Situated on the shores of Lake Ohrid, the town of Ohrid is one of the oldest human settlements in Europe. Built mainly between the 7th and 19th centuries, it has the oldest Slav monastery (St Pantelejmon) and more than 800 Byzantine-style icons dating from the 11th to the end of the 14th century. After those of the Tretyakov Gallery in Moscow, this is considered to be the most important collection of icons in the world © UNESCO

SUMMARY

2020 Conservation Outlook Assessment

Finalised on 04 Dec 2020

The natural values of the site have been under pressure from various factors. Urban and beach developments, both with licensed and illegally constructed buildings, have evidently modified the natural shore of Lake Ohrid and urban constructions have been ongoing within the boundaries of Galičica National Park. Tourism is particularly evident during the summer months and creates additional pressures on the World Heritage site which lacks appropriate visitor management and control measures. The site also struggles with effective waste management, including solid waste and wastewater. Even though a wastewater management system exists for Pogradec in Albania, this is still fully or partially lacking for surrounding rural areas. In North Macedonia, 35% of wastewater produced in Ohrid and Struga municipalities is not treated, with the system coverage of rural areas being especially low. Untreated sewage regularly flows into the lake. Bukovo landfill, located in the World Heritage site, does not meet the EU standards and poses high risk of contamination of the environment. Generally, the majority of areas outside of Ohrid and Pogradec towns is not included in the public service of communal waste collection, thus there are many illegal dumping sites in the World Heritage site, affecting the health of the ecosystems. There is ongoing eutrophication of the lake, especially near the mouths of the inflowing rivers. The hydrological balance of the lake has been disturbed by uncontrolled discharges of lake water to Crn Drim river. In the long-term, this could severely affect the lake’s ecosystem which has already been under pressure from invasive species. Some native species are considered endangered due to the spread of invasive species, sometimes
introduced through illegal fish farming. Wetland habitats have been almost entirely usurped for other purposes. Unsustainable fishing, both legal and illegal, has led to consistently decreasing fish stocks, especially of the native Ohrid trout, despite annual repopulation efforts. Although the Springs of Saint Naum are supposedly a Zone of Strict Protection noted for their high prevalence of rare and endemic species, tourism facilities are a visible pressure. Furthermore, former mining activity and the presence of unmanaged brownfields/dumpsites in Albania are an extremely serious threat to the World Heritage site which, if left unchecked, will severely impact the whole region. Heavy metal content in Memëlisht dumpsite is at such high values (e.g. nickel up to 40 times the EU limit, chromium up to 20 times) that threatens local fauna and flora, as well as human health. The transboundary extension of the World Heritage site to the Albanian side of the lake, achieved in 2019, was a welcome first step towards common management and protection of Lake Ohrid. However, the buffer zone of the North Macedonian side is completely missing and would be necessary to ensure better protection of the site, especially as about 30% of Galičica National Park, as well as the Prespa Lake, that forms a common ecosystem with Ohrid Lake, are both excluded from the site. The existing management institutions suffer from lack of staff and insufficient budget and therefore have little capacity to ensure effective protection of the site’s natural values. Although management policies and arrangements are mostly in place, in practice many of these are inefficient. Management effectiveness of the site is of concern due to lack of financial and human resources, as well as poor enforcement of the regulations (e.g. over exploitation of natural resources by way of overfishing and illegal timber harvesting). Lake Ohrid and the Studenčišća Marsh are not legally protected areas which may lead to further uncontrolled exploitation of natural resources. There are many development projects planned within the World Heritage site (e.g. beach development projects, Ljubaništa 1 and Ljubaništa 2 hotel and housing complexes, Waterscape Park Design of Drilon-Tushemisht, 400-boat marina in Studenčišća marsh, highway A2, railway line Kičevo-Lin), showing the lack of understanding of the meaning of World Heritage protection and appreciation for natural and cultural values of the site.
FULL ASSESSMENT

Description of values

Values

World Heritage values

► A unique lake of tectonic origin supporting high diversity of endemic and relict freshwater species

World Heritage Committee, 2015).

The Ohrid Lake is classified as a mountainous clear water lake of tectonic origin. It is a deep and ancient lake that has existed continuously for approximately two to three million years, enabling uninterrupted biological activity which resulted with numerous endemic and relict freshwater species of flora and fauna. Overall, the lake’s oligotrophic waters contain over 200 endemic species. The lake’s fish fauna includes 17 native species, of which 10 are endemic (two of which belongs to Salmonidae family). The benthic fauna of Lake Ohrid is characterized by a high degree of richness and diversity of archaic, endemic and relic forms that originate from Tertiary period. The rounded sponge Ochridospongia rotunda is a famous endemorelict form that is found only in Lake Ohrid. The highest diversity and the highest percentage of endemism are present in class Gastropoda; about 86% of the 50 known species of gastropods are endemic. Other classes with high degree of endemism include Tricladida (80.5%), Oligochaeta (47.2%), Hirunidea (52.4%), Ostracoda (71.4%), Amphipoda (60%), and Isopoda (75%). Endemism is present also in the microalgae species. About 90 species of the 550 species of diatoms are rare, Tertiary relict, or endemic species. 146 endemic species have been identified. Endemism among these species is 90% of snails, 88% of parasitic infusoria, 71% of flat worms, 66% of small crustaceans and 60% of fish (MEPSO, 2012).

► Important wintering site of Palaearctic waterbirds

The Lake Ohrid region harbours a rich birdlife and is considered to be an important wintering site for Palaearctic waterbirds. In total, 89 species of waterbirds have been recorded on the lake and its surroundings. The highest number of individual wintering waterbirds on the lake was observed in 1989, with about 79,000 individuals. The avifauna of the lake includes, among others, Coot (Fulica atra), Great Cormorant (Phalacrocorax carbo sinensis), Mute Swan (Cygnus olor), Black-necked Grebe (Podiceps nigricollis), Little Grebe (Tachybaptus ruficollis), Red-crested Pochard (Netta rufina), Common Pochard (Aythya ferina), White-eyed Duck (Aythya ferruginea), Tufted Duck (Aythya fuligula) and Corncrake (Crex crex).

Other important biodiversity values

► Faunal species richness, including endemism

Mount Galičica has one of the highest faunal species abundance and presence of endemism both at national and European levels. In an area of less than 25,000 ha, there are more than 3,200 species of fauna (including birds). 72 species are considered locally endemic, while 103 taxa are considered endemic at national or Balkan level. 12 mammal species are categorized as Near Threatened or Vulnerable according to the IUCN Red List of Species. From the 27 mammal species, 17 belong to the bat group (Vespirolaphidae, Vespertilionidae, and Molossidae). Six species are Balkan endemics, including Balkan Mole (Talpa stnakovici), Balkan Chamois (Rupicapra rupicapra balcanica), Balkan Lynx (Lynx lynx martinoi), Balkan Snow Vole.
Dinaromys bogdanovi), Felten's Vole (Microtus felteni), and Macedonian Mouse (Mus macedonicus). Brown Bear (Ursus arctos), Wolf (Canis lupus), Wild Cat (Felis silvestris) and Otter (Lutra lutra) are all present in the National Park Galičica (Nacionalen Park Galičica, 2010).

**Diversity of habitats**

A high diversity of habitats is found in the World Heritage property, extending from the Ohrid Lake at 650 m a.s.l up to the highest mountain tops of Galičica (Peak Magaro 2254 m a.s.l.), and consisting of aquatic habitats, freshwater springs, wetlands, reed belts, broad leave forests and alpine pastures on karstic soils, rocks, cliffs and caves (Nacionalen Park Galičica, 2010). At Galičica National Park level, there are more than 35 habitat types, and out of rare or endangered habitats in Europe, the park accommodates 10 forest types, 2 shrubby types, 4 grass types and 2 hasmophytic types of vegetation. European importance is also present in 2 aquatic habitat types and 3 habitat types associated with underground geomorphological forms.

