IUCN Conservation Outlook Assessment 2017 **(archived)**
Finalised on 10 November 2017

Please note: this is an archived Conservation Outlook Assessment for Lake Baikal. To access the most up-to-date Conservation Outlook Assessment for this site, please visit https://www.worldheritageoutlook.iucn.org.

Lake Baikal

SITE INFORMATION

Country:
Russian Federation
Inscribed in: 1996
Criteria:
(vii) (viii) (ix) (x)

Site description:
Situated in south-east Siberia, the 3.15-million-ha Lake Baikal is the oldest (25 million years) and deepest (1,700 m) lake in the world. It contains 20% of the world's total unfrozen freshwater reserve. Known as the 'Galapagos of Russia', its age and isolation have produced one of the world's richest and most unusual freshwater faunas, which is of exceptional value to evolutionary science. © UNESCO

SUMMARY

2017 Conservation Outlook

Significant concern

The conservation outlook of Lake Baikal is of concern because of ongoing pollution from the Selenga River and the industrial corridor of the Angara River as well as new emerging threats, such as large scale tourism development, nearshore eutrophication, and climate change. The decision to close the Baikalsk Paper and Pulp Mill is a positive step, but its implementation and mitigation of past negative impacts will require time and significant efforts. At the same time, the overall protection and management regime of the property remains insufficient due to an inadequate legal framework and a fragmented and overcomplicated institutional setup for the management of the site. The site's values are still well preserved and largely intact; however, high concerns have emerged in the recent years regarding rapid ecological changes in the coastal zone. The long-term conservation of the site will depend on many factors, including the overall improvement of management effectiveness, as well as measures undertaken to address the new emerging threats, particularly nearshore eutrophication. The potential of hydroelectric developments on the Selenga and Orkhon Rivers in Mongolia is of concern. as well.

Current state and trend of VALUES

High Concern
Trend: Deteriorating

The hydrochemical parameters and the water quality in the central and deep zone of Lake Baikal remain stable and good. The site still includes large areas of untouched wilderness and natural landscapes. However, there is a clear scientific evidence of worrying ecological processes, rapidly progressing within the coastal zone. The most harmful is the mass extinction of the main natural biofilters of the coastal zone – endemic Lubomirskiidae sponges at the scale of entire Lake. Rapid and mass proliferation of the Spirogyra algae (observed along ca. 30-40-50% of the coastal line); mass development of cyanoprocaryotes (with proven ability to

produce dangerous toxins) in the near shore zone and on the sponges; giant algal wash-ups; significant changes in the structure and quantitative characteristics of the near-the-settlement planktonic communities; unclear current state of the population of the Baikal omul are just some of the examples showing the deep and rapid ecological degradation of the coastal zone which became evident in the last 5 years.

Overall THREATS

Very High Threat

There is clear scientific evidence of negative impacts of a number of factors rapidly progressing in the coastal zone of the Lake, including mass proliferation of non-typical Spirogyra algae and significant changes in the structure of the near-the-settlement planktonic communities. The eutrophication of the coastal waters should be considered as the most important threat to the oligotrophic and unique freshwater ecosystem of Lake Baikal. These facts, in combination with increasing coastal taiga fires, absence of a proper bilge water treatment stations and properly functioning sewage treatment stations, rapid increase in tourism infrastructure and visitor numbers represent a high threat to the Lake’s ecosystem.
The toxic by-products of ca. 60-years long functioning of the Baikalsk Paper and Pulp Mill represent one of the most significant potential threat. The development of hydroelectric projects on the Selenga and Orkhon Rivers in Mongolia is another very high threat.

Overall PROTECTION and MANAGEMENT

Serious Concern

The current protection and management regime of the property is ineffective in relation to the main current and emerging threats (mainly water pollution, uncontrolled development of tourism infrastructure and potentially unsustainable natural resource use). This ineffectiveness is primarily caused by the fragmented and complicated institutional setup for management, lack of integrated legal framework, as well as a number of secondary weaknesses, such as low levels of funding and differences in human resources capacities of component protected areas that make up the property.

FULL ASSESSMENT

Description of values

Values

World Heritage values

- **Oldest, deepest and largest (by volume) freshwater ecosystem in the World**
  Criterion:(vii)

  The Baikal Lake ecosystem has existed for more than 20 million years. According to V.D. Mats (2010-2011), the geological history of Baikal is subdivided into 3 stages: Archaeo-Baikal (70 – 30-27 mln years), Pre-Baikal (ca 30-27 – 3.5 mln years) and Lake Baikal (3.5 mln years – present). In addition to being the oldest lake, it is also the deepest lake in the world (1,638 m deep) and contains 23,600 km3 of freshwater (ca. 20% of the global unfrozen freshwater reserves) (Kozhov, 1963; UNEP-WCMC, 2011; Justification for inscription, 1996). A globally unique ecosystem with at least 2,640 species of animals (ca 56% endemic) and 1,000 species of plants (ca. 15% endemic) (Timoshkin, 2001; 2010-2011) and unique features (e.g. freshwater endemic sponge forests and specialized cryophilic, interstitial and freshwater hydrothermal vent communities), foodwebs and system properties (including an exceptional self-purification capacity, high oxygen concentration throughout the water column and exceptionally low particulate matter concentrations) have evolved here.

- **Freshwater invertebrate fauna**
  Criterion:(x)

  The freshwater invertebrate fauna of Lake Baikal counts ca. 2,640 species, ca. 56% of which are endemic and highly adapted to this cold, deep and

oxygen rich freshwater ecosystem. Invertebrate groups with ciliophorans, sponges, flat- and round worms, rotifers, oligochaetes, leeches, polychaetes, snails, amphipods, copepods, and caddisflies (Timoshkin, 2001; 2010-2011; UNEP-WCMC, 2011).

► Freshwater vertebrate fauna

Criterion:(x)

There are 61 species of fish in Lake Baikal, 39 of which are endemic (Sideleva, 2003). The most diversified and unique is Cottoid fish fauna, which includes 33 species and subspecies (45% of the world fauna of freshwater sculpins). Notable examples include two endemic sturgeon species (Acipenser schrenskii and A. baeri baicalensis) the Omul Coregonus autumnalis migratorius, two species of Baikal Oilfish (Comephorus spp.) with completely pelagic life style and endemic deep-water Abyssocottidae sculpins with completely reduced lateral line channel system. A highly iconic vertebrate species of the lake is the endemic Baikal Seal Pusa sibirica.

