IUCN Conservation Outlook Assessment 2014 **(archived)**
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Plitvice Lakes National Park

SITE INFORMATION

Country:
Croatia
Inscribed in: 1979
Criteria:
(vii) (viii) (ix)

Site description:
The waters flowing over the limestone and chalk have, over thousands of years, deposited travertine barriers, creating natural dams which in turn have created a series of beautiful lakes, caves and waterfalls. These geological processes continue today. The forests in the park are home to bears, wolves and many rare bird species. © UNESCO

SUMMARY

2014 Conservation Outlook

Good with some concerns

Generally, the state of the site’s values is considered good, although some concerns exist especially in relation to its water ecosystem. 16 larger and a number of smaller lakes form part of the Plitvice Lakes National Park. All lakes are subject to continuous process of eutrophication which is a natural process. However, due to higher levels of organic pollution, eutrophication process has become considerably faster. Anthropogenic influence accelerating the process relates to waste water discharge from tourism infrastructure and households, agricultural practices with the use of chemicals in the upper watershed of the site and outside the Park’s boundary, and livestock farming. The National Park authority understands this problem and the need to slow down the eutrophication process by reducing the pollution of lakes, however, no concrete measures have so far been developed. The site is also under a heavy pressure from growing tourism, however there is neither systematic tourism development planning, nor monitoring of the impact. Also, there are many privately owned lodging and hospitality tourism facilities all of which use water from the largest lake, Kozjak, and in the long-term, this is not sustainable as it will alter the natural water-flow. On the positive side, the state of the forests ecosystems surrounding water bodies of the site and serving as a buffer zone is good which is very important and contributes significantly to the site’s integrity and overall protection.

Current state and trend of VALUES

Low Concern
Trend: Stable

Generally, the state of Plitvice Lakes World Heritage values is considered to be good. However, certain direct and indirect threats pose critical danger for long-term continuation of the positive trend. The most important natural phenomena and value of the Plitvice Lakes are natural tufa dams which enable water to fall

over numerous cascade-shaped barriers and create waterfalls and lakes. The current state of natural travertine dams is considered to be good and the trend stable. Mistakes in management have been made in the past, affecting the water levels and travertine dams building process. For example, building of mills, deliberate travertine dams destruction and forest exploitation are key examples of past negative anthropogenic influence on this WH value (Ministarstvo graditeljstva i prostornog uredjenja, 2012). High tourism pressure continues to be a threat for the travertine dams due to inadequate trail network (UNESCO, 2006) and organic pollution of Plitvice's water. The Park seems to be focused almost entirely on tourism development and pays little attention to conservation work, i.e. research, monitoring or mitigating threats from tourism development. Travertine dams and the whole water ecosystem are still preserved without major permanent damage, but threats, primarily related to uncontrolled and unsustainable tourism development cause continuous danger for this sensitive ecosystem. The aesthetic value of the site remains well-preserved. From the aesthetic value point of view, meadows and forests significantly contribute to the harmony of the whole National Park. Special concern is given to the continuation of meadows in current state and form. While meadows are an important element of aesthetic value of the site by contributing to its beauty with diverse colours of flora, they are also important habitat for about 70% of all biodiversity in the NP. Having been made by anthropogenic influence in the past, they have been giving way to the surrounding forests through continuous successive encroachment. Forests are one of the key elements that sustain the hydrological system of Plitvice Lakes. They are a buffer zone of the water ecosystem, bringing stability to the ecosystem and contributing to the continuous tufa precipitationprocess by preventing soil erosion, purifying water, regulating the water-flow (Ministarstvo graditeljstva i prostornog uredjenja, 2012). Current state of the forests is considered to be good. After decades of exploitation through selective or regular logging periods, the Nature Conservation Law adopted in 1994 enforced protection of forests which are no longer actively managed. The trend concerning the state of the forests started to turn to a positive one and continues today.

Overall THREATS

High Threat

Current threats to Plitvice Lakes WH values relate to human disturbance (high visitor pressure on the lakes area, devastation of travertine dams), natural system modifications (excessive water draw from lakes, natural eutrophication

intensified by anthropogenic influence, encroachment of forests into meadows), and pollution (inadequate sewage water treatment system, organic pollution of water from adjacent villages and tourism infrastructure, organic pollution of water from agricultural activities). Plitvice Lakes NP is one of the most visited areas of Croatia and the most visited protected area in the country. Natural travertine dams and the lakes are particularly threatened by this intense pressure by visitors as all of them visit the same very limited area (constituting only about 10% of the whole NP). Threats associated to uncontrolled tourism relate also to pollution in that the Park does not have adequate sewage water treatment system. Organic pollution of water from tourism infrastructure poses a direct threat to the aquatic ecosystem of Plitvice. Other biodiversity values (rich fauna and flora) are primarily threatened by biological resource use (illegal hunting and illegal fishing), and human disturbance (disturbance of habitats of some of the key species by visitors). Potential threats to Plitvice Lakes include threats related to transportation (potential dangerous goods discharge from traffic on state roads) and climate change (potential threat to continuous “travertinisation” process). Climate change will potentially affect the values with predicted lower precipitation and higher temperatures. Immediate direct threat to the site and its values poses transportation which is currently allowed via three state roads passing through the Park. The threat of dangerous goods discharge which would affect all WH values including other biodiversity values is very high.

Overall PROTECTION and MANAGEMENT

Mostly Effective

Plitvice Lakes NP WHS is generally considered to be well protected and managed, although some concerns in the management system exist. The site is legally protected under a number of legal provisions, the key being the Nature Conservation Law. It is managed by a Public Institution of Plitvice Lakes National Park that consists of a Governing Board, Director, and Conservation Manager. Participation of local communities in the management needs to be increased. Valid Management Plan is in place, covering the period from 2007 to 2016, subject to review after five years. The Management Plan is a well-developed document serving the key conservation and visitor management goals in the NP, and highlighting current threats to the site. Considering the proposed action plans in relation to mitigating the threats that jeopardize the site’s natural values, which have been in large extent reiterated in a new Spatial Plan from

2012, there is some concern whether actual management measures are being implemented.

FULL ASSESSMENT

Description of values

Values

World Heritage values

► Natural travertine dams

Criterion:(viii)

Continuous and undisturbed production of travertine dams shapes the character of the landscape and hydrological system of the site containing a series of lakes, waterfalls and caves (IUCN, 1979). Plitvice Lakes basin is a karst river basin formed by biological and geo-chemical processes during the last ~6000 years (UNEP-WCMC, 1988, UNESCO, 2006). From geological viewpoint, the carbonates date from the Mesozoic period, and are up to 4,000 metres thick (UNEP-WCMC, 1988). While limestone is predominant, there are also dolomites, forming the plethora of permeable and impermeable layers, and causing the formation of different geomorphological phenomena (Ministarstvo kulture Republike Hrvatske, 2007). The chemical characteristics of water impacted by lithology, accumulation of underground water and constant water flow, created conditions for development of specific aquatic vegetation that is crucial for the formation of travertine (calcareous tufa) and the growth of travertine dams (Ministarstvo kulture Republike Hrvatske, 2007). The formation and growth rate of the phytogenetic travertine dams is approximately 1-3cm/year and the travertine dams have formed 16 larger and many smaller lakes linked by waterfalls and caves (UNEP-WCMC, 1988). Travertine dams grow transversally across an open river valley and produce reservoirs/lakes upstream (UNESCO, 2006). The process of “travertinisation” is extremely sensitive towards pH value (must be over 8,0) and temperature, as well as concentration of dissolved organic carbon (must be below 10 mg/l) (Ministarstvo kulture Republike

Hrvatske, 2007, Eidsvik et al., 1992).
It is interesting to note that Plitvice type of lakes, based on “travertinisation” of the aquatic organisms that live in the water, forms a special type in the limnological typology, classified as ‘lakes with travertine dams’ (UNESCO, 2006).