**Rare and endemic flora**

Mount Galičica contains 1,597 taxons of vascular plants, 143 species of lichens, 435 species of fungi and 117 species of algae, 39 of which are regarded as endemic (Citrus, 2015). It is considered to be one of the floral “hotspots” at European level. 19 taxa of higher plants have the status of Rare (R) species according to the IUCN’s Red List of Threatened Plants and they are found in all parts of the mountain, from its lowest parts, all the way to its subalpine strip. These include the following: Ramonda serbica Pančić, Aikanna noneiformis Griseb., Acer heldreichii Orph. ex Boiss., Ajuga piskoi Degen & Bald., Cynoglossus barrelieri (All.) Vur. & Tan subsp. serpentinica (Rech. f.) Vur. & Tan, Astragalus baldacci Degen, Centaurea soskae Hayek ex Košanin, Erodium guicciardii Heldr. ex Boiss., Eryngium serbicum Pančić, Fritillaria gussichiae (Degen & Dörfl.) Rix, Jurinea taygetea Halácsy, Malus florentina (Zuccagni) C.K.Schneid, Melampyrum heracleoticum Boiss. & Orph., Oxytropis purpurea (Balddacci) Markgraf, Pinus heldreichii H. Christ var. leucodermis (Ant.) Markgraf ex Fitschen, Pinus peuce Griseb., Rindera graeca (A. DC.) Boiss. & Heldr., Solenanthus scardicus Bornm. & Viola eximia Form (Nacionalen Park Galičica, 2010). Floral research conducted on Mount Galičica throughout a longer period of time showed that the mountain, i.e. Galičica National Park, is the only habitat to many plant taxons, belonging to various floral elements from various parts of the Balkan Peninsula and from Europe. These have, so far, not been found in other parts of the former Yugoslav Republic of Macedonia, and their presence on Mount Galičica speaks of the ecological capacity of this mountain as well. Such is the case with the following taxons: Alyssum subvirescens Form., Astragalus gremlii Burnat, Celtis glabrata Steven ex Planchon, Cephalaria setulifera Boiss. & Heldr., Coronilla vaginalis Lam., Crepis vesicaria L., Cytisus procumbens (W.K.) Spr., Damasonium bourgaei Cass., Euphorbia characias L. subsp. wulfenii (Hoppe ex W. Koch) A.R. Smith var. sibthorpii (Boiss.) E.S.Boiss., Gphalium hoppeanum Koch., Lapllyphyllum patavinum (L.) Don f., Hesperis rechingerii Dvorák, Jurinea taygetea Halácsy, Lilium chalcedonicum L., Marubium anisodon C. Koch, Prunus prostrata Labill., Sedum laconicum Boiss., Silene chromodonta Boiss. et Reuter var. vandasii Neum, Thymes pericinus (Hal.) Stoj., Stef. & Kit., and Trifolium sebastiani (Nacionalen Park Galičica, 2010).

**Assessment information**

**Threats**

**Current Threats**

The main threats arise from several factors affecting the site. Former mining activity and the presence of unmanaged brownfields/dumpsites threatens local fauna and flora, as well as the whole Lake Ohrid region, with heavy metal contamination. Increased coastal development, both with licensed and illegally constructed buildings, brought along higher human pressure to the World Heritage site. This goes in line with increased amount of wastewater and solid waste, both of which are inadequately collected and treated. Thus inefficient wastewater and communal waste management is another significant problem, exacerbated during the summer season with increasing number of tourists. Wetland habitats are severely reduced and face continuing pressure, contributing to the loss of nesting/spawning locations for birds and
fish and deteriorating Lake Ohrid's capacity to buffer nutrient inflow (Kostoski et al, 2020; Apostolova et al, 2016; Spirovsk et al, 2020; Vermaat et al, 2020). Intensive agriculture contributes to the pollution and eutrophication of surface and groundwaters (Ministry of Environment and Physical Planning, 2020). Hydrological balance of the lake has been interrupted by natural system alterations and mismanagement, which might affect the health of the ecosystem in the long-term. Unsustainable fishing, both legal and illegal, has led to consistently decreasing fish stocks, especially of the native Ohrid trout. Invasive species, sometimes introduced through illegal fish farming, seem to pose a serious problem and endanger native species. Pressures arising from the operation and mooring of boats require upgraded management solutions.

**Invasive Non-Native/ Alien Species (Invasive species)**

Several invasive species have been found in Lake Ohrid such as the Canadian waterweed (Elodea canadensis), the Acute pond snail (Physa acuta), the amphipod Gammarus roeseli, and the fish species Rainbow trout (Oncorhynchus mykiss), Silver carp (Hypophthalmichthys molitrix), Stone moroko (Pseudorasbora parva), Prussian carp (Carassius gibelio), Eastern mosquitofish (Gambusia holbrooki), Pumpkinseed (Lepomis gibbosus) and European bitterling (Rhodeus amarus). Invasive fish species such as Rainbow Trout, Silver Carp, Stone Moroko, and Bitterling are competitors of the native fish population (GIZ, 2016). The Rainbow Trout is of particular concern, since it might displace the native, and also endemic, Ohrid Trout. Several endemic species are considered endangered due to the presence of invasive species (UNESCO, ICOMOS and IUCN, 2017). Also, invasive species are one of the reasons for the observed changes in the population of endemic species, especially relating to the move of the endemics away from the mouths of the rivers deeper into the lake (UNESCO, ICOMOS and IUCN, 2017).

**Fishing / Harvesting Aquatic Resources (Unsustainable fishing)**

Fishing in the region, primarily of the endemic Ohrid trout (Salmo letnica), belvica (Salmo ohridanus) and eel species, is poorly regulated, monitored and enforced. The number of licensed fishers in Albania has doubled in the last decade, and the activity is certainly unsustainable with frequent seizures of illegal fishing nets by the authorities in both countries, despite the operation of hatcheries (Civil Engineering Institute “Macedonia” JSC Skopje 2019, IUCN 2019a). In January 2020, the North Macedonian government terminated the fishing concession agreement with the responsible concessionaire due to irregularities (e.g. no protection of fish stocks, no accurate records of caught fish) (Ohrid SOS, 2020). There is no data available on the status of endemic fish populations but Jordanova et al. (2016) noted that Ohrid trout stocks have been consistently decreasing over the last decades, despite annual repopulation efforts.

**Housing/ Urban Areas, Tourism/ Recreation Areas (Extension of urban (coastal) development)**

A significant increase in the urbanization of the lakeshore, involving both legal and illegal construction, means fragmentation and degradation of its ecological continuity, as well as higher disturbance of littoral habitats and by this a deterioration of the fish hatchery sites and calm wintering sites for water birds. The last fully functioning remains of Lake Ohrid's coastal wetland at Studenchishte Marsh and parts of National Park Galichica have been encroached with construction resulting in habitat loss and associated disturbance (Spirovsk et al, 2012; Citrus Partners, 2015; Apostolova et al, 2016; Society of Wetland Scientists, 2018). Additionally, various development increases the pressures on already inefficient solid waste and wastewater management systems and contributes to further water pollution. Poor planning and management results in inappropriately located constructions: A plant nursery "Rasadnik" constitutes a risk to groundwaters on the north-east coast (Spirovsk et al, 2020) while tourism facilities are visibly pressuring the Springs of Saint Naum, a hotspot for endemism (Ministry of Environment and Physical Planning, 2020). In summer, more leisure activities can be observed along the lakeshore with potentials of negative impact on the shallow parts of the Ohrid Lake.
Organic pollution is endangering the endemic fauna and flora of the lake, which still is characterized as oligotrophic clear water lake (GIZ, 2016), although some localized areas in the littoral indicate moderate to immense nutrient pollution; river inflows register eutrophic conditions; and hypereutrophic conditions have been recorded in the vicinity of wastewater filter stations (Trajanovska et al, 2014; Center of Public Health records via Ohrid SOS, 2020). Visitor pressure and disturbance occurs especially during the summer months and is mainly related to the use of the lake (swimming, boating), and Galičica National Park (hiking, off-road vehicles), in addition to visiting cultural sites. There is no visitor monitoring system as to allow estimation of visitor numbers, nor there is an active visitor management plan for the property.

The diverting of River Sateska into Lake Ohrid in the 1960s had major negative impacts on the lake’s water quality and level. It became the largest source of phosphorus, a major source of nitrogen, and contributed to the inflow of sediments (over 100,000 m3/year) leading to coastal alterations and eutrophication (Civil Engineering Institute “Macedonia” JSC Skopje 2019). Additionally, changing water flow patterns from their natural range of variation either deliberately by human action or as a result of other activities (prolonged dry periods) is evident in the property. Conversion of the River Studenchishka into Studenchishte Canal several decades ago has redirected and slowed its flow, increased siltation, and impacted its communication with surrounding wetland habitats, for example (Spirovska et al, 2020). Of special concern is the mismanagement of lake water discharge into Crn Drim river by North Macedonian power plants company (ESM), which resulted in low water level of the lake (UNESCO, ICOMOS and IUCN, 2017). In the long-term, such situation may have critical impacts on the lake ecosystem. Meanwhile, dams act as a barrier to the migration of the critically endangered European eel (Anguilla anguilla) and artificial stocking of the species is the suspected explanation for the introduction of parasites to Lake Ohrid (Stojanovski et al, 2010).