► Freshwater flora

Criterion:(x)

15% of the 1,000 species of aquatic plants of the lake are endemic. The same is true for a third of its 560 species of algae (UNEP-WCMC, 2011). Green macrophytes of Draparnaldioides genus, Cladophoraceae and benthonic diatoms are the most diversified and endemic rich groups among floristic biodiversity (Izhboldina, 2007; Pomazkina, Rodionova, 2014; Boedeker et al., 2016).

► Geological features

Criterion:(viii)

The formation of the geological structures in the Baikal rift zone took place during the Palaeozoic, Mesozoic and Cenozoic eras and there are a number of significant geological features (Justification for inscription, 1996). Continental scale active rift valley system that has been existing since the Mesozoic. There are a wide range of specific geological features associated with this system, including extinct volcanoes, relict landslide circuses, abrasion caverns, hot and mineral springs (WHC, 2006). During the long geological history Baikal has accumulated ca. 7.5 km thick sediment layers on the

bottom (Hutchinson et al., 1992). In combination with the great depth (1620 m) it makes Baikal the deepest continental rift (depression) on the planet.

► Freshwater, terrestrial and littoral ecosystems

Criterion:(ix)

The evolution of aquatic life that has taken place over this long period has resulted in an exceptionally unique and endemic fauna and flora (Kozhov, 1964; Timoshkin, 1997; Justification for inscription, 1996). Lake Baikal is situated at the intersection of three bio-geological areas: east Siberian Taiga to the North and West, trans-Baikal coniferous forests to the East and Altay-Sayan Mountain forest to the South (UNEP-WCMC, 2011). This and the considerable altitudinal gradients surrounding the lake (445-2,840 m a.s.l.) support a wide range of different ecosystem types around the lake, with corresponding differences in fauna, flora and vegetation. There are also important littoral wetland ecosystems, such as the Selenga Delta, parts of which form a Ramsar Wetland of International Importance.

Other important biodiversity values

► Terrestrial flora

There are 800 species of vascular plants in the Lake Baikal area, including 20 species of flowering plants. Most of the terrestrial flora is associated with various forest ecosysytems, such as Scots Pine Pinus sylvestris forest to the East, Dahurian Larch Larix gmelina forest along the northern shore, and Stone Pine Pinus sibirica and Siberian Larch Larix sibirica forests along the western shores (and parts of the eastern shores). Some plant species are associated with wetlands and tundra systems of higher altitudes (UNEP-WCMC, 2011). Endemism is not as pronounced as among aquatic flora of the lake. The area slightly overlaps with a global Centre of Plant Diversity (Davis & Heywood, 1994).

► Terrestrial fauna

The terrestrial fauna of the Lake Baikal area is less distinctive than its freshwater fauna, but also significant. Both the southern and the northern

shore have ca. 70 species of mammals (Lyamkin, 2004), including a number of globally threatened species such as Musk Deer Moschus moschiferus VU, Altai Weasel Mustela altaia NT, Otter Lutra lutra NT, and Pallas's Cat Ocotolobus manul (NT) (UNEP-WCMC, 2011, IUCN, 2012b). The avifauna of both the northern and the southern shore of Lake Baikal numbers over 300 species (Popov, 2004) including globally threatened species such as the Siberian Crane Leucogeranus leucogeranus (CR), Swan Goose Anser cygnoides (VU), Eastern Imperial Eagle Aquila heliaca (VU), Saker Falcon Falco cherrug (EN), Great Bustard Otis tarda (VU) and Asian Dowitcher Limnodromus semipalmatus (NT) (UNEP-WCMC, 2011, IUCN, 2012b).

Assessment information

Threats

Current Threats

High Threat

There is clear scientific evidence of negative impacts of a number of factors, rapidly progressing in the coastal zone of the Lake. The most harmful is the mass extinction of the main natural biofilters of the coastal zone – endemic Lubomirskiidae sponges at the scale of the entire Lake. Rapid and mass proliferation of non-typical Spirogyra algae (ca. 30-40-50% of the coastal line), replacing the aborigeneous macrophyte species and suppressing the oxyphilic endemic invertebrates; mass development of cyanoprocaryotes (which have proven ability to produce dangerous toxins) in the near shore zone and on the sponges; giant algal wash-ups; significant changes in the structure and quantitative characteristics of the near-the-settlement planktonic communities; unclear situation with Coregonus migratorius, POP bioaccumulation in Baikal seal, etc. are all examples of negative trends. These facts, in combination with increasing coastal taiga fires, absence of the proper bilge water treatment stations and properly functioning sewage treatment stations, rapid increase in tourism infrastructure and visitor numbers represent a high threat to the Lake's

ecosystem.

► Household Sewage/ Urban Waste Water

High Threat
Inside site, extent of threat not known

Significant and large-scale modifications in composition and productivity of the dominant macroalgae in two local South Baikal bays (Bolshye Koty and Listvyanichny) were reported in 2010-2011 by two independent groups of experts (Kravtsova et al., 2014; Timoshkin et al., 2014). Some time later, mass development of non-typical for open Baikal green filamentous algae of Spirogyra genus (at 0.5–10 m depths) and abundant late autumn bloom of another filamentous algae Stygeoclonium tenue was detected in the shore line zone (first algal belt), which is normally occupied by Ulothrix zonata filaments. In 2013–2014, Spirogyra mass blooming was detected in the shallow water zone at the scale of almost entire lake (Timoshkin et al., 2015; 2016). Several other negative ecological process in the coastal zone have been described, such as mass development of toxic cyanobacteria (both – “saprophitic” and free-living), giant algal wash-ups in at least 5 areas of the Lake, mass extinction and diseases of endemic Lubomirskiidae sponges and snails. Additionally, poor quality of the sewage water treatment at all stations around the Lake’s coast could be observed. The most comprehensive interdisciplinary description of the Baikal coastal zone is given by Timoshkin et al., 2015; 2016. The most extensive multiyear pollution and deep transformations in the benthic and plankton communities, accompanied by the largest ever known Spirogyra wash ups (up to 90 kg per m2) observed on the beaches of North basin (near Tyya river mouth) is thought to have been caused by improperly purified sewages of Severobaikalsk city (Timoshkin et al., 2014a). Deep transformations in macrozoobenthos communities in the mass Spirogyra development areas and in plankton communities of near shore areas of the Lake were reported by Rozhkova et al. (2016) and Bondarenko et Logacheva (2016). Three areas of Baikal, characterized by year round massive development of Spirogyra and deep benthic community transformation were proposed by scientists to be considered as zones of ecological damage (Li, 2017).