► Exceptional aesthetic value
Criterion:(vii)

The geographical phenomena of biogenetic origin of Plitvice lakes is also characterized by exceptional natural beauty. Series of lakes and waterfalls falling over travertine barriers form nearly 1% of the Park’s surface (Ministarstvo kulture Republike Hrvatske, 2007) and are clearly the most important element in Plitvice Lakes National Park (NP), creating an outstanding aesthetic effect. The lakes are divided into Upper lakes located in the forest areas with dolomite rocks as bottom strata, and Lower lakes located in the rocky limestone canyon. The highest lake is at 637 metres above sea level, while the lowest waterfall (Sastavci) below which Korana River starts is at 475 metres above sea level (Ministarstvo kulture Republike Hrvatske, 2007). Kozjak is the largest lake in Plitvice Lakes NP with the surface of 0,83 km2 (Ministarstvo graditeljstva i prostornog uredjenja, 2012). Apart from the series of lakes and waterfalls, 75% of the site is covered by forests that have an important role in sustaining the hydrological system and are also valued for their beauty (Ministarstvo kulture Republike Hrvatske, 2007).

► Forest ecosystems
Criterion:(ix)

Forests cover approximately 75% of the Park and primarily consist of beech and fir (Omphalodo-Fagetum) forest, spruce with white sedge (Carici albae-Picetum), beech with large red dead nettle (Lamio orvalae- Fagetum), hornbeam with heather (Erico herbaceae-Ostyetum), hornbeam communities (Seslerio autumnalis-Osryetum), pine with hellebore on dolomite (Helleboro nigri-Pinetum sylvestris), beech with white sedge (Carici albae-Fagetum), and Dinaric forest of fir on limestone blocks (Calamagrosti–Abietetum) (Ministarstvo kulture Republike Hrvatske, 2007). Beech (Fagus sylvatica) represents 72,8% of all tree stands and it is normally found on 700-900

metres above sea level (UNEP-WCMC, 1988, UNESCO, 2006). Fir (Abies alba) comprises 22,1% of the forests and is found higher than 900 metres above sea level (UNEP-WCMC, 1988, UNESCO, 2006). Spruce (Picea excelsa) and pine (Pinus sylvestris) are represented with 4,7% and 0,4% respectively (UNEP-WCMC, 1988, UNESCO, 2006).
The forests can also be classified in terms of their underlying dolomite and limestone strata. The dolomite communities comprise tertiary pine, hornbeam (Ostrya carpinifolia), spruce, and beech-fir forests. The limestone communities have a smaller number of forest types, but cover a larger area with communities of spruce and fern, spruce in beech, coppiced hornbeam with Eurasian smoke tree (Rhus cotinus), Italian maple (Acer obtusatum), and heather (Erica spp.) (UNEP-WCMC, 1988).
The site contains 84ha of virgin forest of beech (Fagus sylvatica), fir (Abies alba), and juniper (Juniperus sp.) trees up to 700 years old in Čorkova uvala (UNESCO, 2006, UNEP-WCMC, 1988). This is one of the rare remnants of old growth forests of the Dinaric beech-fir (As. Omphalodo-Fagetum) forest located at 860–1028 metres above sea level (Ministarstvo kulture Republike Hrvatske, 2007). It has high importance at European scale as only a few of its kind remain in Europe, and the stable forest ecosystem enables abundance of faunal, floral and fungi species. Special importance to this forest also provides habitation of brown bear (Ursus arctos), wolf (Canis lupus), lynx (Lynx lynx), and wild cat (Felis sylvestris) (Ministarstvo kulture Republike Hrvatske, 2007).
Forests of Plitvice Lakes are an important element in sustaining the whole hydrological system. They form a protection belt around the lakes, prevent soil erosion maintaining the soil stability, prevent torrents, regulate water flow, purify rainwater and air, and provide habitat for fauna and flora. They are a crucial element in sustaining the normal process of travertine formation and thus in maintaining the World Heritage values due to these functions required for the hydrological and ecological processes for travertine build up (Eidsvik et al., 1992, Ministarstvo graditeljstva i prostornog uredjenja, 2012).

Other important biodiversity values

► Rich and diverse fauna

The site is faunistically rich and the species inhabiting the site complement

well other World Heritage values. Some of the most prominent species that reside in the Park are: brown bear (Ursus arctos), wolf (Canis lupus), lynx (Lynx lynx), wild cat (Felis silvestris), and European otter (Lutra lutra) (UNEP-WCMC, 1988, Ministarstvo kulture Republike Hrvatske, 2007). Additional mammal species include rabbit (Lepus europaeus), fox (Canis vulpes), wild cat (Felis silvestris), wild boar (Sus scrofa), deer (Cervus elaphus), doe (Capreolus capreolus), pine marten (Martes martes), least veasel (Mustela nivalis), hermelin (Mustela erminea), and a number of other species (Ministarstvo kulture Republike Hrvatske, 2007).
Out of 161 birds, 103 breed occasionally or regularly in the Park, while 38 of the breeding birds are listed in the Red list of Croatian endangered birds, e.g. short-eared owl (Asio flammeus), Peregrine falcon (Falco peregrinus), and black stork (Ciconia nigra) (Radović et al., 2003). Globally endangered bird species characteristic for central Europe are grey-faced woodpecker (Picus canus), black woodpecker (Dryocopus martius), middle spotted woodpecker (Picoides medius), white-backed woodpecker (Picoides leucotos), and collared flycatcher (Ficedula albicollis) (Ministarstvo kulture Republike Hrvatske, 2007). At the European level, 17 bird species can be found in Annex I of the EU Habitats Directive, while 6 species breed in numbers that enabled Plitvice to be recognized as important part of the Croatian Ecological Network (CRO NEN), i.e. potential Special Protection Area (SPA) of the future EU NATURA 2000 network (Ministarstvo kulture Republike Hrvatske, 2007).
There are 65 known species of small vertebrates. 7 of them are recorded in the IUCN Red List as rare, 2 are recorded in Annex II of the EU Habitats Directive, and 23 in Annex IV of the EU Habitats Directive (Ministarstvo kulture Republike Hrvatske, 2007). Ichtiofauna in the lakes is represented by trout (Salmon trutta) as the key autochthonous species. Underground aquatic fauna is still to be further explored and new species are being detected and found.

► Diverse flora

At a relatively small area, there are species of diverse floral elements such as Mediterranean, Illyric, South-European, Carpathian, Arcto-Alpine, etc. About 1,400 species and subspecies can be found in the Park and 2,5% of them are endangered (Ministarstvo kulture Republike Hrvatske, 2007). 7% of all detected species is protected under provisions of the international conventions. 1,7% of total flora is endemic, some of them being: grassy bells

(Edraianthus tenuifolius), buttercup (Ranunculus scutatus), and Dalmatian Scilla (Scilla litardierei) (PP 2012). Orchids (Orchidaceae) are very diverse with about 50 species in the Park (Ministarstvo kulture Republike Hrvatske, 2007).
A mosaic of meadow communities (23,6% of the site) created by anthropogenic influence in the past, also contributes to the exceptional natural beauty of the site. Depending on altitude, geology, soils and other factors, meadows are found in these classes: Festuco-Brometea, Nardo-Calunatea, Molinio-Arrhenatheretea and Scheuchzerio-caricatea fuscae (UNEP-WCMC, 1988, Ministarstvo kulture Republike Hrvatske, 2007). Apart from being one of the key landscape elements contributing to the aesthetic value of the site, meadows are extremely important in sustaining high biological diversity and some endangered plant species (Ministarstvo graditeljstva i prostornog uredjenja, 2012). Meadows are subject to successive encroachment by nearby forests and if this process continues inevitably it will lead to biodiversity loss and diminishment of aesthetic importance of the site.

► **Other designations**

Plitvice Lakes NP in its entirety forms part of the Croatian Ecological network, and with Croatia in the European Union it is also part of the EU NATURA 2000 network. Parts of the Park qualify for the future Special Protection Areas (SPA), while the whole Park will be a Special Area of Conservation (SCA) within the NATURA 2000 network (Ministarstvo kulture Republike Hrvatske, 2007). The Park is also recognized as Birdlife’s Important Bird Area (IBA). Further on, it lies within one of WWF’s Global 200 ecoregions.