Untreated sewage discharges occur in settlements without wastewater management systems that use inappropriate septic tanks, contributing to eutrophication of the lake and endangering underground waters. Even though a wastewater management system exists for Pogradec in Albania, this is still fully or partially lacking for several of the surrounding rural areas (Bolles + Wilson & IDRA & S. Guri 2015). While in North Macedonia, 35% of wastewater produced in Ohrid and Struga municipalities is not treated i.e. they are directly discharged into the lake, with the sewage coverage of rural areas being especially low (Civil Engineering Institute “Macedonia” JSC Skopje 2019). Solid waste management is also problematic due to inadequate waste collection, separation and treatment; as well as the existence of irregular/illegal dumpsites and landfills which lead to soil, water and air contamination. In Albania, 70% of areas outside Pogradec are not served by a waste collection system. The irregular landfills of Alarup in Albania, as well as Bukovo, Maucker and Struga in North Macedonia are well-known for impacting on the environment, with Bukovo even being characterized as high-level risk (Bolles + Wilson & IDRA & S. Guri 2015, Civil Engineering Institute “Macedonia” JSC Skopje 2019). Pollution of riverine inflows to Lake Ohrid is associated with Bukovo (Lokoshka, 2019). Levels of cadmium in Ohrid trout (Salmo letnica) muscle tissue are higher than critical limits for human consumption established by the European Union and the United Nations Food and Agriculture Organization (Marchetti et al, 2019). Microplastics, pharmaceuticals, and personal care products may have local impacts that have not yet been researched (Hampton et al, 2018).

Forest fires occur from time to time in the World Heritage site and alter the forested habitats. The last
devastating fire in Galičica National Park broke out in 2007, destroying much of the Common Juniper (Juniperus communis) stands. The park is experiencing change in the land use which affects more often occurrence of forest fire, i.e. less grazing and more accumulation of biomass in the juniper range (Nacionalen Park Galičica, 2010).

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<thead>
<tr>
<th>Category</th>
<th>Threat Level</th>
<th>Inside Site</th>
<th>Outside Site</th>
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<tbody>
<tr>
<td><strong>Marine/ Freshwater Aquaculture</strong></td>
<td>High Threat</td>
<td>Inside site, localised(&lt;5%)</td>
<td>Outside site</td>
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<tr>
<td>(Aquaculture)</td>
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<td>Fish farms in Albania, namely in the Drilon and Tushemisht springs area, breed exotic species such as the rainbow trout (Oncorhynchus mykiss) and lead to pollution from antibiotics and other chemicals used by fish farmers. High levels of nutrients such as phosphorus and nitrogen, which accelerate eutrophication, have been detected in nearby streams (Bolles + Wilson &amp; IDRA &amp; S. Guri 2015). This is especially alarming since these springs feed the lake with cool, clean and oxygen rich water, being critical to maintaining the oligotrophic status and the endemic biodiversity of the lake. Nutrient pollution has also been associated with the hatchery at the Hydrobiological Institute Ohrid (Trajanovski et al, 2019; Spirovska et al, 2020).</td>
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| **Mining/ Quarrying**                          | Very High Threat | Inside site, localised(<5%) | Outside site |
| (Former mining activity)                       |              |             |              |
| Former mining activity and the presence of unmanaged brownfields/dumpsites in Albania represent an extremely serious threat to the World Heritage site. If left unchecked, this situation will lead to highly toxic soil, water and air pollution from heavy metals and will severely impact the whole Lake Ohrid region. In Memelisht, a mining dumpsite by the lakeshore is considered a dangerous “Hot Spot” due to the presence of hazardous waste. Soil monitoring undertaken in the area showed toxic levels of nickel (up to 40 times the EU limit), chromium (up to 20 times), cobalt (up to 6 times) and lead (up to 2 times). Very high levels were also observed for manganese (1086-1396 µg/kg.) Heavy metal content is at such high values that threatens local fauna and flora, including harvested fish species and cultivated plant species (Bolles + Wilson & IDRA & S. Guri 2015). |

| **Logging/ Wood Harvesting**                    | Low Threat    | Inside site, widespread(15-50%) | Outside site |
| (Wood harvesting)                              |              |             |              |
| A significant amount of wood harvesting still occurs in the region. Most households in Pogradec municipality (Albania) rely on wood for cooking and winter heating. Total demand has not been formally measured, but it is likely to exceed 55,000 m3 per year. It is unlikely that fuelwood production is sustainable (Pogradec Protected Landscape 2017). This represents a threat to the landscape and ecological integrity of the area, and demand is likely to increase as the local population increases. If left unchecked, it will lead to soil erosion, siltation of the lake, possible flash floods and will amplify the impacts of climate change. Galičica National Park has been traditionally managed as a forest enterprise (e.g. timber extraction) to finance itself. |

| **Crops**                                      | High Threat  | Inside site, widespread(15-50%) | Outside site |
| (Intensive Agriculture)                        |              |             |              |
| Large areas of wetland have been drained and converted into agricultural land over the past century, including almost the entire 500-hectare former Struga Marsh. Alongside urban expansion and tourism/recreation, orchards and crop-farming continue to threaten the last remnant of fully functional coastal wetland at Studenchishte Marsh, whose previous importance as a nesting site for birds has almost been completely lost and where possible local extinctions of nationally rare flora have been recorded (Spirovska et al, 2012; Apostolova et al, 2016). Around 4,000 tonnes of artificial fertilizer are used in the Ohrid basin annually (Ministry of Environment and Physical Planning, 2020). Estimates are not available for natural fertilizers. Agricultural run-off including herbicides and fertilizers is a contributor to eutrophication, especially where rivers run through farmland (Kostoski et al, 2010; Apostolova et al, 2016; Ministry of Environment and Physical Planning, 2020). Pesticides are in widespread use (45,400 litres per year in the basin), and banned substances have been recorded in fish tissue, although the
bioaccumulation impact cannot be comprehensively gauged from the current state of research (Ministry of Environment and Physical Planning, 2020). Soil acidification is an additional risk. Exacerbated by low water levels such as those seen in 2019, nutrient inflow as a result of farming has accelerated eutrophication at Lake Prespa. Knock-on effects to Lake Ohrid are considered possible, and continuous monitoring is required to review whether spring-water arriving from Prespa remains chemically stable (Matzinger et al, 2006a).

**Other**

(Data Deficient)

(Spring Capture and Water Abstraction)

Springs within the World Heritage Site such as at Saint Naum, Šum, and Biljanini Springs have been partially tapped for drinking water and other purposes (Kostoski et al, 2010). In the latter case, this has resulted in a reduction in the quantity of water entering the surrounding coastal wetland (Spировска et al, 2020). At Saint Naum, water abstraction contributes to pressure upon one of the most important Ohrid Region habitats for endemic species (Ministry of Environment and Physical Planning, 2020).

**Tourism/ visitors/ recreation**

(Data Deficient)

(Boating)

Boat traffic may interfere with the spawning of fish as well as contribute to damage of the species-rich littoral zone (Kostoski et al, 2010). Noise is an additional disturbance, also to the region's birdlife (Kostoski et al, 2010). The current use of Studenchishte Canal (formerly River Studenchishka) as a mooring site, including for decrepit craft, is contributing to pollution of the waterway (Ohrid SOS, 2020; Spировска et al, 2020).

**Potential Threats**

In terms of potential threats on World Heritage values, there are several planned projects which might affect the World Heritage site and its values. Tourism development infrastructure such as Ljubaništâ 1 and Ljubaništâ 2 hotel and housing complexes and the Waterscape Park Design of Drilon-Tushemisht might affect the hydrology of the lake, as these locations correspond to the most important systems of springs feeding into Lake Ohrid and contributing to its oligotrophic status, as well as being important fish hatchery sites. While Studenčišča marsh, where a 400-boat marina and parking facility is planned, is also an important fish hatchery site containing valuable species. This kind of tourism infrastructure, as well as planned beach development, would modify the coast and bring along more tourism pressure and potential pollution. On the other hand, large infrastructure projects, such as highway A2, transmission line Bitola-Elbasan and railway line Kičevo-Lin, would have minimal impacts on the World Heritage values if implemented properly and impact assessments account for all potential impacts, including secondary and indirect pressures associated with railway construction. Though the railway line is likely to have disruptive impacts on the Albanian stretch of the coast, as this is one of the last well-preserved stretches of the whole lakeshore. Furthermore, climate change will shrink the extent of alpine and subalpine habitats on National Park Galichica and influence mixing regimes within Lake Ohrid with potentially far-reaching consequences for rare and endemic flora and fauna.