► Tourism/ Recreation Areas

High Threat

Inside site, extent of threat not known
Outside site

Uncontrolled and irresponsible tourism development has had a considerable localized impact on parts of the property around the lake's southern shore and particularly Maloe Morye (e.g. construction, including illegal, near the lake's shore, operation of large yachts without appropriate infrastructure), and parts of Olchon Island. In 2010 visitor numbers reached 674,300, which equals a 30% increase from 2003 (Rosabal & Rao 2011). Increase in the tourist number has led to rapid construction of private hotels near the shore line. Rapid (often – illegal) construction of hotels, guest houses and other types of accommodation without any waste water purification systems and with buildings often located less than 100 m above the shoreline are of particular concern in the settlements on the west coast, such as Listvyanka, Bol. Koty, Bol. Goloustnoe (IUCN Consultation, 2017).

► Tourism/ visitors/ recreation

High Threat
Inside site, extent of threat not known

The most popular tourist/recreation areas are Maloe More strait and Olkhon Island (Middle basin); bays of the western coast of South basin, particularly Listvyanka, Bolshye Koty, Bolshoe Goloustnoe settlements and Aya Bay. Lake Baikal became the most popular recreation destination among the Russian World Heritage sites in 2017 (http://irkobl.ru/sites/tour/topical/page.php). Officially, the tourist arrivals for 2010 equaled 695,100 visitors, compared with 253,000 in 2004, showing an increase over the period. The number of visitors in 2016 increased by about 45 per cent in comparison with the 2015 level (http://baikal-info.ru/kolichestvo-turistov-v-irkutskoy-oblasti-uvelichilos-na-45).

► Solid Waste

High Threat
Inside site, extent of threat not known

The problem of solid waste and garbage increases year by year being most serious in the recreational centers such as Listvyanka town, bays of Maloe More and to Ol'khon Island. This Island has 1,651 residents distributed among 9 small settlements with Khuzhir being the largest with 1,350

permanent residents (official data of the Ol'khon administration of Irkutsk District, 2016). The Island is the largest island of Lake Baikal (730 km2) and receives ≥ 800,000 tourists annually, mainly in summer, (https://lenta.ru/articles/2016/03/23/baikal/); however, since 2014 many hotels are occupied year-round. There is significant lack of scientific knowledge on this problem in Baikal basin. The distribution, composition and amount of solid waste at 33 sites located along the coast of Baikal and in the coastal area of the Selenga upper delta were assessed by Potapskaya et al. (2016). Accumulation of waste was found both in the most visited places and in coastal areas difficult to access, where light and floating garbage is transferred by winds, storms, and swashes. Mass-spectrometry ICP methods identified a high concentration of moving sodium, chlorine, nickel, titanium, cadmium, arsenium, antimony compounds in the elemental composition of coastal detritus accumulation.

► Water Pollution

High Threat
Inside site, scattered(5-15%)

Hydrochemical and microbiological analyses of the sewages from the sewage water purification stations located in the coastal cities of Severobaikalsk, Kichera, Ust-Barguzin, Babushkin, Baikalsk, Slyudyanka were performed by Timoshkin et al. (2014a; 2015; 2016). The analyses of Severobaikalsk, Slyudyanka sewages were performed regularly (ca 1-2 times per year), finding neither of them to function properly as the nutrient concentrations (P and N) were extremely high. High concentrations of fecal indicator bacteria, exceeding different existing standards (EPA, 1986; SRSR, Sanitary Regulations and Standards of Russia, 2000; Official Journal of the European Union, 2006), were detected at the end of the tourism season (September, 2014) in many localities, in surface and near-bottom water layers of the coastal zone as well as interstitial waters, especially under coastal algal mats in the splash zone (no official regulations occur in the above cited documents for the interstitial waters of the beaches and the splash zone). For instance, water samples, collected near the Khuzhir Settlement exceeded USEPA standards by 3.3 fold (E. coli) and 10.7 fold (enterococci), EU standards by 3.1 (E. coli) and 6.5 fold (enterococci), and Russian Federation standards by 6 fold (TCB only; enterococci are not regulated). Importantly, the three coastal settlements where the high concentrations of fecal indicator bacteria were

found (Listvyanka Settlement, Khuzhir Settlement and Khakusy Bay) are each located in a different basin of the lake, and they have comparatively small permanent populations. However, they are among the most popular sightseeing and recreational destinations at Lake Baikal. These results suggest that intensification of tourism and recreational activities, coupled with inadequate wastewater treatment, are the main causes of bacterial contamination of Lake Baikal's coastal zone.
Parfenova et al. (2016) provide the general assessment of the microbiological monitoring of Lake Baikal ecosystem, mainly concentrated on the pelagic zone.
Studies between 2013 and 2017 on the fecal pollution in the main tributaries surrounding Listvyanka (South Baikal) have revealed the lower parts of 4 streams, located within the settlements, have always been heavily polluted in June and August-September. While the upper parts of the streams and small rivers, located in neighboring taiga area, have always been pollution free.

► Water Pollution

Data Deficient
Inside site, extent of threat not known
Outside site

Eastern-Siberian Inland Navigation Company (largest on Baikal – https://vsrp.ru/) carries out the regular service (trans-Baikalian lines including) on significant areas of the South and Middle basins (Irkutsk Oblast and Buryat Republic). The number of smaller private shipping services is rapidly increasing. Estimation of the total ship numbers varies significantly: from over than 2000 to more than 5000. According to http://www.kapitalpress.ru/kapitalist/archive/2014/74/2112/, 246 ships and about 6400 small size vessels were registered in Baikal and Irkutsk reservoir area. There are only 2 bilge water (BW) collection stations: at the northern top (Severobaikalsk city) and Baikal settlement (South basin) accepting the BW for money. According to the data from the Limnological Institute, the approximate total BW volume from the ships, registered on Baikal, should not be less than 417 tons per year. The BW stations however, received 12.2 tons only (navigation period of 2014 – 2015). Judging from this information (1), the length of the Lake (636 km) (2) and the total approximate ship number (more than 2000) the illegal BW discharge in the Lake should be

considered as one of the most dangerous, yet unsolved problems with poorly understood consequences.