Assessment information

Threats

Current Threats

High Threat

Current threats to Plitvice Lakes WH values relate to human disturbance (high visitor pressure on the lakes area, devastation of travertine dams), natural system modifications (excessive water draw from lakes, natural eutrophication intensified by anthropogenic influence, encroachment of forests into meadows), and pollution (inadequate sewage water treatment system, organic pollution of water from adjacent villages and tourism infrastructure, organic pollution of water from agricultural activities).
Plitvice Lakes NP is one of the most visited areas of Croatia and the most visited protected area in the country. Natural travertine dams and the lakes are particularly threatened by this intense pressure by visitors as all of them visit the same very limited area (constituting only about 10% of the whole NP). Threats associated to uncontrolled tourism relate also to pollution in that the Park does not have adequate sewage water treatment system. Organic pollution of water from tourism infrastructure poses a direct threat to the aquatic ecosystem of Plitvice. Other biodiversity values (rich fauna and flora) are primarily threatened by biological resource use (illegal hunting and illegal fishing), and human disturbance (disturbance of habitats of some of the key species by visitors).

▶ Fishing / Harvesting Aquatic Resources

Data Deficient
Inside site

High level of illegal fishing within the Park is noted in the Plitvice Lakes Management Plan (Ministarstvo kulture Republike Hrvatske, 2007). More details about illegal fishing are not available.

▶ Tourism/ visitors/ recreation

High Threat
Inside site

Plitvice Lakes NP is one of the most touristically valorised and visited areas of Croatia. Except during the war (1991-1995), the Park notes constant yearly rise in the number of visitors. E.g. in the year 2000, 482,275 visitors came to

Plitvice, in 2004, 749,209, and in 2008, 948,891 (Ministarstvo graditeljstva i prostornog uredjenja, 2012). 2011 already noted more than 1 million visitors per year (H.J., 2013). The highest number of tourists visits the area during the summer months of July and August, with approximately 10,000 visits per day (Ministarstvo graditeljstva i prostornog uredjenja, 2012), reaching a record in August 2012 with more than 12,000 visitors per day (Likaplus, 2013). Generally, all tourists go to the lakes zone, making enormous pressure to this fragile ecosystem and posing threat to travertine dams caused by an inadequate trail network (UNESCO, 2006), in addition to higher risk of more intensive species' habitat destruction (Ministarstvo kulture Republike Hrvatske, 2007).

Currently, there is no management of visitors by Park authority, nor has the carrying capacity for the lakes zone or the wider NP area been developed and determined (Ministarstvo kulture Republike Hrvatske, 2007, Ministarstvo graditeljstva i prostornog uredjenja, 2012). In 1986, the then Spatial Plan envisaged to raise the capacity from 2-3,000 visitors/day to 10,000 visitors/day with a projected annual visitation of 1,657,000 visitors/year (UNESCO World Heritage Centre, 1996). Newer studies of carrying capacity do not exist, although their development was envisaged in 2007 in the Plitvice Lakes Management Plan and repeated in 2012 in the Plitvice Lakes Spatial Plan.

Various sources note negative impact of such large number of tourists concentrated in a very small area – ca. 10% of the NP area, especially due to lack of proper management of visitation (Ministarstvo kulture Republike Hrvatske, 2007, Confidential consultation, 2013).

► Commercial hunting, Subsistence hunting

Data Deficient
Inside site

High level of illegal hunting within the Park and in the border areas was reported through confidential consultation (2013) and noted in the Plitvice Lakes Management Plan (Ministarstvo kulture Republike Hrvatske, 2007). The Spatial Plan (2012) indicates that illegal hunting of protected species outside the Park borders might be a problem for decrease in the population of lynx (Lynx lynx) (Ministarstvo graditeljstva i prostornog uredjenja, 2012). Currently, the population of lynx is at critical level (maximum 3-5 animals).

More details about illegal hunting are not available.

▶ Tourism/ visitors/ recreation

High Threat
Inside site

High number of visitors obviously has positive economic benefits for the region, however, due to the lack of visitor management, it is not beneficial for maintenance of Plitvice's natural values (Ministarstvo graditeljstva i prostornog uredjenja, 2012, Confidential consultation, 2013). The following reasons for threatening certain species and their habitats in the Park have been detected: devastation of micro-habitats and fauna near the hotels, devastation of fauna near frequent tourist trails, collection of fauna and flora without permission, and disturbance of bats in the caves (Ministarstvo kulture Republike Hrvatske, 2007).
Continuous disturbance of otter's habitat by visitors may lead to significant decrease in the number of this species and in order to protect it, the Park would have to ban visitation of at least 50% of the lakes' coasts (Ministarstvo kulture Republike Hrvatske, 2007). The Institute for Nature Protection proposed the Park to prohibit visitors' use of the western coast of the largest lake, Kozjak, in order to enable protection of otter, as well as to allow other animals to use the lake and to better protect endangered plant species and habitat (Ministarstvo graditeljstva i prostornog uredjenja, 2012).
The Park has sufficient capacity to deal with this threat and Management Plan and Spatial Plan propose a set of measures which would decrease visitors' impact on biodiversity. However, there is a concern raised around plans to enhance visitation in forest areas by introducing a new set trails and biking paths (Ministarstvo kulture Republike Hrvatske, 2007). Good point is that this way the pressure from the lakes would be reduced, but large mammals inhabiting forests would then be disturbed in greater intensity than at present.

▶ Other Ecosystem Modifications

Low Threat
Inside site

In 2011, an incident happened in Plitvice Lakes NP with protected area management authority deliberately destroying travertine dams on 24 locations in the Park between the 3rd Korana waterfall and Sastavci waterfall

with the aim of opening new areas for visitors and building of new trails (Confidential consultation, 2013, Likaplus, 2012, Civilnodruštvo, 2012). This was done without support of any expert studies and against the Nature Conservation Law. While nature protection inspection started the examination of the situation and concluded that devastation was caused by human intervention (Civilnodruštvo, 2012), the process has been stopped, most likely due to political reasons.

► Dams/ Water Management or Use

High Threat
Inside site
Outside site

Water-flow of the Plitvice Lakes system has a decreasing tendency (Ministarstvo graditeljstva i prostornog uredjenja, 2012). Currently, Lake Kozjak, the largest and deepest lake in Plitvice (81,5ha, 47m long) provides drinking water for the whole National Park area and municipalities of Rakovica and Plitvička jezera, including all hotels and restaurants in the Park (Ministarstvo kulture Republike Hrvatske, 2007, Ministarstvo graditeljstva i prostornog uredjenja 2012).
On a long-term base, utilization of water from Kozjak, especially in case of longer dry periods, can disrupt the natural process of travertine dams building, and thus threaten Plitvice Lakes' natural values. Information on the quantity of water drawn from the lake is presently not available.
The Park currently does not posses a study of ecologically acceptable water-flow of Kozjak Lake for water supply. Management Plan (2007) and Spatial Plan (2012) indicate the future plan to remove the source of drinking water outside of the Park area, but this issue has been problematic for many years and more firm decision to solve it is needed. Additionally, water supply network is not in adequate condition due to lack of resources and non-existence of specialized company for management and maintenance of the water supply network and infrastructure for reception, transport and distribution of water to consumers (Ministarstvo graditeljstva i prostornog uredjenja, 2012).
Generally, taking water from the lake is not legal and the Park still has not obtained the official permission for it (Ministarstvo graditeljstva i prostornog uredjenja, 2012, Nature conservation Law, 2005).
Capacity to work on this problem is low due to reported lack of resources. To

solve this issue it is necessary to work with other national/regional agencies outside the Park authority.