**Tourism/ Recreation Areas**

(Plans for construction of tourism infrastructure)

Several tourism development projects are planned within the World Heritage site. One of them relates to Ljubaništâ 1 and Ljubaništâ 2 hotel and housing complexes close to Sveti Naum in North Macedonia. This could severely affect the water quality and the habitat quality of the areas as fish spawning ground. It is intended to place 20% of the Ljubaništâ 1 complex in the lake area itself, while the remaining part is planned to be within Galicîca National Park (which would require changes in the management zoning of the park) (Citrus, 2015). Tourism facilities have also been envisaged for other areas, including Konjsko, Kalishta and Gorica. Another planned project is the construction of a 400-boat marina and parking facility in the Studenčišča marsh, an important area containing valuable species and acting as fish hatchery. This would increase human disturbance in the area as well as lead to the degradation of water quality and possible introduction of alien species. Extensive digging would be required to ensure water quality.
depth for such a large marina, resulting in wide-scale habitat loss (Ohrid SOS, 2020). Also, there is the Waterscape Park Design project of Drilon-Tushemisht in Albania. The project design mentions the illegal fish farms in the Drilon springs as an opportunity to improve and increase their production (PROAP, 2019). This could increase their polluting activity and potential for introduction of invasive species. There are also several planned beach development projects, including beach development in the Ohrid Municipality; Lagadin Beach, Daljan Beach, beach near the Scout Camp (120 m long), beach on the stretch from Studencišta marsh to the Park Hotel (700 m long), and beach located in Debarca Municipality (State Party of FYR of Macedonia, 2017).

**Roads/ Railroads**

(Railway planned from Kičevo-Lin)

The railway line Kičevo-Lin is part of the pan-European corridor VIII. There are possible impacts on the quality of the lake water in case of incidents and substance run-offs during the construction and operation phases (Public Enterprise for Railway Infrastructure “Macedonian Railways”, 2010). With relevant precautionary measures, such incidents should be avoided. However, the railway line is likely to have disruptive impacts on the Albanian stretch of the coast, as this is one of the last well-preserved stretches of the whole lakeshore (UNESCO, 2019). Railway construction will also reduce the possibility for future revitalization of Struga Marsh (UNESCO, ICOMOS and IUCN, 2017).

**Roads/ Railroads**

(Highway A2 planned from Trebenište-Struga-Kjafasan)

A2 highway is planned in the northern part of the World Heritage site, from Trebenište to Struga (section 2) and from Struga to Kjafasan (section 3), as part of the pan-European corridor VIII. It passes through agricultural lands and would have minimal impact to the lake if all precautionary measures are taken and pollution of Sateska river channel avoided (Public Enterprise for State Roads, 2015). However, concerns have been expressed that possible impacts of the project on the Outstanding Universal Value of the site have not been fully assessed (UNESCO, 2019; World Heritage Committee, 2019).

**Tourism/ visitors/ recreation**

(Off-road vehicle tourism)

In Galičica National Park, some companies operate off-road, 4x4 vehicle tourism activities (total of 40 vehicles allowed inside park premises). If not properly managed, these activities can lead to increased noise disturbance, inappropriate waste disposal, habitat destruction through crushing of flora, soil erosion, water pollution, human-wildlife conflict, and introduction of invasive species (Ohrid SOS 2020).

**Utility / Service Lines**

(Gas pipeline)

A gas pipeline is planned to connect North Macedonia (Skopje) to Albania, with connecting branches towards Ohrid, Debar and Struga in the North Macedonian part. This project will be located along the Struga plains, together with the railway, highway A2 and transmission line projects.

**Utility / Service Lines**

(Transmission line)

This project concerns the construction of a 400kV transmission line from Bitola – Elbasan, connecting North Macedonia and Albania. It would have minimal impact to the lake if all precautionary measures are taken. It is essential that careful mitigation measures are put in place to reduce the risk of bird collision and electrocution (AD MEPSO 2015). This project will be located along the Struga plains, together with the railway, highway A2 and gas pipeline projects.
Natural and Cultural Heritage of the Ohrid region - 2020 Conservation Outlook Assessment

**Habitat Shifting/ Alteration**

*Rising temperatures*

Lake Ohrid is expected to experience decreased vertical mixing and less frequent deep convective mixing as global temperatures increase (Matzinger et al, 2007). Over time, this is predicted to interplay with eutrophication pressures and contribute to a decline in dissolved oxygen levels, particularly in deep water locations, impacting endemic fauna (Matzinger et al, 2007). Littoral and shoreline vegetation may mitigate some of these effects if appropriately managed, albeit with associated ecological shifts (Vermaat et al, 2020). However, the remaining Lake Ohrid wetland is itself considered at risk of irreversible changes to its ecological functioning as a result of climate change combined with other human impacts (Melovski et al, 2014).

The narrow range of endemic in-lake species, which may inhibit their ability to adapt to warming conditions, is an additional concern (Markovic et al, 2017).

Situated in the south of Europe with a small alpine zone, Mount Galichica is at significant risk from climate change. Alterations to the snowpack and a narrowing of subalpine and alpine habitats on its upper reaches is anticipated, with associated threat to species such as Crocus cvijici (Melovski et al, 2014).

**Overall assessment of threats**

The main threats arise from several factors affecting the site. Former mining activity and the presence of unmanaged brownfields/dumpsites threatens local fauna and flora, as well as the whole Lake Ohrid region, with heavy metal contamination. Increased coastal development, both with licensed and illegally constructed buildings, brought along higher human pressure on the World Heritage site. This is linked to increased amount of wastewater and solid waste, both of which are inadequately collected and treated. Thus inefficient wastewater and communal waste management is another significant problem, exacerbated during the summer season with increasing number of tourists. Intense agriculture; wetland loss and deterioration; and boating are additional threats. Ecological shifts towards more pollution tolerant and cosmopolitan species have been observed in areas of Lake Ohrid where pressures such as nutrient inflow are elevated (Lorenschat et al, 2014; Cvetkoska et al, 2018; Trajanovski et al, 2019). Hydrological balance of the lake has been interrupted by natural system alterations and mismanagement, which might affect the health of the ecosystem in the long-term. Unsustainable fishing, both legal and illegal, has led to consistently decreasing fish stocks, especially of the native Ohrid trout. Invasive species, sometimes introduced through illegal fish farming, seem to pose a serious problem and endanger native species. In terms of potential threats on World Heritage values, there are several planned projects which might affect the state of the property and its values, such as Ljubaništa 1 and Ljubaništa 2 hotel and housing complexes, the Waterscape Park Design of Drilon-Tushemisht, and the 400-boat marina and parking facility at Studeničišća marsh. The first two locations correspond to the most important systems of springs feeding into Lake Ohrid, and all three locations are important fish hatchery sites. This kind of tourism infrastructure, as well as planned beach development, would modify the coast and bring along more tourism pressure and potential pollution.

**Protection and management**

Assessing Protection and Management

**Management system**

In North Macedonia, the World Heritage site is managed by several institutions: the Ministry of Culture, the Ministry of Environment, the Institute for Protection of Monuments of Culture and Museum - Ohrid,
the Natural History Museum Dr Nikola Nezlobinski - Struga, Galičica National Park, the Institute for Hydrobiology in Ohrid. Integrative management of natural and cultural components is supposed to be assured through the functioning of the Commission for Management of the Natural and Cultural Heritage of the Ohrid Region, whose members were appointed in May 2017. In Albania, the World Heritage site is managed by the Regional Administration for Protected Areas - Korçë, the Regional Directorate for Cultural Heritage - Korçë, and the Municipality of Pogradec. Despite being established on paper since April 2015, the Management Committee for the Pogradec Protected Landscape has never met.

Draft Management Plan for the World Heritage site in North Macedonia was prepared in 2010, and further revised in 2015 and again in 2019. The Management Plan (2020-2029), accompanied by a Strategic Environmental Assessment, was finally adopted by the government on January 2020. The Management Plan for the Pogradec Protected Landscape in Albania was approved in December 2014, and is accompanied by a World Heritage Supplement intending to complement and strengthen the management for the property.

