t), oil products - 0.04 t (in 2019 - 0.03 t), COD - 32.18 t (in 2019 - 38.94 t) were discharged into the Lake Baikal basin with wastewaters.

The volume of waste generation in 2020 amounted to 183,386.9 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, was 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 2020 amounted to 1.94 million m³ (2019 - 1.32 million m³). The increase in water withdrawal from Lake Baikal is associated with an increase in water transfer for the needs of utilities and heat power. The volume of water use in the area of the Baikalsk Pulp and Paper Mill increased compared to last year - water intake increased by 0.62 million m³ (32%).

In the reporting year compared to 2019, there is a decrease in the mass discharge of some pollutants, but in general, the discharge of pollutants in the area of the Baikalsk PPM increased from 1.56 million m³ in 2019 to 1.87 million m³ in 2020.

Baikal-Amur Mainline Route Zone. In 2020 the discharge of wastewater into the Baikal-Amur Mainline zone rivers amounted to 0,99 million m³: in the city of Severobaykalsk - 1 million m³ of insufficiently treated wastewater in the Tyva river; in the settlement of Kichera - 0.03 million m³ of insufficiently treated wastewater in the Kichera river (in 2019 - 0.04 million m³); in the settlement of Angoya - 0.004 million m³ of insufficiently treated wastewater to the Upper Angara river (in 2019 - 0.004 million m³); in the settlement of Novy Uoyan - 0.04 million m³ of insufficiently treated wastewater to the Upper Angara river (in 2019 - 0.03 million m³); in the settlement of Yanchukan - 0.002 million m³ of insufficiently treated wastewater to the Upper Angara river (in 2019 - 0.003 million m³); in the settlement of Tunnelny - 46.14 million m³ normative clean wastewater to the Itykit river (in 2019 - 42.95 million m³).

3. Measures aimed at protecting Lake Baikal taken in 2020 were as follows.

Statutory regulation and coordination of Lake Baikal protection. Within the framework of the Decree of the Government of the Russian Federation №627 dated April 30, 2020 "On the Governmental Commission for the Protection of Lake Baikal" a Governmental Commission for the Protection of Lake Baikal was formed in 2020.

The Commission is a coordinating body for ensuring coordinated actions of the interested executive authorities in the field of protection of Lake Baikal. Previously, this was handled by the Interdepartmental Commission for the Protection of Lake Baikal. The agenda of the first meeting of the commission was to discuss the need to regulate the treatment of construction waste and the organization of the sites of temporary waste accumulation during the construction or reconstruction of major infrastructure.

During the work of the commission it was decided to prepare a draft decree of the Government, defining the requirements for the temporary accumulation of waste, places of its disposal, as well as the procedure for its subsequent reclamation. The Ministry of Natural Resources of Russia together with the supervisory authorities have been instructed to ensure environmental control at all stages of the infrastructure project. In order to execute the order of the President of the Russian Federation on the development of integrated indicators of protection of the unique ecological system of Lake Baikal and its condition using the data of state ecological monitoring, the Ministry of Nature together with the Siberian Branch of RAS to develop a platform of digital monitoring and forecasting of the ecological situation of the BNA. Within the framework of the federal project "Preservation of Lake Baikal" in 2020 to complete the work on creation of the state multilingual information resource, providing Internet access to digital information in the field of protection of Lake Baikal and the BNA. On the order of the President of the Russian Federation, the Government approved the concept of creating a large federal system for environmental monitoring, which should be included in the federal project "Ecology". Within the framework of implementation of a set of measures for the conservation and reproduction of unique aquatic biological resources, the fight against poaching using modern equipment of fish control authorities should ensure the creation of a sustainable system of natural reproduction and restoration of Lake Baikal aquatic biological resources. Rosrybolovstvo plans to reconstruct two fish hatcheries in the Republic of Buryatia and to form a mobile fish protection complex to prevent mass diseases of factory origin fish, increase the output of larvae and juvenile omul and sturgeon by 2024 to 2 billion fish and ensure restoration of stocks of valuable aquatic bioresources. The Federal Agency for Fishery has been instructed, together with the government of the Irkutsk Region and the Russian Academy of Sciences, to further study the issue of developing aquaculture in the region.

In 2020 the Government of the Russian Federation formed an interdepartmental working group responsible for the organization of work on the liquidation of the accumulated damage to the environment, formed during the operation of the Baikalsk Pulp and Paper Mill. The Russian Academy of Sciences was instructed to provide scientific support for the evaluation of technological solutions for recycling and decontamination of waste of BPPM; the selection of optimal solutions should be carried out with the participation of Rosprirodnadzor.