► Water Pollution, Household Sewage/ Urban Waste Water, Agricultural/ Forestry Effluents

High Threat
Inside site

Plitvice Lakes are exposed to a natural process of eutrophication, i.e. process of enrichment of water with nutrients. Under anthropogenic influence, such as agricultural activity, animal husbandry, waste water discharge from tourism infrastructure and households, the process of eutrophication has been considerably accelerated (Ministarstvo kulture Republike Hrvatske, 2007, IUCN Consultation 2, 2013). Additional, some natural processes like leaching of soil/humus by terrestrial waters in the coast area of the lakes as well as input of organic material in lake waters by leaves of deciduous trees can increase the eutrophication in the lakes. One of the effects of eutrophication is overgrowing of edging zones and bottom of some of the lakes with macro-vegetation, resulting often with minimized circulation of water, building of the organic material, and slowing down of the “travertinisation” process. In some cases, eutrophication, with the weight of collected material, can endanger the barriers’ stability and even lead to disintegration of travertine dams (Ministarstvo kulture Republike Hrvatske, 2007).
Plitvice Lakes Management Plan (2007-2016) addresses eutrophication as a threat and according to the Management Plan, sustaining positive trend of travertine dams formation is one of the aims in managing the site. The Park plans to minimize anthropogenic impacts that lead to increased eutrophication of the lakes and establish continuous monitoring of parameters responsible for eutrophication (Ministarstvo kulture Republike Hrvatske, 2007). The plan to work on this issue has been emphasized in the Spatial Plan (2012) as well.
The Park has medium capacity to solve the problem.

► Household Sewage/ Urban Waste Water

High Threat

Inside site
Outside site

Sewage water system in Plitvice Lakes is old and inadequate (Ministarstvo graditeljstva i prostornog uredjenja, 2012, Confidential consultation, 2013). This threat is particularly present in seasons of drought and maximum tourist pressure (late spring, summer and early autumn) (Confidential consultation, 2013). The sewage water system exists, but without built in treatment of purification (Ministarstvo graditeljstva i prostornog uredjenja, 2012). What is utilized is a sub terrain in Rastovača location where water is being discharged untreated, while in villages that don’t have canalization, sewage water is collected in septic holes or released in škrape or vrtače (natural holes characteristic for karst landscape) (Ministarstvo graditeljstva i prostornog uredjenja, 2012). The Spatial Plan (2012) notes that the present condition and impermeability of canalization is questionable due to different materials being used in its construction throughout different periods (Ministarstvo graditeljstva i prostornog uredjenja, 2012).
Risk of serious water contamination leading to enhanced eutrophication is worrying and very high. Enhanced eutrophication might potentially slow down the travertine dams building process.
Spatial Plan (2012) emphasizes lack of available resources to install a modern sewage treatment system (Ministarstvo graditeljstva i prostornog uredjenja, 2012), leading to the conclusion that management capacity to deal with this threat is low.

► Agricultural/ Forestry Effluents

Very Low Threat
Inside site

The Plitvice Lakes region is characterized by continuous depopulation and thus agricultural activity in the Park and in surrounding zones does not represent a high threat to the values of the WHS. After the war, agriculture in the vicinity of the Park has been slowly recovering and today the use of chemicals poses a threat to the water ecosystems of the Park. This is especially relevant for the area in the upper watershed which needs to be more efficiently controlled in order to reduce the amount of pollutants (primarily nitrates) in subterranean drinking water (Ministarstvo graditeljstva i prostornog uredjenja, 2012).
As for traditional agriculture within the Park boundaries, local population is

allowed to use the land in the zone of use. This is the zone where all settlements are located, with the main villages being Plitvička jezera (with Mukinje), Jezerce, Plitvica, Poljanak, Rastovača and Babin potok. Plitvički Bijela Rijeka river which feeds Plitvice Lakes is located in the very source area of Plitvice Lakes where extensive traditional farming and livestock grazing is occurring (Ministarstvo graditeljstva i prostornog uredjenja, 2012).

Potential Threats

Low Threat

Potential threats to Plitvice Lakes include threats related to transportation (potential dangerous goods discharge from traffic on state roads) and climate change (potential threat to continuous “travertinisation” process). Climate change will potentially affect the values with predicted lower precipitation and higher temperatures. Immediate direct threat to the site and its values poses transportation which is currently allowed via three state roads passing through the Park. The threat of dangerous goods discharge which would affect all WH values including other biodiversity values is very high.

► Water Pollution

High Threat
Inside site

National Park boundaries were enlarged in 1997 to include the whole Plitvice Lakes catchment area in the Park. Until then, two state roads were passing through the Park: D1 connecting northern and southern Croatia and passing the length of 22km within the NP boundaries, and D42 in the northern part of the Park in the length of 11,2km (Ministarstvo graditeljstva i prostornog uredjenja, 2012). As of 1997, D52, located in the south, also crosses the NP in the length of 22,9km (Ministarstvo graditeljstva i prostornog uredjenja, 2012). There are other roads crossing the Park, but they are of minor local and provincial importance.
Direct danger for the lakes ecosystem poses allowed transport of dangerous goods via these state roads, as well as pollution caused by CO2 emission and noise. Moreover, some roads are in bad condition (e.g. D42) and require modernization and better maintenance (Ministarstvo graditeljstva i prostornog uredjenja, 2012). D1 is the road with the heaviest traffic and this is the road used by visitors coming both from northern or southern direction

to the Park's main entrance. D52 is the key road for transit of oil and gas from Croatia to Bosnia and it is located in one of the most sensitive areas in the NP (Ministarstvo kulture Republike Hrvatske, 2007).
The Park, in cooperation with the State, Province, and Road management authority, plans to remove all transit traffic from road D1 and prohibit traffic of dangerous goods from road D52 (Ministarstvo kulture Republike Hrvatske, 2007). Further on, the Institute for Nature Conservation of Croatia recommended relocation of road D42 in addition to D1 and D52, to remove any potential danger from this type of pollution from hydrogeologically and biologically sensitive Park areas (Ministarstvo graditeljstva i prostornog uredjenja, 2012).
Considering the location of the state roads in the NP, the risk for contamination of lake water from e.g. oil is high. The Park needs to work cooperatively with other relevant institutions to solve this problem.

► Temperature changes

Data Deficient
Inside site
Outside site

Plitvice Lakes represent a sensitive ecosystem, especially towards temperature and precipitation. Long term predictions of changes of temperature in the sense that it will rise, as well as longer and more frequent drought periods will have impact on Plitvice (Confidential consultation, 2013).

Protection and management

Assessing Protection and Management

► Implementation of Committee decisions and recommendations

Some Concern

A number of World Heritage Bureau and Committee sessions reported on Plitvice Lakes NP WHS state of conservation. Majority of these reports were linked to the war circumstances that had effect on Plitvice Lakes and due to which the site was placed on the List of WH in Danger (1992-1997).
UNESCO Missions in 1992 (during the war) and in 1996 (after the war that

ended in 1995) resulted with a set of recommendations for the then and future management of the site. Although more than 17 years have passed since these recommendations, majority of them still have not been implemented due to lack of resources or potential other reasons.
Some recommendations have partially been implemented such as minimization of motor traffic through the Park. D1 is the principal state road connecting north and south Croatia and the main entrance to the Park which is planned to be relocated (Ministarstvo kulture Republike Hrvatske, 2007). Although highway was built taking much of the D1 traffic, this road still passes the Park bringing traffic congestion in high season.

► Relationships with local people

Some Concern

The National Park authority emphasizes good relationship with local population (Ministarstvo kulture Republike Hrvatske, 2007). However, currently there is only a very low involvement of local people in site management through (Ministarstvo kulture Republike Hrvatske, 2007). One representative of local communities is now reportedly part of the governing body (IUCN Consultation, 2014).
The Park does not invest enough in local communities (Ministarstvo kulture Republike Hrvatske, 2007), nor have any community wellbeing programmes been developed. It Is planned to enhance communication with local people through preparation of a joint newsletter, joint tourism promotional programmes, and inclusion of settlements in visitation and interpretation system (Ministarstvo kulture Republike Hrvatske, 2007). The Park also emphasizes the plan to organize educational conservation related workshops for local communities and to involve the locals in monitoring of the Park’s state of conservation (Ministarstvo kulture Republike Hrvatske, 2007).
While the Park emphasizes its support for more extensive utilization of traditional management practices in the Park, it also sees a lot of possibilities for enhanced cooperation with local people in the development of sustainable tourism. The potential areas for cooperation are: traditional accommodation offer, traditional gastronomic offer, production of traditional crafts and food products, raising of traditional livestock, and employment as tour guides (Ministarstvo kulture Republike Hrvatske, 2007).