Transboundary cooperation has been ongoing between authorities in both countries, including the following developments: signed Agreement between the Council of Ministers of the two countries for the Protection and Sustainable Development of Lake Ohrid and its Watershed (Skopje, 2004), established Bilateral Lake Ohrid Watershed Committee (2005); signed Agreement on the Protection and Sustainable Development of the Prespa Park Area (European Commission, 2014), inclusion of Galičica National Park in the Transboundary Prespa Park in 2000 and 2010, development of Trilateral Strategy and Action Plan for the Prespa Lake Basin (2012-2016), designation of Ohrid-Prespa Transboundary Biosphere Reserve within the UNESCO Man and the Biosphere Programme (2014), and establishment of the Fund for Nature of Prespa-Ohrid (2017). Despite its authorization in 2005, the constitutive meeting of the Lake Ohrid Watershed Management Committee took place only in January 2020.

Effectiveness of management system

Although management policies and arrangements are mostly in place, in practice many of these are not sufficiently efficient. There is a lack of dialogue and culture of collaboration among different branches of administration at state and local levels, as well as at the transboundary level. Deficiencies have been noted in the general implementation of urban and protected area planning regulations and plans in both States Parties.

In terms of management of Galičica National Park (larger part of which is included in the World Heritage site), UNESCO, ICOMOS and IUCN (2017) noted there are serious problems with management effectiveness of the park due to lack of financial and human resources. Lake Ohrid and the Studenčišća Marsh are not legally protected areas which may lead to further uncontrolled exploitation of natural resources.

While protection of Studenčišća Marsh is envisaged at both local municipality and government level in the Republic of Macedonia, the latest proposal for a Nature Park (Category IV) suggests Zones of Strict Protection and Active Management to cover just 34% of the protected area extent, reduced from 57% of a Monument of Nature (Category III) that was previously proposed in 2012 (Sprivoska et al, 2012; Spirovska et al, 2020). For National Park Galichica, the combined Zones of Strict Protection and Active Management incorporate just 59.6% of the area, which is below the IUCN threshold (Citrus Partners, 2015).

Designation of Lake Ohrid as a Wetland of International Importance under the Ramsar Convention has been repeatedly outlined with various deadlines in editions of the National Biodiversity Strategy with Action Plan for the Republic of Macedonia under the Convention on Biological Diversity but the relevant paperwork is yet to be submitted to the Ramsar Secretariat.

Boundaries

The boundaries of the World Heritage site differ strikingly between the two countries. The lake component represents approximately 95% of the site in Albania while the watershed is in the buffer zone. Whereas in North Macedonia, the watershed has been substantively included within the boundaries of the World Heritage site and no buffer zone exists, which threatens the integrity of the
site. One of the key challenges in defining a buffer zone for the World Heritage site is proper safeguarding of the St. Naum-Drilon spring complexes in Ohrid Lake, which are connected with Prespa Lake through karstic Galicica mountain. Prespa is also seen as a source of invasive species and pollution, so adding it to the buffer zone might ensure effectiveness of Ohrid Lake protection (UNESCO, ICOMOS and IUCN 2017). Also, the current boundary to the east follows the ridge of mountain Galicica cutting the national park and the mountainous ecosystem into two parts.

**Integration into regional and national planning systems**

According to the Management Plan for Natural and Cultural Heritage of the Ohrid Region and the Management Plan for Pogradec Protected Landscape, the integration of regional and national planning seems to be appropriate.

**Relationships with local people**

According to Ohrid SOS (2017 and 2020), public consultations on relevant processes affecting the World Heritage site are largely ineffective. Access to information including final versions of reports/strategic environmental assessments, consolidated active texts of laws, and planning documents is insufficiently facilitated. Participatory management of the World Heritage site should be enhanced through functioning of the recently established Commission for Management of the Natural and Cultural Heritage of the Ohrid Region (North Macedonia) and the Management Committee for Pogradec Protected Landscape (Albania). In North Macedonia, the Commission is composed of 21 members, including members of three relevant municipalities and two NGO representatives. In Albania, the Committee is composed of 15 stakeholders, including members of Pogradec municipality, one NGO representative and one local citizen initiative representative. In terms of transboundary cooperation, civil society representatives have a seat on the bilateral Ohrid Watershed Committee.

**Legal framework**

The World Heritage site has several layers of legal protection afforded by both States Parties. In North Macedonia, the protection of cultural heritage is regulated by the Law on Cultural Heritage Protection (Official Gazette of RM No. 20/04, 115/07), by-laws and the Law declaring the old city core of Ohrid as a cultural heritage of particular importance (Official Gazette of RM No. 47/11). The protection of natural heritage is regulated by the Law on Nature Protection (Official Gazette of RM No. 67/2004, 14/2006 and 84/2007). The following legal instruments are also applicable: the Law on Protection of Lake Ohrid, Lake Prespa and Lake Dojran (Official Gazette of RM No. 45/77) under which Lake Ohrid was proclaimed as a protected area (‘monument of nature’), the Law on Managing the World Cultural and Natural Heritage of the Ohrid Region (Official Gazette of RM No. 75/10), and the Law on Waters (Official Gazette of RM No. 87/08, 06/09, 161/09, 83/10, 51/11, 44/12, 23/13, 163/13, 180/14). The draft Law on Managing the World Cultural and Natural Heritage of the Ohrid Region (not yet officially adopted) is supposed to enable better integration of management of natural and cultural components. Nonetheless, provisions and exceptions in other laws undermine the legal framework (Ohrid SOS, 2020).

Under the Law on Construction, buildings of state importance (defined as first category), including tourism development zones and the constructions within them, are permitted for protected areas even if they cause harm to the environment. As yet unrevised definitions of temporary buildings and urban equipment under the same law, which has also recently downgraded penalties for various infractions (Official Gazette of the Republic of Macedonia No 18/20), permit a wide array of interventions in the 50m green belt that is supposed to protect Lake Ohrid according to the Law on Waters. The newly adopted Law on Urban Planning (Official Gazette of the Republic of Macedonia RM No 32/20) limits public participation for General Urban Plans and urban plans for areas/constructions of state importance too (Ohrid SOS, 2020). Legalization processes have also normalized thousands of illegal constructions, and deadlines for applications have been extended on at least two occasions. The latest draft on the Law on the Handling of Illegal Constructions will additionally make objects built illegally between 2011 and 2019 eligible for legalization if it becomes effective. A special provision for the Ohrid Region in the draft law states that constructions which fail heritage impact assessments will not be legalized. However, legal requirements for strategic environmental and other relevant assessments as well as licensing procedures for their proponents do not guarantee sufficiently robust evaluations of impacts to
world heritage values and cumulative influence is not considered. In Albania, the Pogradec Terrestrial/Aquatic Protected Landscape was legally established in 1999 to protect both terrestrial and aquatic eco-systems, and covers the entire area of the World Heritage site and its buffer zone. Additionally, a number of laws are considered pertinent for the property with regard to natural heritage protection: Law on Protection of Biodiversity (No. 9587/2006, 68/2014); Law on Protected Areas (No. 8906/2002, 9868/2008); Law on Protection of Wild Fauna (No. 10006/2008); Law on rules and procedures for International Trade of Endangered Species of Flora and Fauna (No. 9867/2008); Law on Hunting (No. 10.253/2010, 7/2014). The protection of cultural heritage is regulated by the new Law on Cultural Heritage and Museums (No. 27/2018), while the Law on Territorial Planning and Development adopted in 2014 is also relevant.

Law enforcement  
Some Concern

Enforcement of land use plans is weak. For example, in North Macedonia, according to the Law on Waters, no construction of permanent buildings is allowed in the coastal belt of the lake within a width of 50 metres from the elevation of the highest water level of Lake Ohrid. Nevertheless, there has been intensive coastal development along the shore of the lake in both countries, and many houses were constructed illegally (UNESCO, 2017 and 2019). The enforcement of land use restrictions is also weak, leading to over exploitation of natural resources by way of overfishing, timber harvesting, and reedbed clearance. Inspectorates lack capacity to fulfill their obligations (Ohrid SOS, 2019, 2020).