► Water Pollution

High Threat
Inside site, extent of threat not known
Outside site

The Baikalsk Paper and Pulp Mill (BPPM) has led to a localized (reaching 16-17 km into the lake) increase of key pollutants including phenol and mercury up to 10 times the maximum permissible concentrations (Rosabal & Rao, 2011). In 2013 a decision was taken to permanently close down the mill. All facilities were shut down as of December 2013 (SP report, 2014) and do not function till present (September, 2017). However, limited information is available on specific actions planned to mitigate the impact from the past operations (e.g., sludge ponds near the lake shore). In particular, a commonly accepted (following strict ecological expertise) and scientifically based program to mitigate the impact from the past operations is urgently needed at the federal level. Mr Putin V.V., the President of Russian Federation, during his visit of Irkutsk (August 2017) paid special attention to Baikal protection and elaborated a kind of verdicts to the respective governmental officials. One of the recent government orders (assignment [No Пр-1602, п.1 а) http://kremlin.ru/acts/assignments/orders/55355]) instructs the complete removal of pollutants related to former activity of the BPPM in order to restore the areas. “Rosgeologiya Co” was elected as the company responsible for the cleaning and restoration of the polluted area (http://irkutskmedia.ru/news/617883/).

► Water Pollution

Data Deficient
Inside site, extent of threat not known
Outside site

A large industrial Irkutsk-Shelekhov complex, comprising the cities of Shelekhov, Irkutsk, Angarsk and Usolye-Sibirskoe, with enterprises from the heat power engineering, chemical, oil-refining and aluminium industries and the production of construction material, is located in the valley of the Angara River at a distance of 70 – 150 km from the western shore of South Baikal. Air pollution (chlorinated hydrocarbons; PCB’s, dioxins) generated within the

industrial corridor of the Angara River enters the water of the South basin and these chemicals biomagnify in animals at the top of the lake's food chain (e.g., golomyanka and seal) with potential human health effects (Mamontov et al. 2000; Kuzmin et al. 2005). Results shown by Samsonov et al. (2017) indicated that the total POP concentrations are 3-5 orders of magnitude higher in many benthic animal species (such as sponges, gastropods, amphipods) as compared to Baikal water due to the bioaccumulation. However, in a more recent study Khodzher et al. (2016) note that there is "…insignificant input of atmospheric impurities (compounds of sulphur, nitrogen and heavy metals) from the atmosphere into the South basin. The data on the accumulation of POPs and PAHs in the snow cover demonstrate that atmospheric pollution above Lake Baikal is of a local character and the contribution of the regional transfer of these classes of organic pollutants is insignificant at the shore and water area of South Baikal".

► Water Pollution

High Threat
Inside site, extent of threat not known

Ozersky et al., (2017) investigated the history of heavy metal (V, Cu, Zn, Cd, Hg, Tl, Pb, U) pollution in Lake Baikal seals over the past 8 decades. C and N stable isotope analysis (SIA) and laser-ablation ICP-MS of seal teeth were used to examine changes in feeding ecology, heavy metal levels associated with life history events and long-term variation in metal exposure. SIA did not suggest large changes in the feeding ecology of Baikal seals over the past 80 years. LA-ICPMS analyses revealed element-specific ontogenetic variability in metal concentrations, likely related to maternal transfer, changes in food sources and starvation. Hg and Cd levels in seals varied significantly across the time series, with concentrations peaking in the 1960s - 1970s but then declining to contemporary levels similar to those observed in the 1930s and 1940s. Trends in atmospheric emissions of Hg suggest that local sources as well as emissions from eastern Russia and Europe may be important contributors of Hg to Lake Baikal and that, despite the size of Lake Baikal, its food web appears to respond rapidly to changing inputs of contaminants.

► Fishing / Harvesting Aquatic Resources

Data Deficient

Inside site, extent of threat not known

General information and estimations of the total number and biomass of the leading commercial fish species, Coregonus migratorius (omul) in the lake differs significantly between the data provided by academic Limnological Institute SD RAS (Irkutsk, obtained by hydroacoustic method) and by the federal Baikalrybvod (Ulan-Ude, obtained by traditional net sampling and counting of the spawning specimens, entering the rivers). In any case, the fishing deficiency is evident at present. The number of the spawning omul population decreased by approximately 2 times (Romanov, 2014). According to preliminary estimations, 2.7 million fish entered the Upper Angara for spawning in 2010, while in 2013 this number decreased to just 1.1 million (http://newsbabr.com/?IDE=123924).
There is no scientifically supported and generally accepted viewpoint on this problem so far. Illegal fishing, structural changes in the pelagic ecosystem (including food sources for omul), changes in temperature regime and pollution are considered as the main issues. The respective governmental organizations (such as Rosrybolovstvo, or the Federal fishery agency) announced the necessity to accept the ban on commercial fishing in 2017. Due to uncertain information and lack of scientific consensus the ban has been postponed until 2018 (http://www.vsp.ru/2017/07/04/nechego-lovit/).

► Invasive Non-Native/ Alien Species

High Threat
Inside site, extent of threat not known

The most widely distributed invasive macrophyte species is Elodea canadensis, first found in Baikal at the end of 1970s. At present, elodea is known from many localities with maximum abundance in bays (Chyvyrkuy, Barguzin) and gulfs. Another group of alien species – green filamentous alga – spirogyra – became widely distributed in benthos of the coastal zone of Baikal since ca 2010. According to Timoshkin et al. (2016), the distribution area of Spirogyra spp. covered over 30% of the coastal zone of the Lake. The problem of Spirogyra penetration in Baikal and its natural history (whether the Spirogyra is an invasive species or not) is under debate. The distribution of both water plants is limited to shallow water zones.
Five introduced fish species (their parasitofauna included) have been found in Baikal; of them Perccottus glenii is becoming the most widepsread one,

successfully occupying coastal communities (Pronin et al., 1998).

► Logging/ Wood Harvesting

High Threat
Outside site

Current intensification of the wood production in the catchment area of the Lake needs to be considered as one of the potentially serious threats for the Baikal ecosystem (decrease of tributaries water balance, etc.). Some sources note attempts to modify the federal Law on Baikal regarding the wood harvesting around the Lake (e.g. https://iz.ru/636384/valeriia-nodelman/minprirody-predlozhilo-razreshit-sploshnye-rubki-vozle-baikala). The ministry of natural resources and ecology of the Russian Federation applied for a permission to modify the Law and allow “sanitary cleaning” in the taiga areas that suffered from numerous forest fires in 2015-2017. Potentially this may lead to illegal tree-felling and further deforestation of not only burned, but also untouched areas around Baikal. Rapid deforestation of the central ecological zone of the Lake will negatively influence the annual water balance of the tributaries and may affect the Lake’s water level and the structure of the coastal communities.