A new version of the Order of the Ministry of Natural Resources and Environment of the Russian Federation dated 21.02.2020 No. 83 "On approval of standards for maximum permissible impacts on the unique ecological system of Lake Baikal and the list of harmful substances, including substances belonging to the categories of especially dangerous, highly dangerous, hazardous and moderately dangerous for the unique ecological system of Lake Baikal" included a number of changes concerning the allowable content of harmful substances in waste water discharged into Lake Baikal, as well as harmful substances in waste water discharged into water bodies within the central and buffer ecological zones.

Federal Law No. 207-FZ dated 13.07.2020 "On Amendments to Article 46 of the Federal Law "On Environmental Protection" and Certain Legislative Acts of the Russian Federation", paragraph 1 introduced provisions that are important for the southern and northern coasts of Baikal regarding the transportation of oil and oil products. Organizations transporting raw hydrocarbons and products manufactured from them shall approve a plan for the prevention and elimination of oil and petroleum product spills by 01.01.2024 (paragraph 3 of Article 5), implement the plan and have the financial support to implement the measures provided by the plan.

Federal Law No. 254-FZ dated 31.07.2020 "On peculiarities of regulation of certain relations in order to modernize and expand the trunk infrastructure and on amendments to certain legislative acts of the Russian Federation" added a new Article 25.1 "Final Provisions" in the following wording. 1. Until 31.12.2024 in the CEZ BNA, it is allowed to carry out activities necessary to increase the throughput of the Baikal-Amur and Trans-Siberian railways within the boundaries of the Baikal natural area, in accordance with the Federal Law "On the specifics of regulating certain relations in order to modernize and expand the main infrastructure and amendments to certain legislative acts of the Russian Federation" taking into account the specifics established by this article. 2. Construction, reconstruction of infrastructure facilities (facilities not related to the creation of forest infrastructure) to increase the throughput of the Baikal-Amur and Trans-Siberian railways on the lands of the forest fund are allowed with clear cuttings and the transfer of these lands to lands of other categories. 3. The list of infrastructure facilities specified in paragraph 2 of this article shall be established by the Government of the Russian Federation in accordance with Federal Law No. 254-FZ. The above list includes, along with such facilities, environmental protection measures associated with the construction, reconstruction of such facilities. The above list shall not include objects intended for permanent or temporary residence of citizens, as well as for recreational and other activities not related to ensuring the operation of public railway infrastructure as part of the Baikal-Amur and Trans-Siberian railway lines.

Federal Law No. 189-FZ dated 11.06.2021 "On Amending Article 25.1 of the Federal Law "On Protection of Lake Baikal" replaces Article 25.1 of Federal Law No. 94-FZ dated 01.05.1999 "On Protection of Lake Baikal" by Paragraph 4 reading as follows: "In case of establishment by the documents of territorial planning of borders of settlements, formed from rotational and other temporary settlements, created before January 1, 2007 within the borders of the lands of the forest fund for logging, provided the location of such settlements outside the borders of specially protected natural areas, the provisions of subparagraph 2 of paragraph 1 of Article 11 of this Federal Law shall not be applied".

By Federal Law No. 254-FZ of 31.07.2020 "On peculiarities of regulation of certain relations in order to modernize and expand the trunk infrastructure and on amendments to certain legislative acts of the Russian Federation" article 38 of Federal Law No. 33-FZ dated 14.03.1995 "On specially protected natural territories" has been amended with paragraph 5 in the following wording: "Peculiarities of adoption by December 31, 2024 by the authorized executive authorities of the subjects of the Russian Federation, local authorities of decisions to change the boundaries of specially protected natural territories of regional or local importance in terms of exclusion from the borders of such territories of land and land plots intended for construction, reconstruction of objects, necessary to increase the throughput capacity of the Baikal-Amur and Trans-Siberian Railways are established by the Federal Law "On peculiarities of regulation of certain relations in order to modernize and expand the mainline infrastructure and on amendments to certain legislative acts of the Russian Federation.

By Federal Law No. 429-FZ dated 08.12.2020 "On Amending certain legislative acts of the Russian Federation" Article 1 of Federal Law No. 94-FZ dated 01.05.1999 "On Protection of Lake Baikal" has been amended by paragraph 3 reading as follows: "Decisions of interstate bodies adopted on the basis of provisions of international treaties of the Russian Federation in their interpretation contradicting the Constitution of the Russian Federation shall not be subject to execution in the Russian Federation. Such a contradiction may be established in the manner determined by federal constitutional law.