Implementation of Committee decisions and recommendations  
Some Concern

The States Parties have been responding to the World Heritage Committee decisions (World Heritage Committee 2014, 2016, 2017, 2019a, 2019b). As requested by the Committee, the Management Plan for the property in North Macedonia has been adopted, the Commission for Management of the Natural and Cultural Heritage of the Ohrid Region established, the extension of the property to the Albanian side of the lake achieved, and some negatively impacting development projects have been halted (Galičica Ski Centre and Resort, two sections of road A3, Ljubaništa 3 development zone). In contrast, several Committee decisions have not been implemented; including an overall Strategic Environmental Assessment and Heritage Impact Assessment assessing the potential cumulative impacts of all planned infrastructure plans and other major projects on the property’s OUV; a comprehensive action plan for the lakeshore; and transboundary cooperation on monitoring biodiversity and water quality, and establishing common management actions such as jointly agreed fishing quota. Implementation of the 19 recommendations from the 2017 World Heritage Centre, ICOMOS, and IUCN Reactive Monitoring Mission has been delayed in respect to the advised timeline and there is evidence to suggest that information provided to the Committee has been inaccurate in some instances (Ohrid SOS, 2019; Ohrid SOS, 2020).

Sustainable use  
Some Concern

Fishing in the region is poorly regulated and enforced, making the activity unsustainable. In January 2020, the North Macedonian government terminated the fishing concession agreement with the responsible concessionaire due to irregularities (e.g. no protection of fish stocks, no accurate records of caught fish) (Ohrid SOS, 2020). Additionally, it is unlikely that timber harvesting is being done sustainably in the region (Pogradec Protected Landscape 2017). Galičica National Park has been traditionally managed as a forest enterprise to finance itself but even here timber extraction is probably excessive. Recent moves towards other forms of activity such as off-road vehicles, an ultra-marathon routed through a Zone of Strict Protection and the 2019 Two Lakes Motor Racing Rally (on asphalt roads) suggest the need for carefully designed decision-making processes, risk assessments, and strongly defined limits of acceptable change in order to balance increasingly complex pressures on the national park.

Sustainable finance  
Serious Concern

The participating municipalities and the central governments are supposed to bear the financial burden of the operational costs. Investments into the socio-economic sector in order to promote sustainable
land use are lacking. The nature conservation institution in the region on the North Macedonian side, Galičica National Park, is largely lacking financial support from the Government and has depended on the extraction of natural resources from the park, i.e. logging and sale of wood for firewood (Nacionalen Park Galičica, 2010). The financial plan included in the Management Plan of the Albanian side of the World Heritage site is aspirational, with no information as to current funding commitments. One positive development in terms of financing is the Prespa Ohrid Nature Trust (PONT), which is a transboundary conservation trust fund that has established long-term financing, and is used to attract co-financing for important conservation activities. This is managed jointly by government agencies and NGOs.

**Staff capacity, training, and development**

Data Deficient

In Albania, Pogradec Protected Landscape is administered by the Regional Administration for Protected Areas in Korçë. Its staff consists of one specialist responsible for natural resource management and biodiversity conservation. The Regional Directorate for Cultural Heritage (RDCH) is responsible for the management and protection of cultural heritage in the territory of Korçë. One staff unit is dedicated to the cultural heritage of Pogradec municipality. The archaeological remains of the early Christian church in Lin are monitored by a Lin inhabitant who reports to the RDCH staff. Detailed information on staff capacity and training from both countries is not available.

**Education and interpretation programs**

Some Concern

The National Park Galičica has opened a visitor centre near the town of Ohrid. Financing of environmental education and interpretation programmes is largely missing (Nacionalen Park Galičica, 2010).

**Tourism and visitation management**

Serious Concern

Tourism development at the Ohrid Lake has already a visible tendency to overstretch the thresholds of sustainability. Both the lake and cultural heritage attract visitors who mainly visit the region within a couple of months during the summer season. The lake is the warmest then. Some visitors also visit Galičica National Park, but there is no visitor counting system and no estimates available on the number of tourists. Visitor management plan for the World Heritage site does not exist. A sustainable tourism strategy also does not exist.

General vision for the region, considering all the planned infrastructure projects, appears to be focused on the development of mass tourism in both countries.

**Monitoring**

Some Concern

Water quality monitoring is the responsibility of the National Environment Agency in Albania and of the Hydro-meteorological Institute in North Macedonia. Yet, a coordinated transboundary water monitoring programme is still lacking. In North Macedonia, the Hydrobiological Institute in Ohrid is responsible for monitoring the aquatic ecosystems, whereas the terrestrial ecosystems of Galičica National Park should be monitored by the administration of the park. Still, rigorous information on the status of local species populations is lacking because there are no established species monitoring programmes. There are financial restrictions in enabling regular monitoring of biodiversity of both the Lake Ohrid and the national park.

**Research**

Some Concern

The Hydrobiological Institute in Ohrid carries out research and educational activities focusing on Lake Ohrid, which includes the management of a Masters of Science in limnology. It organizes summer schools in the fields of hydrobiology and environmental protection. The Institute has also been researching the invasive species present on the lake in the context of project ESENIASTOOLS, East and South European Network for Invasive Alien Species (Trajanovski 2019). In spite of the fact that Ohrid has an old university, ecology related research is underrepresented, and the St. Kliment Ohridski University, Faculty of Tourism and Hospitality, Ohrid has not yet effectively engaged in the field of sustainable tourism on the local level. International research activities such as the paleoenvironmental investigations undertaken by the ICDP SCOPSCO initiative have resulted in numerous peer-reviewed papers with relevance for the World Heritage Site but most are published in English only and feedback
Mechanisms to the general population of the Ohrid Region are weak.

**Overall assessment of protection and management**

The main institutions responsible for nature conservation in the World Heritage site are the Galičica National Park and the Hydrobiological Institute for North Macedonia, as well as the Regional Administration for Protected Areas for Albania. However, these institutions are extremely underfinanced and thus lack adequate resources for appropriate protection and monitoring of the natural values in the site. Although management policies and arrangements are mostly in place, in practice many of these are not sufficiently efficient. Cooperation of authorities in management of combined natural and cultural elements in the site has been improving, although this needs to be fully operational on an ongoing basis. The Management Committee for the Pogradec Protected Landscape in Albania has never met, while the constitutive meeting of the Lake Ohrid Watershed Management Committee took place in January 2020, despite its authorization in 2005. Draft Management Plan for the World Heritage site in North Macedonia was adopted in January 2020, even if some concerning issues with the plan have been raised. The Management Plan for the Pogradec Protected Landscape in Albania was approved in December 2014. Legal framework is in place but laws aimed at the protection of natural and cultural values are frequently undermined by other legislation and its enforcement is weak, e.g. uncontrolled and/or illegal urban coastal development continues to be a problem and overall management effectiveness is of concern due to lack of financial and human resources, as well as poor enforcement of the regulations.

Planned major tourism development projects (such as beach development projects, Ljubaništa 1 and 2, Waterscape Park Design of Drilon-Tushemisht, boat marina in Studenčišća marsh) show lack of vision about the protection and promotion of World Heritage values, as well as sustainable development for Ohrid region.

**Assessment of the effectiveness of protection and management in addressing threats outside the site**

Boundary of the World Heritage site does not entirely meet the integrity requirements. Primarily, the transboundary extension to the Albanian side of the lake, achieved in 2019, was a welcome first step towards common management and protection of Lake Ohrid. However, a buffer zone of the North Macedonian side of the site is completely missing and would be necessary to ensure better protection of the site.

**State and trend of values**

**Assessing the current state and trend of values**

**World Heritage values**

- **A unique lake of tectonic origin supporting high diversity of endemic and relict freshwater species**

There are different factors that have been affecting Lake Ohrid and its biodiversity. Uncontrolled constructions along the lake shore have modified the landscape which now appear as almost unbroken suburbs connected with the town of Ohrid stretching along the eastern shore, as well as the town of Pogradec stretching along the western shore. Combined with agricultural pressures, this has also led to the severe decline of wetland habitats, which, in terms of full functionality along the coast, are reduced to a tiny corner in the north-east despite their importance in terms of habitat provision for nesting/spawning birds and fish as well as for buffering the oligotrophic conditions in which Lake Ohrid's

Considering that the region has serious problems with communal waste and wastewater collection and treatment (UNESCO, ICOMOS and IUCN 2017, Civil Engineering Institute “Macedonia” JSC Skopje 2019), water pollution is an immediate threat linked to the coastal development. Changes in the nutrient characterisation of the lake are evident near the river mouths of Sateska, Koselska, Velgoška and Čerava. Lake Ohrid is an oligotrophic lake, but eutrophication is most evident near the rivers’ mouths (UNESCO, ICOMOS and IUCN, 2017). These are also the areas where moderate to bad status of aquatic flora and invertebrate fauna was diagnosed by GIZ (2016). Benthic invertebrate species and native fish fauna seem to be in stable condition in the pelagic zone (GIZ, 2016). Ohrid Trout (Salmo letnica) “stocks have been consistently decreasing over the last decades, despite annual repopulation efforts from artificially spawned juveniles”, mainly due to overfishing and lack of enforcement of fisheries regulations, although pollution is also a possible factor (Jordanova et al, 2016). The composition of fish species and their spawning grounds are further at risk from eutrophication, disturbances to macrophyte vegetation and the aforementioned shoreline activities (Talevski et al, 2010). However, consistent species population data is lacking, making a more thorough assessment of the situation challenging.