► Legal framework and enforcement

Mostly Effective

Legal protection does not seem to be a major problem as the Ministry of Environmental and Nature Protection rather successfully supervises all activities in Plitvice Lakes NP (Confidential Consultation, 2013). The key legal provision based on which the Park is being managed is the Nature Conservation Law of 2005 (Ministarstvo kulture Republike Hrvatske, 2007). While the legal framework is considered mostly effective, some issues such as participatory management approach and regulation of non-legally built infrastructure in NP's ownership need to be dealt with in the near future (Ministarstvo kulture Republike Hrvatske, 2007). Also, land tenure issues in the Park are not resolved. Some parts are owned by a number of owners and some public lands have no solved property rights (Ministarstvo graditeljstva i prostornog uredjenja, 2012). This requires cooperation between various owners in solving the issue. The Park aims to enlarge the surface under its ownership (Ministarstvo graditeljstva i prostornog uredjenja, 2012).

► Integration into regional and national planning systems

Mostly Effective

Spatial Plan that was developed in 2012 after years of consultations complies with regional and national planning systems. While the Management Plan is the key strategic document for management of the Park, Spatial Plan is a legally binding document (Ministarstvo graditeljstva i prostornog uredjenja, 2012). The Spatial Plan was developed in line with the Strategy and Programme of Spatial Development of Croatia (1997), international conservation related conventions ratified by Croatia, Spatial Planning Law, the Law on Conservation and Protection of Cultural Heritage, Nature Conservation Law, the Law on Water, the Law on Agriculture, the Law on Forests, etc.

► Management system

Mostly Effective

The site has an up to date Management Plan for the period 2007-2016. It identifies the site's values, management objectives, desired management outcomes, and key threats. According to the Nature Conservation Law, the

implementation of the Management Plan is analyzed after five years, based on which a revised Plan, if necessary, is developed (Nature Conservation Law, 2005). Considering the repetition of planned management actions noted in the Management Plan and re-emphasized in the Spatial Plan (2012), it does not seem that the Management Plan is used actively to guide the management, at least not in a larger extent. The Management Plan was developed within the World Bank funded project Karst Ecosystem Conservation (KEC), and it is indicated in the Plan that it was developed with input and with appropriate information sharing with all key stakeholders (Ministarstvo kulture Republike Hrvatske, 2007). Natural resource management activities outlined in the Plan are aimed at protecting the site's values; however, at the moment the management system is not showing or implementing necessary measures to minimize current and potential threats to the site.

The site is being managed by the Public Institution of Plitvice Lakes National Park, within the Ministry of Environmental and Nature Protection. The Public Institution of Plitvice Lakes National Park consists of the Governing Board, Director, and Conservation Manager. The Governing Board is responsible for key developmental decisions. Local community is not represented in the Governing Board and the Park plans to propose changes in legal regulations (namely, in the Nature Conservation Law), to include local population in the Park management (Ministarstvo kulture Republike Hrvatske, 2007). The NP's operations are organized and administered by the Director who is appointed by the Minister for a four-year mandate. The Conservation Manager oversees the NP's conservation operations.

► Management effectiveness

Some Concern

Plitvice Lakes NP was highly valorised in touristic sense prior to the war in the early 1990s, and the trend of the visitors' rise continued after the war. Prior to the war, high tourist demand prompted unsustainable development with misdirected accessibility and facility expansion within the NP boundaries (UNESCO World Heritage Centre, 1996). Short term economic gains dominated the area due to a lack of scientific data and understanding of the ecosystem, and in the absence of adequate protection policy and regulation mandate (UNESCO World Heritage Centre, 1996). After the war, management authority of the NP understood in certain extent the value and fragility of the

Plitvice ecosystem (e.g. introducing prohibition of timber extraction from the Park), but continues to avoid necessary management measures to stop potential irreversible negative effects on the site. The site has a valid Management Plan in place with a number of focused action plans. Threats have been identified and budgetary elements needed to eliminate the threats calculated. Legal framework is in place, but its enforcement raises some concerns.
There is some concern regarding staffing in the Park as it seems majority of staff is oriented solely on tourism rather than conservation. Systematic research and monitoring is still missing, as is proper visitor management. However, the site attracts more than 1 million tourists per year and generally the condition of the site seems to be good. Without enforcement of appropriate visitor regulation measures and measure to combat other threats, the Park management risks serious deterioration of WH values.

► Boundaries

Mostly Effective

The NP was established in 1949 covering the surface of 19,474 ha (Ministarstvo graditeljstva i prostornog uredjenja, 2012). In 1997, the NP boundary was extended to 29.685,15 ha to include the whole Plitvice Lakes water catchment and to ensure better protection and integrity of the NP and WHS values (Ministarstvo kulture Republike Hrvatske, 2007). The boundary of the World Heritage Site was extended accordingly in 2000 (UNESCO World Heritage Committee, 2000).
The boundary is marked on the field. It does not take into account morphological characteristics of the terrain, nor the ownership issues, creating problems for Park management authority (Ministarstvo kulture Republike Hrvatske, 2007).
The 2007 Management Plan introduced new zoning system of the Park, consisting of: the zone of strict protection (66,8%), the zone of active conservation (31,5%), and the use zone (1,7%) (Ministarstvo kulture Republike Hrvatske, 2007). The zone of strict protection encompasses mainly forest ecosystems, rock formations and other ecosystems that do not require active conservation. Except scientific research, inventory and monitoring, no activities are allowed in this zone which is also excluded of roads and marked forest trails (Ministarstvo kulture Republike Hrvatske, 2007). The zone of active conservation mainly includes meadows and potentially remnants of

traditional architecture. The management aim in this zone is to keep the meadow landscape in its current form by regular mowing and encouragement of traditional extensive livestock grazing, and to preserve cultural heritage in the NP. The use zone includes all settlements, roads, forest trails and the lakes zone with its waterfalls. Recreation and tourism are allowed in this zone.

► Sustainable finance

Highly Effective

Funding is generally considered sufficient (UNESCO, 2006). In 2006, 95,2% of income came from self-financing, while the State budget formed only 0,89% of the overall income. The total turnover was nearly 25 million EUR, and after covering all the expenses, the leftover income was 4,2 million EUR (Ministarstvo kulture Republike Hrvatske, 2007). The income has constantly been increasing and in 2012 total income was nearly 44 million EUR with leftover of 4,7 million EUR (Slobodnalika, 2013). Comparing with the years prior to the war, the total turnover by the Plitvice Lakes Public Institution doubled (Eidsvik et al., 1992).
The NP has a budget plan corresponding to the proposed action plans in relation to visitor management, scientific monitoring and other conservation related measures. The available budget plan was presented in the Management Plan in 2007, showing some 5 million EUR is required for all action plans' implementation. Financial resources seem to be adequate to implement all necessary management measures required to maintain the site’s values; however, high income from entrance fees and tourism in general could be invested more in conservation rather than further tourism development (Confidential consultation, 2013).

► Staff training and development

Mostly Effective

The NP employs about 730 people, but most of them are involved in tourism related activities with some 130 staff working in conservation (Ministarstvo kulture Republike Hrvatske, 2007). However, considering the NP’s structure consists of the following sectors: Office of the Director, Department of conservation, Department of marketing, Department of visitor guiding and transportation, Department of financial business, Sector of hotel tourism and

hospitality, Sector of maintenance, Sector of trade; information on the exact number of staff working directly in conservation is not available.