By the decree of the Government of the Russian Federation dated 26.05.2020 No. 749 "On amendments to the Appendix No. 5 to the federal target program "Protection of Lake Baikal and the socio-economic development of the Baikal natural territory in 2012-2020" the corrections concerning provision and distribution of subsidies from the federal budget to the budgets of the subjects of the Russian Federation were made in order to co-finance expenditure obligations of the subjects of the Russian Federation related to the implementation of measures of the federal target program "Protection of Lake Baikal and the socio-economic development of the Baikal

natural area. In 2020, draft law 922421-7 "On Amendment of Article 25.1 of the Federal Law "On Protection of Lake Baikal" was submitted to the State Duma for consideration, relating to issues involving the transfer of forest lands occupied by protective forests within the boundaries of the CEZ BNA into lands of settlements.

Measures for protection of Lake Baikal.

In 2020, the Federal Target Program "Protection of Lake Baikal and socio-economic development of the Baikal Natural Area for 2012-2020" was completed. At the same time, the implementation of the federal project "Protection of Lake Baikal" started in 2019, which became the successor of some of the activities of the Federal Target Program, was continued. The amount of financing the activities for protection of Lake Baikal within the framework of the Federal Target Program in 2020 at the expense of the federal budget made 3,212.01 million roubles, the total volume of financing for 2012-2020 made 22,869.7 million roubles, with 17,827.7 million roubles or 78 % of it used. The federal project "Protection of Lake Baikal" allocated 2,128.06 million roubles from the budgets of the regions of the Russian Federation in 2020. Despite the fact that many activities within the framework of the completed FTP were successfully implemented, a number of important projects were not implemented or completed due to negligence of contractors, non-fulfilment of state contracts, systematic postponement of the development of design and estimate documentation. As a result, the overall effectiveness of the federal program "Protection of Lake Baikal and the socio-economic development of the Baikal natural area for 2012-2020" for the entire period of 2012-2020 was 87.3%. In accordance with the national project "Ecology" and the program of municipal solid waste management in 2020 works on accounting and elimination of unauthorized dumps were carried out, measures on organization and construction of MSW landfills in the Baikal natural area were implemented. In Transbaikal Region, design and estimate documentation for sewage treatment plants was developed, but their construction and reconstruction were not carried out.

Ecological evaluation. In the Irkutsk region, 184 conclusions of the state environmental evaluation of the federal level were prepared and approved for the objects located in the Baikal natural area in 2020, of which 33 conclusions for the objects planned for implementation in the BNA were negative. For objects planned for implementation in the BNA CEZ, 13 state ecological evaluations were conducted, two objects received a negative opinion.

In the Republic of Buryatia, 113 conclusions were prepared and approved by expert commissions of state ecological evaluation at the federal level for objects located in the BNA in the reporting year, four of which received a negative conclusion. For objects planned for implementation in the BNA CEZ, 18 state ecological evaluations were conducted in 2020, two objects received a negative opinion. Positive conclusions were issued for all sites.

In Transbaikal Region, the state ecological evaluation was conducted for 14 federal-level facilities located in the BNA. Positive conclusions have been issued for all sites. In 2020, there were no ecological evaluations of the regional level facilities located in the BNA.

Ecological monitoring. The environmental monitoring in 2020 was carried out by the organisations of Roshydromet (Russian Federal Service for Hydrometeorology and Environmental Monitoring), 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 Transbaikal Region. 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 BNA monitoring.

The existing system of monitoring of the unique environmental system of Lake Baikal and Baikal Natural Area needs the reconstruction of the monitoring network of Roshydromet, 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.

Surface water quality data obtained in 2020 indicate changes in the hydrochemical regime throughout Lake Baikal. There are areas with a stable negative impact of economic activity on the ecosystem. Anomalies in the composition of the aquatic environment are regularly noted in them; the reasons for the anomalies have been established. Unsatisfactory condition of water treatment facilities in the settlements of Kultuk, Babushkin, Listvyanka, Slyudyanka and others is associated with the ingress of insufficiently treated wastewater and household waste into the lake. It is expressed in the form of elevated concentrations of substances of the nitrogen group, phosphatone, copper, aluminium, zinc. Exceeding the background values is due to the annually increasing anthropogenic load, unorganized ("wild") tourism, the lack of sewage treatment plants.