A positive correlation between water quality disturbance and the presence of invasive species, especially in lake tributaries, was also established (Trajanovski 2019). Invasive species are considered one of the reasons for some native species being endangered (UNESCO, ICOMOS and IUCN, 2017), with fish farms in Albania which breed exotic species contributing to the introduction as well as to water pollution.

Hydrology of the lake has been affected by uncontrolled discharges of lake water into Crn Drim river as well as by climate change, with prolonged dry periods without heavy rains, decreasing the water level. Sedimentation is evident near the Sateska river mouth, ultimately altering flora and fauna in this part of the lake (UNESCO, ICOMOS and IUCN 2017).

Furthermore, unmanaged, contaminated areas from former mining activity in Albania will lead to highly toxic pollution and impact the whole region if left unchecked. Heavy metal contamination in the Memëlisht dumpsite is threatening local fauna and flora, as well as human health (Bolles + Wilson & IDRA & S. Guri 2015). Dumpsite removal has been initiated but there are other areas that need urgent closure and remediation.

► Important wintering site of Palaearctic waterbirds

Wetland International (2006) reported as much as 79,000 waterbirds were recorded on the surface of Lake Ohrid in North Macedonia in winter 1989. Fremuth et al. (2000) noted 24,000 waterbirds in 1997, while in 2010 and 2011 only 10,000 and 17,000 individuals were counted, respectively (taken from Velevski et al., 2010). Waterbirds are especially abundant in parts of the lake where reed beds are still present. With growing tourism, alteration of the lake shore (beach expansion, destruction of reeds and marshes), ongoing eutrophication and poaching, population of wintering waterbirds seem to be in decline (IUCN and ICOMOS, 2012).

Summary of the Values

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

Uncontrolled coastal development along the shore negatively affects Lake Ohrid, its biodiversity and the landscape. The importance of Studenchishte Marsh for nesting birds has almost been entirely lost (Spirovksa et al, 2012). Invasive species and increasing pollution by organic and inorganic sewage is threatening vulnerable aquatic fauna and flora. Sedimentation near the river mouths causes eutrophication of this oligotrophic lake, changing the lake’s flora and fauna. Heavy metal contamination in former mining sites in Albania are threatening local fauna and flora, as well
as human health. Ohrid Trout (Salmo letnica) stocks have been consistently decreasing over the last decades, despite annual repopulation efforts from artificially spawned juveniles, mainly due to overfishing and lack of enforcement of fisheries regulations. Ichthyofauna in general is additionally subjected to diverse pressures including eutrophication, pollution, boating, shoreline activities, non-native species, wetland loss and changes to macrophyte vegetation (Talevski et al, 2010; Kostoski et al, 2010; Apostolova et al, 2016; Jordanova et al, 2016), although data is deficient to assess full impacts. Hydrological issues, i.e. deliberately induced decrease of water level, affect the overall lake ecosystem. At least one endemic species is considered possibly extinct due to human impact (Hauffe et al, 2010) and local extinctions of nationally rare plants are also suspected (Spirovska et al, 2012; Apostolova et al, 2016).

Due to increasing poaching of waterbirds, as well as several other factors such as alteration of the lake shore, reduction of reed beds and marshes, tourism development, there is also a negative trend for population of wintering waterbirds.

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

Other biodiversity values primarily relate to species abundance, endemism and diversity in Galičica National Park. Changes have been occurring throughout the years due to modifications in land use; i.e., heavy decline of grazing on pastures accompanied by abandonment of mountain villages and succession. The risk of forest fires is higher and several fires have already devastated parts of the mountains. Galičica hosts diverse habitats and is an important refuge of species even at European level (Nacionalen Park Galicica, 2010). The status of species in Galičica National Park seems to be stable, although timber extraction, modifications in land use and tourism pressures, including illegal construction, affect changes in the landscape.

**Additional information**

**Benefits**

**Understanding Benefits**

- **Coastal protection, Flood prevention,**
- **Water provision (importance for water quantity and quality)**

Lake Ohrid is important for water quantity and quality, and it has a strong ability of self-purification. In certain areas it is surrounded by reed beds, such as in the Studenčište marsh, which function as natural filters for the lake. The marsh also stores carbon in its 5,000-year-old peatlands (Apostolova et al, 2016) and has the role of regulating the water levels, functioning as a natural flood mitigation system, while the reed regulates coastal erosion.

Factors negatively affecting provision of this benefit:
- Climate change: Impact level - High, Trend - Increasing
- Pollution: Impact level - Very High, Trend - Increasing
- Habitat change: Impact level - Very High, Trend - Increasing

- **Outdoor recreation and tourism,**
- **Natural beauty and scenery**

Lake Ohrid is one of the most significant tourism destinations both in North Macedonia and Albania, attractive for its landscape beauty, Galičica National Park’s natural values, Lake Ohrid’s water quality, and cultural heritage. Recreation is primarily associated with Lake Ohrid (swimming, beach) and the national park (hiking, enjoying the park’s natural values). This makes a key contribution to the local
History and tradition

Ohrid town is one of the oldest settlements in Europe, being built from the 7th until 19th century. Its architecture represents the most complete ensemble of ancient urban architecture in this part of Europe, while the town hosts the oldest Slav monastery and more than 800 Byzantine icons. Archaeological remains are scattered throughout the Ohrid region. The entire region was and continues to be a spiritual centre frequented by visitors.

In the shallow waters near the shores of the lake, three sites testify to the presence of prehistoric pile dwellings, and the small Lin Peninsula in Albania is the site of the remains of an Early Christian church founded in the middle of the 6th century (World Heritage Committee 2019b).

Fishing areas and conservation of fish stocks

Endemic Ohrid trout (Salmo letnica) is more affected than other fish species in Lake Ohrid due to greater demand for it (it is used in traditional dishes and is considered a delicacy) and its economic value.

Factors negatively affecting provision of this benefit:
- Pollution: Impact level - High, Trend - Increasing
- Overexploitation: Impact level - High, Trend - Continuing
- Invasive species: Impact level - High

Fishing of Ohrid trout is poorly regulated and enforced. Hatcheries in both countries regularly contribute to the population of the trout by replenishing the fish stocks. Nevertheless, unsustainable (and sometimes illegal) fishing occurs both in North Macedonia and in Albania, thus the population of the trout is in constant decrease (Jordanova, 2016). Pollution and bioaccumulation are other negative impacts (Jordanova et al, 2016; Marchetti et al, 2019).

Collection of timber, e.g. fuelwood

A significant amount of wood harvesting is still done in the region. Most households in Pogradec municipality rely on wood for cooking and winter heating. Total demand has not been formally measured, but it is likely to exceed 55,000 m³ per year.

Factors negatively affecting provision of this benefit:
- Overexploitation: Impact level - High, Trend - Continuing

Timber is being extracted from Galičica National Park and is mainly sold for fuel wood. Annual extraction ranges from 7,000 to 12,000 m³ of fuel wood (Nacionalen Park Galicica, 2010).

Collection of medicinal resources for local use

Collection of medicinal resources is permitted in the national park. Commonly gathered resources are Ohrid Tea (Sideritis raeseri), Common Juniper Berries (Juniperus communis), and medicinal herbs, both for individual consummation and further trade (Nacionalen Park Galicica, 2010).

Fire in Galičica National Park is one of the factors affecting collection of medicinal resources.

Importance for research

Lake Ohrid sediments are an important paleoenvironmental archive, enabling scientists to infer how climate and other conditions have changed over hundreds of thousands of years (Wagner et al, 2017). Current research is even combining archeological findings with sediment records to investigate the birth of European agriculture (Universitat Bern, 2018). Species groups such as ostracods and diatoms, which include numerous endemics, are highly valuable for these kinds of purposes as they can be fossilized in large enough quantities for robust conclusions to be drawn (Lorenschat and Schwalb, 2013; Jovanovska et al, 2016).