► Fire/ Fire Suppression

Very High Threat
Inside site, extent of threat not known
Outside site

Increasing intensity of coastal forest fires within the last 3-5 years (http://fires.ru), affecting not only the continental parts, but also the isles (ca. 70% of the forest on unique Bolschoy Ushkaniy Island – North Basin – suffered from strong fire in 2015) should be considered as one of the most significant threats for Baikal ecosystem. For example, about 900,000 and 500,000 hectares of near Baikal forests suffered in 2015 from intense fires in Buryat Republic and Irkutsk district respectively (http://activatica.org/problems/view/id/511/version/622). It includes mass mortality of terrestrial animals and plants (1); nutrient enrichment of the water ecosystem (=eutrophication) by means of atmospheric deposition (2a), ground waters (2b), tributary waters (2c); soil/water contamination by forest fire products (PCB etc.) which might be bioaccumulated in the hydrobionts (3); coastal soil erosion/landscape modifications; (4) and changes in the

tributary water balance (5), which may affect the Lake's water level. These processes are poorly studied. Almost nothing is known about possible impacts of the fire suppression methods and deposition of fire atmospheric aerosols on Baikal ecosystem.

► Temperature extremes

Data Deficient
Inside site, throughout(>50%)
Outside site

Water temperature and ice cover have been responding strongly to climate change in the recent past, with a trend towards warmer and wetter winters. This is likely to have multiple consequences on ecosystem dynamics, the extent of which at this stage is difficult to predict (Moore et al., 2009).
An increase in lake water temperature has been documented in the offshore pelagic zone of Lake Baikal by various scientists (Shimaraev et al., 2002; Troitskaya et al., 2003; Hampton et al., 2008; Katz et al., 2011; Sizova et al., 2013; Shimaraev and Domysheva, 2013). Additionally, some researchers established a positive relationship between surface water temperatures in May-October and the biomass of Baikal phyto- and zooplankton (Shimaraev et al., 1994; Afanasyeva and Shimaraev, 2006). Subsequently, others have suggested that warmer waters may have contributed to an increase in thermophilic zooplankton in the pelagic zone of Lake Baikal (Afanasyeva and Shimaraev, 2006; Hampton et al., 2008; Moore et al., 2009; Izmest'eva et al., 2016; Silow et al., 2016). On the other hand, no correlation was found between the surface water temperature increase and the mass development of Spirogyra (Timoshkin (2016); Timoshkin et al. (2016; 2017 in press).

Potential Threats

Very High Threat

The planned extensive additional tourism developments (both in terms of new areas included and envisaged visitor numbers) pose a significant potential threat to the site's values. The potential of hydroelectric developments on the Selenga and Orkhon Rivers in Mongolia remains of concern. The World Heritage Committee has repeatedly requested the States Parties of Mongolia and the Russian Federation to jointly develop a Strategic Environmental Assessment for any future hydropower and water management projects, which could

potentially affect the property, taking into account any existing and planned projects on the territory of both countries. However, no progress has been achieved in this regard so far.

► Dams/ Water Management or Use

Very High Threat
Inside site, extent of threat not known

The proposed development of hydropower projects in Mongolia has been discussed for a number of years now and the World Heritage Committee expressed its concerns about potential impacts on Lake Baikal in several Decisions (World Heritage Committee, 2017). The projects include the Egiin Gol project, the Shuren hydropower project and the Orkhon River project. Recently it has been confirmed by the State Party of Mongolia that an assessment of potential impacts of the projects specifically on Lake Baikal and its biodiversity will be undertaken. However, the World Heritage also repeatedly requested the States Parties of Mongolia and the Russian Federation to jointly undertake a Strategic Environmental Assessment (SEA) for any future hydropower and water management projects, which could potentially affect the World Heritage site (UNESCO, 2017). Furthermore, new regulations were proposed in the Russian Federation with regards to the water level of Lake Baikal which would provide for fluctuations of the water level within a wider range than currently allowed (UNESCO, 2016). This could result in significant impacts and therefore the SEA needs to consider these potential implications together with the proposed hydropower and water management projects. To date the SEA has not been completed yet. The unique biodiversity and water quality of Baikal may be greatly impacted by these projects and the consequences are unpredictable (Komarova, 2017).

► Industrial/ Military Effluents

Very High Threat
Inside site, extent of threat not known

In 2013, a decision was taken to permanently close down the mill. All facilities were shut down as of December 2013 (SP report, 2014) and do not function till present (September, 2017). However, limited information is available on specific actions planned to mitigate the impact from the past operations (e.g., sludge ponds near the lake shore). In particular, commonly accepted (after strict ecological expertise) and scientifically based program

on the actions to mitigate the impact from the past operations at the federal level is urgently needed. The President of the Russian Federation during his visit to Irkutsk (August 2017) paid special attention to the protection of Lake Baikal and issued a number of requests to the respective governmental officials. One of them [No Пр-1602, п.1 а) http://kremlin.ru/acts/assignments/orders/55355] is to restore the areas polluted by former activities of the paper and pulp mill (http://kremlin.ru/acts/assignments/orders/55355; https://m.vedomosti.ru/business/news/2017/08/17/729950-putin-baikalskogo). “Rosgeologiya Co” was chosen as the company responsible for the cleaning and purification of the polluted areas (http://irkutskmedia.ru/news/617883/). The effectiveness of the programmes will need to be evaluated in the future in order to assess whether pollution from the former mill remains a potential threat.

► Water Pollution

Very High Threat
Inside site, extent of threat not known

Fortunately, present concentrations of organochlorine contaminants in the water of the pelagic zone of Lake Baikal are below international regulatory standards. However, this masks an important problem. Experts who test the toxicity of chemicals extracted from aquatic environments normally focus on concentrations of separate, individual contaminants. Yet in nature, organisms are exposed to a “cocktails of contaminants,” where a mixture of organochlorine compounds, for example, consisting of individual chemicals (in particular, pesticides) at low, allowable concentrations, significantly harms aquatic communities (Kortenkamp, 2008; Relyea, 2009; Servan-Schreiber, 2014). Although the synergistic effect of multiple contaminants on fresh water ecosystems is beginning to receive scrutiny, it has never been examined for the unique and potentially sensitive communities of Lake Baikal. Therefore, the discharge of an “organochlorine cocktail” into the littoral zone of Northern Baikal via the failed wastewater treatment plant and from aerosols potentially may be very dangerous for sensitive biota of the oligotrophic and endemic biota (Timoshkin et al., 2016: pp. 495-496).

► Avalanches/ Landslides

High Threat

Inside site, extent of threat not known

This threat may be considered as potential and local one, but, in combination with possible earthquake in the vicinities of Baikalsk city (avalanches and landslides happened in 1930 and 1970 in the area), with many ponds of the former Baikalsk Paper and Pulp Mill filled up by poisonous sludge, is of concern (Timoshkin, 2014; http://baikal-info.ru/sel-mozhet-razrushit-hranilishcha-yadovityh-othodov-bcbk) and may be extremely hazardous for the Baikal ecosystem.