Training of staff was provided through expert visits to other national parks, while KEC project offered training in GIS education, and Balcani project offered education in site administration (UNESCO, 2006). During 2001-2002, USAID funded staff training projects, while the World Bank small grants programme funded promotional and educational materials.

► Sustainable use

Mostly Effective

The use of natural resources in the NP by local population is regulated by the Park management, the relevant Ministry and the forestry advisory administration (UNESCO World Heritage Centre, 1996). Local people are permitted to cut timber as fuel wood from the zone of use in which settlements and agricultural lands are located. The forest in this area is mainly in degraded state (Ministarstvo kulture Republike Hrvatske, 2007). Generally, forests area excluded from active management in the Park and they are not being used for wood processing industry. Management interventions are allowed only on degraded timber and in cases of irregular circumstances such as fire, wood broken by ice or heavy snowfall, etc. Between 1961 and 1991 approximately 40,000-88,000 m3 was logged by the State Agency for Forestry (Eidsvik et al., 1992, UNESCO World Heritage Centre, 1996). During the war harvesting was significantly reduced and timber was used only for fuel wood and a few timbers for road barricades. Today’s situation with absence of regular forest management is in line with UNESCO Mission (1992) recommendations.
Sustainable use of meadows is not implemented in its full extent. Livestock grazing, in addition to mowing, is an important way of combating successional forest encroachment and in keeping this important habitat for abundant biodiversity associated with this type of habitat. The Park needs to work more closely with local communities to support more extensive livestock grazing and mowing of meadows.
Traditional agriculture without chemicals is permitted in the zone of use and under regulated capacity.

► Education and interpretation programs

Some Concern

There are no educational programmes for local or other schools, or for local communities (Ministarstvo kulture Republike Hrvatske, 2007, Confidential consultation form 2, 2013).
Spatial Plan (2012) indicates the plan to develop and put up educational and informative panels on all locations with high visitor frequency, in addition to establishment of educational trails throughout the Park (Ministarstvo graditeljstva i prostornog uredjenja, 2012).

► Tourism and interpretation

Some Concern

Tourism related to Plitvice Lakes NP is a primary sector in the region. The number of tourists has constantly been rising (except in the early 1990s due to the war), reaching more than 1 million tourists per year in the past two years (H.J., 2013). Visitors come to the Park via one of the two main entrances where basic information about the Park is provided.
The Park was designated as a World Heritage Site in 1979, being one of the oldest WHSs in the world. While the State Party states there is adequate awareness of visitors about the World Heritage designation (UNESCO, 2006), a number of sources stated this to be insufficient. UNESCO World Heritage logo can be seen in some places, but more could be done in offering explanation of World Heritage concept, values, and Plitvice Lakes as a World Heritage site (Confidential consultation, 2013). There are generally very few educational boards available along the paths and they are in bad condition and in Croatian language. Adding to this, the staff at the information desks is not trained in conservation issues nor can respond to any scientific questions regarding Plitvice. Only recently the Park introduced educational/interpretative tour guiding for groups available in a number of languages (Nacionalni Park Plitvička jezera, 2013).
The Management Plan encompasses an Action Plan on presentation, promotion and visitor system in the NP. Considering the measures indicated in this Action Plan and the measures proposed in the Spatial Plan in 2012, it seems that not much has been implemented since the Action Plan’s release in 2007. The critical information on carrying capacity of the lakes zone and

wider NP area is still to be delivered. Educational trails are missing and the quality of interpretation material needs to be either improved or totally developed, including education of staff to become guides in the Park (Ministarstvo kulture Republike Hrvatske, 2007).

► Monitoring

Mostly Effective

The National Park has four expert teams monitoring forest ecosystems, and also monitors water quality, eutrofication, travertine formation (http://www.np-plitvicka-jezera.hr/en/science-in-the-park/monitoring/). Monitoring of water quality has also been undertaken by staff from the Scientific Investigation Centre "Ivo Pevalek" since 2006.

► Research

Some Concern

Scientific research has been present in Plitvice for more than 160 years. Biological station “Plitvice Lakes” was established in 1961, which operates until today (with shorter non-operating periods and on new location). In 1975 it was renamed to a Scientific-expert centre “Ivo Pevalek”, and the centre is equipped with basic equipment for monitoring and qualified personnel (Ministarstvo kulture Republike Hrvatske, 2007). In the 1980s scientific research was very intensive in the centre with research on parameters relevant for travertine dam formations, limnology, and research on fauna, plant communities, forest, and meadows (Ministarstvo kulture Republike Hrvatske, 2007). The centre also collected information on meteorological and climatological situation (UNEP-WCMC, 1988). With the outbreak of war in 1991 some facilities were damaged. After the war, the UNESCO Mission (1996) found that extensive ongoing baseline inventory and monitoring needs are highly needed in this site. In the late 1990s, research was re-established through a project on the ecological state of Plitvice aquatorium, several inventories and more recently forest and hydrogeological projects (Ministarstvo kulture Republike Hrvatske, 2007). “Ivo Pevalek” centre was again moved to a new location in 2003, and the Park established cooperation with the World Bank from 2003-2007 (KEC project). KEC was beneficial for obtaining the inventory of flora – 88% of floral species known by then were detected in a field inventory from 2004 to 2006 (Ministarstvo kulture

Republike Hrvatske, 2007). The population of brown bear (Ursus arctos) has been researched and monitored ever since 1981 (Huber, 2009).
There seems to be a lot of investment in complex scientific research, but many of these do not provide information and recommendations relevant for management and decision-making in conservation (Confidential consultation, 2013). Also, the Park needs to have better cooperation with scientific research institutions in the country and abroad.
The Park plans to collect enough information about habitats and species relevant for better and easier Park management. It is necessary to collect current knowledge in order to build a database with information on the NP and to avoid duplication of research, systematically implement scientific research, establish monitoring of all elements of protected area, and ensure the monitoring results feed into the new research projects (Ministarstvo kulture Republike Hrvatske, 2007).

Overall assessment of protection and management

Mostly Effective

Plitvice Lakes NP WHS is generally considered to be well protected and managed, although some concerns in the management system exist. The site is legally protected under a number of legal provisions, the key being the Nature Conservation Law. It is managed by a Public Institution of Plitvice Lakes National Park that consists of a Governing Board, Director, and Conservation Manager. Participation of local communities in the management needs to be increased. Valid Management Plan is in place, covering the period from 2007 to 2016, subject to review after five years. The Management Plan is a well-developed document serving the key conservation and visitor management goals in the NP, and highlighting current threats to the site. Considering the proposed action plans in relation to mitigating the threats that jeopardize the site’s natural values, which have been in large extent reiterated in a new Spatial Plan from 2012, there is some concern whether actual management measures are being implemented.

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

Data Deficient

Majority of threats relating to Plitvice Lakes NP originates inside the Park. Key

threats outside the site are organic pollution of water from agricultural activities in the upper watershed of the lakes and globally occurring climate change. There is a risk of contamination of water with pesticides and other chemicals, such as nitrates, and threaten the quality of water in the lakes which is currently being used as primary and the only drinking water source. However, this poses a low threat as agriculture is of low intensity. No information is available on the Park's measures to address this threat.

State and trend of values

Assessing the current state and trend of values

World Heritage values

▶ **Natural travertine dams**

Low Concern
Trend:Stable

The current state of natural travertine dams is considered to be good (UNESCO, 2006, Confidential consultation, 2013), although there is low concern about the Park authority's attitude toward their management. Continuous production of travertine dams with water falling over the dams is the key phenomena of Plitvice Lakes NP and the process is highly sensitive to temperature, pH value and concentration of dissolved organic carbon, as well as any contamination of the waters, e.i. nutrients (Ministarstvo kulture Republike Hrvatske, 2007, Eidsvik et al., 1992). Sustaining the conditions to enable this continuous process by implementing effective management measures and by eliminating threats is the key to long-term uninterrupted "travertinisation". Mistakes in management and general resource use have been made in the past, affecting the water levels and travertine dams building process. For example, building of mills, deliberate travertine dams destruction and forest exploitation are key examples of past negative anthropogenic influence on this WH value (Ministarstvo graditeljstva i prostornog uredjenja, 2012). The most recent deliberate destruction of travertine dams on 24 locations occurred in 2011 with the aim of opening new areas for visitors and building of new trails (Confidential Consultation, 2013, Likaplus, 2012, Civilnodruštvo, 2012). Some of these travertine dams

are permanently damaged and natural water-flow of several smaller lakes was lowered down.