Due to its wealth of world-unique species, including many that have evolved in-lake, not to mention its accessibility and manageable size, Lake Ohrid is additionally a natural laboratory for the study of evolution and the processes that drive speciation (Wagner et al, 2017). It has recently furnished evidence for dynamic equilibrium of speciation and extinction rates over evolutionary time (Wilke et al,
IUCN World Heritage Outlook: https://worldheritageoutlook.iucn.org/
Natural and Cultural Heritage of the Ohrid region - 2020 Conservation Outlook Assessment

2018).
Factors negatively affecting provision of this benefit:
   - Habitat change: Impact level - High, Trend - Decreasing

The various threats to Lake Ohrid's unique ecosystem and the species within it risk jeopardizing the knowledge that can be gleaned from the World Heritage Site (Albrecht and Wilke, 2008).

➤ Importance for research
Species new to science are still being discovered at various locations in the World Heritage Site, including on Mount Galichica (Levkov and Williams, 2011; Mueller, 2016; Spirovska et al, 2020).
Factors negatively affecting provision of this benefit:
   - Habitat change: Impact level - High, Trend - Increasing

There is a risk that anthropogenic pressures may push species endemic to the Ohrid Region out of existence before they have even been formally discovered, particularly since several of those that have been recorded occupy small geographical areas such as littoral zones or springs, where various pressures from water abstraction to recreation is continuing (Albrecht and Wilke, 2008). Extinction is suspected for at least one Lake Ohrid species as a result of the destruction of springs at Bej Bunar (Hauffe et al, 2010).

➤ Tourism-related income,
   Provision of jobs
According to the State Statistical Office for the Republic of Macedonia, 428,979 tourists visited the Municipalities of Struga and Ohrid alone in 2019. 150,000 visitors stayed in the Municipality of Pogradec in 2013, based on estimations from its tourism department. Many of the tourists are attracted by and consume activities related to the natural and cultural values of the World Heritage Site, not least its clear, oligotrophic waters. Hence, the economic contribution to the regional economy is substantial.

➤ Other
Due to a specific climate that regulates temperature extremes and moisture levels, the Ohrid Region has served as a refugium during periods of past climate change, which relates to its floral diversity in the present day (Sadori et al, 2016). The relative stability and sustained presence of Lake Ohrid for over 1,000,000 years has similarly enabled several freshwater species such as relict diatoms and sponges to evade extinction.
Factors negatively affecting provision of this benefit:
   - Pollution: Impact level - High, Trend - Increasing
   - Habitat change: Impact level - High, Trend - Continuing

Multiple simultaneous human pressures risk reducing the stability of the Lake Ohrid system and evidence of a shift towards cosmopolitan and pollution tolerant species over endemics is already evident in localized areas. Habitat fragmentation and conversion of natural habitats to other land uses will likewise inhibit access to and capacity of the Ohrid Region refugium in the future.

Summary of benefits
Key benefits generated by the World Heritage site include: environmental services; benefits related to food; health and recreation values; cultural and spiritual values; economic contributions via tourism; knowledge related to evolution, climate and environmental change; and extraction of materials (timber). Lake Ohrid is important for water quantity and quality, and it has a strong ability of self-purification. In certain areas it is surrounded by reed beds, such as in the Studenčište marsh, which function as natural filters for the lake. The marsh also has the role of regulating the water levels, functioning as a natural flood mitigation system, while the reed regulates coastal erosion. There is great demand for the endemic Ohrid trout (Salmo letnica) since it is considered a local delicacy with high economic value, but fishing is poorly regulated and enforced. Hatcheries in both countries regularly contribute to the population of the trout by replenishing the fish stocks. Nevertheless, unsustainable (and sometimes illegal) fishing occurs both in North Macedonia and in Albania, thus the population of the trout is in constant decrease (Jordanova, 2016).
Lake Ohrid is one of the most significant tourism destinations both in North Macedonia and Albania, attractive for its landscape beauty, Galičica National Park’s natural values, Lake Ohrid’s water quality, and cultural heritage. Recreation is primarily associated with Lake Ohrid (swimming, beach) and the national park (hiking, enjoying the park’s natural values). Commonly gathered resources are Ohrid Tea (Sideritis raeseri), Common Juniper Berries (Juniperus communis), and medicinal herbs, both for individual consummation and further trade (Nacionalen Park Galicica, 2010). A significant amount of wood harvesting is still done in the region. Most households in Pogradec municipality rely on wood for cooking and winter heating. Total demand has not been formally measured, but it is likely to exceed 55,000 m³ per year. Timber is being extracted from Galičica National Park and is mainly sold for fuel wood. Annual extraction ranges from 7,000 to 12,000 m³ of fuel wood (Nacionalen Park Galicica, 2010).

Paleoenvironmental archives supplied by Lake Ohrid sediments are combining with insight emerging from its unique ecology to help scientists understand the climatic, environmental and human history of the wider catchment over hundreds of thousands of years as well as speciation processes. Such studies have revealed the importance of the wider region as a refugium during previous periods of climate change. Ohrid town is one of the oldest settlements in Europe, being built from the 7th until 19th century. Its architecture represents the most complete ensemble of ancient urban architecture in this part of Europe, while the town hosts the oldest Slav monastery and more than 800 Byzantine icons. Archaeological remains are scattered throughout the Ohrid region. The entire region was and continues to be a spiritual centre frequented by visitors. In the shallow waters near the shores of the lake, three sites testify to the presence of prehistoric pile dwellings, and the small Lin Peninsula in Albania is the site of the remains of an Early Christian church founded in the middle of the 6th century (World Heritage Committee 2019b). Abundance and diversity of species, including high level of local and Balkan-related endemism gives the region a European and even global significance. Thus the site has exceptional intrinsic value.

Projects

Compilation of active conservation projects

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<tr>
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<th>Organization</th>
<th>Brief description of Active Projects</th>
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<tr>
<td>1</td>
<td>German Corporation for International Cooperation (GIZ)</td>
<td>A 2012-2020 project entitled “Conservation and Sustainable Use of Biodiversity at Lakes Prespa, Ohrid and Shkodra/Skadar” is currently being implemented by the German Corporation for International Cooperation (GIZ) in Albania, North Macedonia, and Montenegro. The project is funded by the German Federal Ministry of Economic Cooperation and Development and its main objective is that the lakes’ natural resources are managed on a transboundary basis and in compliance with EU environmental and biodiversity protection targets. It has produced publications on “Fish and Fisheries” (November 2017) and a “Monitoring Manual for Lake-bound Species and Habitats of Lakes Prespa, Ohrid and Shkodra/Skadar” (May 2019).</td>
<td><a href="https://www.giz.de/en/worldwide/20318.html">https://www.giz.de/en/worldwide/20318.html</a></td>
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<td>2</td>
<td>Wetlands International</td>
<td>For the 5th consecutive year, RAPA and civil society in Albania participated in the 2020 International Waterbird Census organized by Wetlands International. In January 2020, 11,000 birds (26 species) wintering at Lake Ohrid were counted, with the largest presence being of Common coot (Fulica atra), Black-headed gull (Chroicocephalus ridibundus), Tufted duck (Aythyta fuligula) and Little grebe (Tachybaptus ruficollis). Results showed a smaller number of wintering birds compared to previous editions, probably as a consequence of the mild and dry winter. The counting was conducted simultaneously in the Albanian and North Macedonian parts of the lake.</td>
<td><a href="https://www.wetlands.org/our-approach/healthy-wetland-nature/international-waterbird-census/#read-more">https://www.wetlands.org/our-approach/healthy-wetland-nature/international-waterbird-census/#read-more</a></td>
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<td>22</td>
<td>Jordanova, M., Rebok, K., Rocha, E. (2016). Liver Pathology of Female Ohrid Trout (Salmo letnica Kar.) from the Eastern Coast of Lake Ohrid: Baseline Data Suggesting the Presence of a Pollution Gradient. Turkish Journal of Fisheries and Aquatic Sciences 16 (2): 241-250.</td>
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<td>MEPSO (2012). Open Procedure No. 101/2012 for Awarding a Contract for Public Procurement of Services Drafting a Feasibility Study and Master Plan for Development and Building a Ski Centre in the National Park Galicica Tender Documentation.</td>
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56 Test Report and Appraisal of Toxicology of Wood Pillar (Bay of Bones) (2010-2011)


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