► Mining/ Quarrying

Low Threat
Inside site, extent of threat not known

The license of the LLC “Invest-Euro-Company” for the Kholodninskoye gold deposit was suspended and the application was officially withdrawn by the company (UNESCO, 2016). Therefore, this potential threat is currently assessed as low.

Protection and management

Assessing Protection and Management

► Relationships with local people

Some Concern

No specific measures have been taken to involve local people in the management of the property (WHC, 2006). There is also a conflict of interest between the development priorities of local and regional governments and the protection of the OUV of the property.

► Legal framework

Serious Concern

Although there is a special Law for the Conservation of Lake Baikal, the legal framework is ineffective overall as it allows development of major tourism

infrastructure inside the property, with potentially serious consequences for its OUV (Rosabal & Rao, 2011). Implementation of environmental legislation in the case of Lake Baikal has not stopped harmful operations and activities (such as those of the BPPM). The Russian Federation lacks a framework law to define the unified management of World Heritage sites, which often consist of several protected areas of various designations. The recent Federal Law No. 365-FZ on “special economic zones in the Russian Federation” and the Order of the Government of the Russian Federation on development of infrastructure within Barguzinskiy Biosphere Reserve further weaken the legal basis for effective conservation of the OUV of the property (IUCN, 2012a). Recently, changes have been proposed to the regulations for the water level of Lake Baikal for 2016-2017, which would provide for greater fluctuations in the water level. This is of concern given that no assessment has been undertaken of potential impacts on the World Heritage site and its values (UNESCO, 2017).
Of particular concern are also regulations regarding discharge of sewage, including the Federal Law 63 regarding the officially permitted discharge of purified sewage with very high (for Baikal ecosystem) nutrient concentrations into the Lake. For example, it allows to discharge into Lake Baikal purified sewage, which may contain up to 1 mg/l of P(PO4), what is several orders of magnitude higher than the natural concentrations of this nutrient in Baikal waters. (IUCN Consultation, 2017).

► Enforcement

Data Deficient

Data deficient

► Integration into regional and national planning systems

Some Concern

The development of several Special Economic Zones for tourism show that the objective “conservation and management of the OUV of the property” in accordance with the WHC Operational Guidelines is not integrated and mainstreamed into regional and national planning systems. Overall, unregulated and increasing tourism development in the region remains of high concern (IUCN Consultation, 2017) and requires a regional level approach to planning, which takes into account the values and vulnerability

of Lake Baikal.
Furthermore, there is certain lack of collaboration between the two administrative territories (Irkutsk District and Republic of Buryatiya) on whose territory Lake Baikal is located, particularly with regards to elaboration of effective scientific and protection and monitoring programs (IUCN Consultation, 2017).

► Management system

Serious Concern

The property lacks a unified management system and a central management authority. It consists of 3 Nature Reserves, 2 National Parks, 2 Managed Reserves, as well as poorly defined (also in terms of management regime) coastal protection central ecological zones (UNEP-WCMC, 2011). These appear poorly coordinated. A management plan aimed at protection of the OUV of the entire property is missing (Rosabal & Rao, 2011, WHC, 2006)

► Management effectiveness

Some Concern

No management effectiveness assessment of the entire property or parts thereof has been published. Since 2009, poaching, unauthorized development, and environmentally irresponsible tourism have much worsened (IUCN Consultation, 2013).
Furthermore, an integrated approach to the management of the World Heritage site and integration with other relevant sectors and planning instruments (tourism infrastructure approval, water management regulations) continues to be lacking (IUCN Consultation, 2017).

► Implementation of Committee decisions and recommendations

Serious Concern

Many recommendations and requests of the World Heritage Committee, have not been met by the State Party thus far, such as regarding legal measures for the protection of the property, implementation of the recommendations of the 2005 reactive monitoring mission, and clarification of tourism development plans. The reasons for this lack of response are not clear. Other recommendations, such as on Baikal Seal monitoring, have been met by the State Party.

Recently, a number of World Heritage Committee Decisions included requests with regards to the proposed hydropower projects development on the territory of Mongolia, and specifically a request to the States Parties of Mongolia and the Russian Federation to jointly develop a Strategic Environmental Assessment for any future hydropower and water management projects, which might have negative impacts on the World Heritage site. However, this request has not been implemented to date (UNESCO, 2017).

► Boundaries

Data Deficient

The boundaries of the property, and particularly of its central ecological zone, appear to be poorly defined and/or documented.

► Sustainable finance

Some Concern

Funding is insufficient (WHC, 2006). Funding comes in general from the federal and state budgets, which provided only one third of the funds needed in 2005 (Rosabal & Debonnet, 2005). In addition, the two National Parks gain some funds from tourism income (UNEP WCMC, 2011). Financial support from the federal/local auhtorities and respective scientific institutions is rather limited and not sustainable/stable at present (IUCN Consultation, 2017).

► Staff training and development

Mostly Effective

Staff numbers of all component PAs except Selenga Delta Ramsar site (7) and Pribaikalskiy National Park (ca. 200) are unknown. Staff training levels of the various PAs are likely to vary. In general, access to specialist staff for education, conservation management/promotion/interpretation and visitor management has been characterized as good, average and bad, respectively (WHC, 2006). As soon as the new monitoring program is elaborated and accepted, the staff of the laboratories of the Ministry of natural resources dealing with monitoring of Lake Baikal will need to be trained on specific aspects, such as identification of the massively developing benthonic

macrophytes, sponge diseases, etc. (IUCN Consultation, 2017).

▶ Sustainable use

Data Deficient

A draft “Complex Scheme for the Protection and Use of Natural Resources in Baikal Natural Territory” was reportedly pending approval in 2005 (Rosabal & Debonnet, 2005), but its fate since then is unclear. It is not clear how quotas for natural resource use are defined in the area, and how licenses are distributed.

▶ Education and interpretation programs

Data Deficient

The awareness of the World Heritage site and its values among visitors, local communities and local authorities was characterized as “adequate” in 2006, but no details about education and interpretation programmes are available.

▶ Tourism and visitation management

Serious Concern

Although the property has strong tourism potential, and tourism is developing rapidly, this is not happening in a sufficiently planned and sustainable way, leading to considerable threats to the property’s OUV (Rosabal & Debonnet, 2005). A sustainable tourism development strategy for the property is missing (IUCN, 2009).
In recent years, both tourism infrastructure development and visitors numbers have been increasing dramatically, with negative impacts already visible (IUCN Consultation, 2017).