▶ Exceptional aesthetic value

Good
Trend:Stable

Lakes, waterfalls, forests, and meadows are essential elements of the Plitvice Lakes NP, all contributing to the outstanding aesthetic value of this World Heritage Site. While the waterfalls with lakes are the most visited and the most important part of the NP, the surrounding ecosystems strengthen the feeling of natural beauty the site possesses. The state of this value continues to be stable, although some changes are evident, especially in relation to meadows.
Unless more stringent management is applied, meadows in the long-run will give way to the surrounding forests, risking loss of biodiversity. Continuous encroachment is happening, reducing the sizes of meadows, an important habitat for 70% of species in the NP (Ministarstvo kulture Republike Hrvatske, 2007).

▶ Forest ecosystems

Low Concern
Trend:Stable

Historically, forests have gone through the biggest changes concerning their management. About 75% of the NP is consisted of forests and nowadays, forests are excluded from active management (Ministarstvo kulture Republike Hrvatske, 2007). From 1937-1961 irregular and regular periods of selective cutting were occurring, while the State Agency for Forestry logged some 40,000-88,000 m^3 of timber per year from 1961-1991 (Eidsvik et al., 1992, UNESCO World Heritage Centre, 1996). During the war, forest exploitation ceased with occasional timber felling for fuel wood and road barriers. After 1995, exploitation of forest was not resumed and as of 1994, forest has been protected by law (Nature Conservation Law, 1994).
General state of the forests and trend are good. While during the war period forests started to slowly recover (UNESCO World Heritage Centre, 1996), its continued legal protection enabled further recovery. Forests are not used for wood processing industry anymore and certain management actions occur only in irregular circumstances such as fire, damaged trees by ice or heavy

snow-fall, etc. According to the Nature Conservation Law (2005), item 42/5, special programmes of forest ecosystems protection regulate conservation measures (Nature Conservation Law, 2005). Current programmes of forest ecosystems protection date from 1982-1984 and need serious revisions considering the NP boundary changes and changes in legal regulations concerning forests (Ministarstvo graditeljstva i prostornog uredjenja, 2012). Considering legal protection of forests since 1994, it is evident that the forests have gone through an intensive recovery process. However, new programmes for forest ecosystems protection, monitoring measures and careful management need to be implemented to ensure natural state of forest ecosystems that are of critical importance for biological diversity and travertine dams building continuation. The Management Plan notes the plan to enlarge the visitors trail network into the forest areas as to reduce pressure from the key Plitvice's natural phenomena (Ministarstvo kulture Republike Hrvatske, 2007). This will need to be done with particular care. It is also envisaged to open the scientifically highly valued Čorkova uvala old growth forest, which is now in the management zone of the strictest protection with permitted scientific exploration only (Ministarstvo kulture Republike Hrvatske, 2007).

Other important biodiversity values

► Rich and diverse fauna

The site is faunistically rich and the species inhabiting the site complement well other World Heritage values. Some of the most prominent species that reside in the Park are: brown bear (Ursus arctos), wolf (Canis lupus), lynx (Lynx lynx), wild cat (Felis silvestris), and European otter (Lutra lutra) (UNEP-WCMC, 1988, Ministarstvo kulture Republike Hrvatske, 2007). Additional mammal species include rabbit (Lepus europaeus), fox (Canis vulpes), wild cat (Felis silvestris), wild boar (Sus scrofa), deer (Cervus elaphus), doe (Capreolus capreolus), pine marten (Martes martes), least veasel (Mustela nivalis), hermelin (Mustela erminea), and a number of other species (Ministarstvo kulture Republike Hrvatske, 2007).
Out of 161 birds, 103 breed occasionally or regularly in the Park, while 38 of the breeding birds are listed in the Red list of Croatian endangered birds, e.g. short-eared owl (Asio flammeus), Peregrine falcon (Falco peregrinus), and black stork (Ciconia nigra) (Radović et al., 2003). Globally endangered bird

species characteristic for central Europe are grey-faced woodpecker (Picus canus), black woodpecker (Dryocopus martius), middle spotted woodpecker (Picoides medius), white-backed woodpecker (Picoides leucotos), and collared flycatcher (Ficedula albicollis) (Ministarstvo kulture Republike Hrvatske, 2007). At the European level, 17 bird species can be found in Annex I of the EU Habitats Directive, while 6 species breed in numbers that enabled Plitvice to be recognized as important part of the Croatian Ecological Network (CRO NEN), i.e. potential Special Protection Area (SPA) of the future EU NATURA 2000 network (Ministarstvo kulture Republike Hrvatske, 2007). There are 65 known species of small vertebrates. 7 of them are recorded in the IUCN Red List as rare, 2 are recorded in Annex II of the EU Habitats Directive, and 23 in Annex IV of the EU Habitats Directive (Ministarstvo kulture Republike Hrvatske, 2007). Ichtiofauna in the lakes is represented by trout (Salmon trutta) as the key autochthonous species. Underground aquatic fauna is still to be further explored and new species are being detected and found.

► Diverse flora

At a relatively small area, there are species of diverse floral elements such as Mediterranean, Illyric, South-European, Carpathian, Arcto-Alpine, etc. About 1,400 species and subspecies can be found in the Park and 2,5% of them are endangered (Ministarstvo kulture Republike Hrvatske, 2007). 7% of all detected species is protected under provisions of the international conventions. 1,7% of total flora is endemic, some of them being: grassy bells (Edraianthus tenuifolius), buttercup (Ranunculus scutatus), and Dalmatian Scilla (Scilla litardierei) (PP 2012). Orchids (Orchidaceae) are very diverse with about 50 species in the Park (Ministarstvo kulture Republike Hrvatske, 2007).
A mosaic of meadow communities (23,6% of the site) created by anthropogenic influence in the past, also contributes to the exceptional natural beauty of the site. Depending on altitude, geology, soils and other factors, meadows are found in these classes: Festuco-Brometea, Nardo-Calunatea, Molinio-Arrhenatheretea and Scheuchzerio-caricatea fuscae (UNEP-WCMC, 1988, Ministarstvo kulture Republike Hrvatske, 2007). Apart from being one of the key landscape elements contributing to the aesthetic value of the site, meadows are extremely important in sustaining high biological diversity and some endangered plant species (Ministarstvo

graditeljstva i prostornog uredjenja, 2012). Meadows are subject to successive encroachment by nearby forests and if this process continues inevitably it will lead to biodiversity loss and diminishment of aesthetic importance of the site.

► Other designations

Plitvice Lakes NP in its entirety forms part of the Croatian Ecological network, and with Croatia in the European Union it is also part of the EU NATURA 2000 network. Parts of the Park qualify for the future Special Protection Areas (SPA), while the whole Park will be a Special Area of Conservation (SCA) within the NATURA 2000 network (Ministarstvo kulture Republike Hrvatske, 2007). The Park is also recognized as Birdlife's Important Bird Area (IBA). Further on, it lies within one of WWF's Global 200 ecoregions.