Environmental supervision. In 2020, federal supervision authorities carried out 251 environmental control events in the Baikal natural area. The total number of inspections compared to 2019 decreased by a quarter and amounted to 121 inspections (154 inspections in 2019). The number of violations detected increased by 10% compared to 2019 and amounted to 274 offenses (246 offenses in 2019).

Based on the results of regional supervision in the Baikal Natural Area in 2020, compared with the last year, the number of inspections (by type of supervision) decreased by 20.7 times and amounted to 214 inspections. The number of violations detected decreased by 5.6 times and amounted to 274 offenses (1 542 violations in 2019). This is due to the special regime introduced in the Russian Federation in connection with quarantine measures to combat the spread of coronavirus infection COVID-19. For this reason, in the reporting year the number of inspections of persons carrying out their activities on Lake Baikal, including those related to the operation of water transport (14 inspections) decreased by 2.5 times.

Environmental violations. In 2020, the number of administrative violations recorded at the BNA in the field of environmental protection and nature management decreased by 11.1% compared with 2019 and amounted to 2,625 violations. 54% of violations were detected in the Republic of Buryatia. The main violations recorded within the BNA in 2020 were:

- violation of fire safety rules in forests (55.9% of the total number of detected violations);
- violation of rules for hunting, rules governing fishing and other types of wildlife use (6.9%);
- non-compliance with environmental requirements for the management of production and consumption waste (6.4%);
- concealment or distortion of environmental information (5.9%).

In 2020, the number of environmental crimes recorded at BNA, compared with 2019, decreased by 16.9% and amounted to 2,656 crimes. The main ecological crimes in 2020 were related to illegal woodland felling (86.0% of the total number of detected crimes) and illegal fishing (catching) of aquatic biological resources (7.9%). The largest number of crimes was recorded on the territory of the Republic of Buryatia — 43.2%.

Scientific research. The measures being developed and implemented to preserve Lake Baikal are based on scientific research data. In the reporting year, research in the Baikal Natural Area was carried out by the Limnological Institute of the Siberian Branch of the Russian Academy of Sciences (Irkutsk), the Baikal Institute of Nature Management of the Siberian Branch of the Russian Academy of Sciences (Ulan-Ude) Institute of Geography named after V.B.Sochava of the Siberian Branch of the Russian Academy of Sciences (Irkutsk), the Institute of the Earth Crust (Irkutsk), the Siberian Institute of Plant Physiology and Biochemistry (Irkutsk), the Institute of Geochemistry of the Siberian Branch of the Russian Academy of Sciences (Irkutsk),

the Institute of the Earth Crust of the Siberian Branch of the Russian Academy of Sciences (Irkutsk), A. P. Vinogradov Institute of the Siberian Branch of the Russian Academy of Sciences (Irkutsk), the Institute of Solar-Terrestrial Physics (Irkutsk), the Geological Institute of the Siberian Branch of the Russian Academy of Sciences (Ulan-Ude), the Baikal Museum of the Irkutsk Research Centre (r.s. Listvyanka, Irkutsk Region), the Research Institute of Biology, Irkutsk State University (Irkutsk), East Siberian State University of Technology and Management (Ulan-Ude), as well as employees of specially protected areas.

International cooperation. In 2020, due to the procedure for the domestic appointment of the Mongolian Government Commissioner for the implementation of the Agreement and reorganizations on the Mongolian side, as well as restrictions related to the spread of coronavirus infection, no meetings of the working bodies in the framework of the Agreement implementation were held.

At the same time, the Russian side ensured the implementation of protocol decisions of the 15th Meeting of Plenipotentiaries of the Government of the Russian Federation and the Government of Mongolia on the implementation of the Agreement (06.08-07.08.2019, Yekaterinburg, Russian Federation).

As part of the agenda of the Meetings of Plenipotentiaries of the Government of the Russian Federation and the Government of Mongolia on the transboundary Selenga River basin issues of water situation, assessment of transboundary water quality and impact of economic activities of enterprises on water bodies of the basin, implementation of water protection and water management measures, as well as the planned construction of hydraulic structures in the territory of Mongolia were considered.

The main instruments of state management of water bodies that ensure their protection and use in the Russian Federation are the Schemes of Integrated Use and Protection of Water Bodies of Transboundary River Basins, including the one approved by Order No. 100 of the Yenisey basin water management board dated 24.06.2014 for the Selenga River Basin (Russian part of the basin), in Mongolia — the Single Water Management Plan of Mongolia, approved by the Government of Mongolia in 2013.

The obligations of the Russian side to implement the Agreement in 2020 have been completed in full.