▶ Monitoring

Some Concern

There are several monitoring programmes for pollutants, species, land use, and forest fires implemented within the property, under the auspices of the Ministry of Natural Resources and Ecology (WHC, 2006), and involving Rospirrodnadzor, the Main Department of Natural Resources of the Republic of Buryatia, the East-Siberian Research Institute of Geology, the Biology Institute of Irkutsk State University (Moore et al. 2009), Geophysics and

Mineral Resources, and other organizations (Rosprirodnadzor, 2011). The federal program of Lake Baikal monitoring undertaken by the Ministry of natural resources and ecology needs urgent revision (Timoshkin et al., 2014; 2015; 2016), as none of the important ecological parameters is included to this monitoring scheme. List of POPs (and other organic pollutants) for mandatory and regular monitoring of their concentrations needs to be significantly broaden, it has to be done not only in pelagic zone and in pelagic species, but special attention should be paid to the coastal zone and benthonic flora and fauna.

► Research

Mostly Effective

Considerable research has been conducted at Lake Baikal. The Limnological Institute of the Siberian Branch of the Russian Academy of Sciences and Irkutsk State University have been active there since 1928, under various names (LI SB RAS, 2012; Kozhova & Izmest'eva 1998) and numerous international research teams have worked at the lake since 1991. A Web of Knowledge search of "Lake Baikal" yields almost 8,500 scientific articles for the period 1927-2012 (WoS, 2012). However, there is a lack of coordination of scientific and monitoring activities (Rosabal & Debonnet, 2005; Moore et al. 2009).

Overall assessment of protection and management

Serious Concern

The current protection and management regime of the property is ineffective in relation to the main current and emerging threats (mainly water pollution, uncontrolled development of tourism infrastructure and potentially unsustainable natural resource use). This ineffectiveness is primarily caused by the fragmented and complicated institutional setup for management, lack of integrated legal framework, as well as a number of secondary weaknesses, such as low levels of funding and differences in human resources capacities of component protected areas that make up the property.

► Assessment of the effectiveness of protection and management in

addressing threats outside the site

Some Concern

A number of threats originate from outside the property, including pollution, uncontrolled tourism infrastructure development and recently potential threats from hydropower projects development in Mongolia. An integrated approach, centred on the protection of the Outstanding Universal Value of the site, is urgently needed in order to guarantee its long-term protection and ensure inter-sectorial coordination to mitigate and prevent these multiple threats.

State and trend of values

Assessing the current state and trend of values

World Heritage values

► Oldest, deepest and largest (by volume) freshwater ecosystem in the World

Low Concern
Trend:Stable

Lake Baikal remains the oldest and largest freshwater body in the world; however, its ecosystem is becoming increasingly threatened by a number of negative factors (see below).

► Freshwater invertebrate fauna

High Concern
Trend:Deteriorating

There is a clear scientific evidence of worrying ecological processes, rapidly progressing within the coastal zone. The most harmful is the mass extinction of the main natural biofilters of the coastal zone – endemic Lubomirskiidae sponges at the scale of entire Lake. Rapid and mass proliferation of the Spirogyra algae (observed along ca. 30-40-50% of the coastal line); mass development of cyanoprocaryotes (with proven ability to produce dangerous toxins) in the near shore zone and on the sponges; giant algal wash-ups; significant changes in the structure and quantitative characteristics of the

near-the-settlement planktonic communities; are just some of the examples showing the deep and rapid ecological degradation of the coastal zone which became evident in the last five years (Timoshkin, et al., 2015; Timoshkin, 2016).

► Freshwater vertebrate fauna

High Concern
Trend:Deteriorating

General information and estimations of the total number and biomass of the leading commercial fish species, Coregonus migratorius (omul) in the lake differs significantly between the data provided by academic Limnological Institute SD RAS (Irkutsk, obtained by hydroacoustic method) and by the federal Baikalrybvod (Ulan-Ude, obtained by traditional net sampling and counting of the spawning specimens, entering the rivers). In any case, the fishing deficiency is evident at present. The number of the spawning omul population decreased by approximately 2 times (Romanov, 2014). According to preliminary estimations, 2.7 million fish entered the Upper Angara for spawning in 2010, while in 2013 this number decreased to just 1.1 million (http://newsbabr.com/?IDE=123924).
There is no scientifically supported and generally accepted viewpoint on this problem so far. Illegal fishing, structural changes in the pelagic ecosystem (including food sources for omul), changes in temperature regime and pollution are considered as the main issues. The respective governmental organizations (such as Rosrybolovstvo, or the Federal fishery agency) announced the necessity to accept the ban on commercial fishing in 2017. Due to uncertain information and lack of scientific consensus the ban has been postponed until 2018 (http://www.vsp.ru/2017/07/04/nechego-lovit/).

► Freshwater flora

Data Deficient
Trend:Data Deficient

No systematic information about the conservation state of freshwater flora is available.

► Geological features

Good
Trend:Stable

The values associated with the rift valley system are not affected by anthropogenic pressures.

► Freshwater, terrestrial and littoral ecosystems

High Concern
Trend:Deteriorating

Terrestrial ecosystems within the property have so far been preserved, but are increasingly negatively affected by uncontrolled and irresponsible tourism development along an increasing part of the shoreline (IUCN, 2012a, Rosabal & Debonnet, 2005, Rosabal & Rao, 2011). The overall condition and water quality of Lake Baikal in its central and deep zone remain good. However, there is a clear scientific evidence of worrying ecological processes, rapidly progressing within the coastal zone. The most harmful is the mass extinction of the main natural biofilters of the coastal zone – endemic Lubomirskiidae sponges at the scale of entire Lake. Rapid and mass proliferation of the Spirogyra algae (observed along ca. 30-40-50% of the coastal line); mass development of cyanoprocaryotes (with proven ability to produce dangerous toxins) in the near shore zone and on the sponges; giant algal wash-ups; significant changes in the structure and quantitative characteristics of the near-the-settlement planktonic communities; unclear current state of the population of the Baikal omul are just some of the examples showing the deep and rapid ecological degradation of the coastal zone which became evident in the last 5 years (Timoshkin, et al., 2015; Timoshkin, 2016).

Summary of the Values

► Assessment of the current state and trend of World Heritage values

High Concern

Trend: Deteriorating

The hydrochemical parameters and the water quality in the central and deep zone of Lake Baikal remain stable and good. The site still includes large areas of untouched wilderness and natural landscapes. However, there is a clear scientific evidence of worrying ecological processes, rapidly progressing within the coastal zone. The most harmful is the mass extinction of the main

natural biofilters of the coastal zone – endemic Lubomirskiidae sponges at the scale of entire Lake. Rapid and mass proliferation of the Spirogyra algae (observed along ca. 30-40-50% of the coastal line); mass development of cyanoprocaryotes (with proven ability to produce dangerous toxins) in the near shore zone and on the sponges; giant algal wash-ups; significant changes in the structure and quantitative characteristics of the near-the-settlement planktonic communities; unclear current state of the population of the Baikal omul are just some of the examples showing the deep and rapid ecological degradation of the coastal zone which became evident in the last 5 years.

► **Assessment of the current state and trend of other important biodiversity values**

High Concern

Trend: Deteriorating

Together with their ecosystems, terrestrial and littoral flora and fauna are inferred to be increasingly negatively affected by uncontrolled and irresponsible tourism development. Several of the terrestrial species of the property are globally threatened (IUCN, 2012b).

Additional information

Benefits

Understanding Benefits

► **Legal subsistence hunting of wild game**

Legal hunting of wild game in taiga around Lake Baikal is one of the traditional way of life in Irkutsk district and Buryatia for professional hunters (by quotes and licenses) and local communities.

► **Collection of wild plants and mushrooms**

Collection of wild plants (medical grass, wild berries) and mushrooms around

the Lake is practiced by local communities in Irkutsk district and Buryatia.

► Commercial wells

There are several private companies producing bottled Biakal water. One example is “Woda Baikala” (Baikal Water) (http://baikal-water.ru/). It is produced on the coasts of the Lake, in Listvyanka settlement; the water is pumped from the depth of about 500 m, about 1500 m from the shore line. Lake Baikal is an inertial system: it needs approximately 400 years to completely substitute its waters from its tributaries. The integral influence of certain mechanisms of exchange causes the annual partial renewal of deep Baikal waters. The age of Baikal water at a depth of over 250 m changes from 7.2 to 11.1 years in different years and different areas. The age was determined with the help of such chemical tracers, as dissolved atmospheric freon and tritium/helium (for References, see Khodzher et al., 2006). Therefore the water, taken for bottling from the depth of 500 m is significantly older and, therefore (at least, theoretically), less influenced by the current negative processes (pollution).

► History and tradition

Lake Baikal area is full of archeological enigmas and is the real center of archeological investigations (Karnyshev, 2010: http://irkipedia.ru/content/arheologiya_baykalskoy_prirodnoy_territorii_karnyshev_d_ba
. There are many historical memorials such as ancient (ca. 2500 years old) rock paintings in Aya, Sagan-Zaba and other bays (human bodies, fish, different animals etc.). The map of the main archeological sites, monuments and excavations includes 61 separate stations; their short description is given by Gryunova, (2012).

► Sacred natural sites or landscapes

The are very many sacred natural sites and landscapes, mostly associated with buddhism tradition. One of the most famous ones is Shamany Cape on Olkhon Island.

► Sacred plants or animals

Historically, many local species have been considered as sacred by local people (buryats, evenks and others). These species include the Baikal seal

and the brown bear.

► Collection of medicinal resources for local use

A large number of plant, animal and mineral resources have been used for medical purposes. The most famous one is fat of Baikal seal (traditionally used to heal and prevent lung diseases).

► Outdoor recreation and tourism

Baikal provides excellent and exciting possibilities for outdoor recreation and tourism for different types of visitors.

► Contribution to education

Due to unique biological and geological features, Lake Baikal is inspiring and admired destination of scientists and students around the world. It is known, that the Lake is an embryonic ocean. Many geological features of the Lake (age, large volume and depths, sediment thickness, presence of hydrovents, etc.) and biological peculiarities (presence of seal, pelagic sculpins, amphipods; specialized cryophilic, hydrovents) are similar with oceanic ecosystems. Commonly accepted, that Baikal is a natural laboratory for investigations of riftogenesis, general questions of evolution, speciation, etc. Therefore, many regular international expeditions, summer schools, symposia, etc. in fields of ecology, geology, tourism and recreation, etc. (for example, Swiss-Russian; Japanese-Russian) and field excursions have been organized during last decades. The international collaboration and students exchange is quite intensive.

► Carbon sequestration

The area around the Lake is very poorly populated; the giant regions of the Lake’s catchment area are covered by wild taiga and forests with high capability for carbon sequestration

Deforestation and taiga fires are the most dangerous negative factors affecting the provision of this benefit.

► Tourism-related income, Provision of jobs

It is difficult to estimate the importance of Lake Baikal for the economy of Irkutsk district and Buryatia, but it is very significant. Standard official estimations of the total tourist-related income for Irkutsk district in 2015 differs within 0.7 – 1 % of the total income (see, for example, http://guberniya38.ru/razvitie-turizma-v-pribajkale/). Interestingly, how the independent experts estimate the development of Pribaikalye region for the nearest future (one of the factors – tremendous annual growth of the Chinese tourist number): increasing the total tourist number till 5 million people will provide job opportunities for about 50, 000 people. The total annual economic effect will be as high as 700 billions of roubles.

Summary of benefits

Generally, Lake Baikal provides an extremely wide range of rich and partly as yet unutilized benefits which – provided the property is managed in a sustainable way – may contribute significantly to the livelihoods, economy, science and spiritual well-being of local inhabitants, the citizens of the Russian Federation and humankind. Lake Baikal harbors an enormous quantity of pure drinking water and an unusual diversity of endemic life forms (Kozhov, 1963; Timoshkin, 2001). Specifically, Baikal contains one fifth of the total amount of unfrozen freshwaters of the globe. Lake Baikal is first among lakes in terms of its exceptional taxonomic diversity; more than 2660 animal and more than 1000 plant species and subspecies have been described, with ca. 60% of the animal species being endemic (Timoshkin, 2010-2011). Therefore, the lake is an ideal natural laboratory for investigating questions regarding evolution and processes of endemic speciation. Many endemic invertebrates (sponges, for instance) should be considered as potential sources for new biologically active substances and medicines (for example - antibiotics).

Projects

Compilation of active conservation projects

№	Organization/ individuals	Project duration	Brief description of Active Projects
1		From: 2017 To: 2017	

№	Organization/ individuals	Project duration	Brief description of Active Projects
2		From: 2017 To: 2017	
3		From: 2017 To: 2017	

Compilation of potential site needs

№	Site need title	Brief description of potential site needs	Support needed for following years
1			From: 2017 To: 2017
2			From: 2017 To: 2017

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