Summary of the Values

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

Low Concern

Trend: Stable

Generally, the state of Plitvice Lakes World Heritage values is considered to be good. However, certain direct and indirect threats pose critical danger for long-term continuation of the positive trend. The most important natural phenomena and value of the Plitvice Lakes are natural tufa dams which enable water to fall over numerous cascade-shaped barriers and create waterfalls and lakes. The current state of natural travertine dams is considered to be good and the trend stable. Mistakes in management have been made in the past, affecting the water levels and travertine dams building process. For example, building of mills, deliberate travertine dams destruction and forest exploitation are key examples of past negative anthropogenic influence on this WH value (Ministarstvo graditeljstva i prostornog uredjenja, 2012). High tourism pressure continues to be a threat for the travertine dams due to inadequate trail network (UNESCO, 2006) and organic pollution of Plitvice's water. The Park seems to be focused almost entirely on tourism development and pays little attention to conservation work, i.e. research, monitoring or mitigating threats from tourism

development. Travertine dams and the whole water ecosystem are still preserved without major permanent damage, but threats, primarily related to uncontrolled and unsustainable tourism development cause continuous danger for this sensitive ecosystem. The aesthetic value of the site remains well-preserved. From the aesthetic value point of view, meadows and forests significantly contribute to the harmony of the whole National Park. Special concern is given to the continuation of meadows in current state and form. While meadows are an important element of aesthetic value of the site by contributing to its beauty with diverse colours of flora, they are also important habitat for about 70% of all biodiversity in the NP. Having been made by anthropogenic influence in the past, they have been giving way to the surrounding forests through continuous successive encroachment. Forests are one of the key elements that sustain the hydrological system of Plitvice Lakes. They are a buffer zone of the water ecosystem, bringing stability to the ecosystem and contributing to the continuous tufa precipitationprocess by preventing soil erosion, purifying water, regulating the water-flow (Ministarstvo graditeljstva i prostornog uredjenja, 2012). Current state of the forests is considered to be good. After decades of exploitation through selective or regular logging periods, the Nature Conservation Law adopted in 1994 enforced protection of forests which are no longer actively managed. The trend concerning the state of the forests started to turn to a positive one and continues today.

Additional information

Key conservation issues

▶ **Travertine dams building process with water quality levels are threatened by anthropogenic influence**

Local

Currently, the state of natural travertine dams and water ecosystem is considered to be good. However, a number of threats are affecting the site and creating pressure to maintaining the condition of the site’s values. Some threats could be solved by implementing actions at local scale, while some require involvement at regional and national scales. Maintaining the positive

trend of travertine dams' formation building is the key to sustaining ecological balance and biological diversity of the site, including sustaining the World Heritage values.
The following challenges and threats need to be addressed in order to maintain the site's values related to travertine dams and water ecosystems:
1. Anthropogenic influence that threaten the water quality
a) Inadequate sewage treatment system;
b) Organic pollution from tourism infrastructure and surrounding villages;
c) Natural process of eutrophication intensified by anthropogenic influence;
d) Water-draw from Kozjak Lake to serve the tourism facilities and adjacent municipalities;
e) Agricultural activities in the catchment area.

▶ **Lack of efficient visitor management system**

Local

Tourism is highly developed in Plitvice Lakes NP and requires urgent management measures, including evaluation of carrying capacity for the entire NP, and especially for the areas of Veliki slap, Korana canyon, Bijela and Crna Rijeka, including Plitvički Ljeskovac, Galovački prsten, Prošćansko and Kozjak Lakes and development of an efficient visitor management system.

▶ **Local communities not sufficiently involved in active management of the Park**

Local

Local communities see the NP as primary source of income due to their involvement in the Park as staff or as providers of tourism services. Local communities have only one representative in the Park's Management Board.

Benefits

Understanding Benefits

▶ **Does management of the site provide jobs (e.g. for managers or rangers)?**

Economic benefits with regards to providing jobs for local population are considered to be one of the major benefits of Plitvice Lakes NP for the

communities within and outside the site in the region. The Park employs 730 people and it is estimated that 3,000 members of Park employees' families indirectly benefit from the Park (Ministarstvo kulture Republike Hrvatske, 2007). Majority of employees work in tourism related industry, in restaurants and hotels managed by the NP. Also, local population not directly employed by the Park gains economic benefits by offering private accommodation and hospitality services to the visitors. Restaurants often serve local dishes and drinks, small kiosks offer home-made traditional pastry, honey, cheese and other local products.
Plitvice Lakes NP is considered to be almost the only source of income in the region, and thus the key benefit to the local community is related to tourism development.

► Outdoor recreation and tourism

The site is extremely important for tourism and recreation. The highest benefit from tourism industry in the sense of visitor use of the site has wider global community. This is justified by national structure of visitors staying overnight in hotels in the park. Unfortunately, there is no monitoring of visitors' nationality at the entrances to the Park, but according to data collected in the hotels, only minor number of tourists comes from Croatia. For example, in 2008, there were 948,981 visitors and 234,645 overnights with only about 6% being domestic guests (Ministarstvo graditeljstva i prostornog uredjenja, 2012). Naturally, local people have direct benefits from tourism industry, but this assessment of tourism benefit is related to actual visitation in the site based on the site's natural values and recreational activity.
The highest number of tourists visits the area during July and August, with approximately 10,000 visits per day (Ministarstvo graditeljstva i prostornog uredjenja, 2012), reaching a record in August 2012 with more than 12,000 visitors/day (Likaplus, 2013). Apart from walking on the trails, the visitors can go hiking, drive bicycles, undertake a boat or a bus/train ride, and hire a boat on peddles. The highest number of tourists stays nearby the waterfalls and lakes zone and only small number of tourists opt for hiking.

► Is the protected area valued for its nature conservation?

Ecological benefits are twofold and they primarily relate to the site's intrinsic value as well as the benefit of conserved nature for humans to appreciate and enjoy.

The site has exceptional geological and biological importance with continuous and undisturbed “travertinisation” dependant on biological and bio-chemical processes. It provides important habitats for wildlife (mammals, birds, aquatic fauna, small vertebrates, speleofauna) and floral species, including some endemic and endangered species.

► Traditional agriculture

Traditional agriculture is a minor benefit provided by the NP. It used to be important activity, but due to continuous depopulation trend and the war in the early 1990s, traditional agriculture and livestock grazing have been abandoned with slow recovery nowadays. Local population is permitted to use the land in the NP with the purpose of traditional agriculture (without any use of chemical fertilizers). The management zone where this is allowed is the zone of use.

► Contribution to education

Considering the values for which Plitvice Lakes is acclaimed for, the site should have prominent position in the world of science. Currently, some research projects are occurring and are mainly associated with forest water ecosystems of the Park. Čorkova uvala’s virgin forest is one of the key areas enabling gathering of new knowledge relevant not only at national but at larger European scale. Hydrological system of Plitvice is unique and more investment needs to be put into scientific studies exploring the travertine dams’ phenomena, and more importantly, presenting the “travertinisation” process to wider public, including adjusting educational programmes for school students.

Summary of benefits

90,7% of Plitvice Lakes NP is situated in Lika-Senj county (Ministarstvo kulture Republike Hrvatske, 2007). Lika is one of the most underdeveloped regions in the whole of Croatia and it is under special care conditions by the state. With regards to providing benefits for people residing in the Park and those in the region adjacent to the Park boundary, Plitvice Lakes NP WHS represents a focal source of economic gain. Tourism related to Plitvice Lakes is the key sector that provides these benefits, both for those that are directly employed by the NP and for those that provide services for visitors as private entrepreneurs. The

Park employs 730 people and it is estimated that 3,000 members of Park employees' families indirectly benefit from the Park (Ministarstvo kulture Republike Hrvatske, 2007). Tourism benefits in the sense of using the NP for recreation, walking, enjoying nature and similar activities, are provided mainly to the international community and in lesser extent to domestic visitors. Unfortunately, there is no monitoring of visitors' nationality at the entrances to the Park, but according to data collected in the hotels, only minor number of tourists comes from Croatia. For example, In 2008, there were 948,981 visitors and 234,645 overnights with only about 6% being domestic guests (Ministarstvo graditeljstva i prostornog uredjenja, 2012).
The site has exceptional intrinsic and nature conservation values and provides habitats for abundant fauna and flora.
Traditional agriculture is a minor benefit provided by the NP, potentially to be further expanded in the future. Local population is much more oriented towards tourism industry.
Educational benefit of Plitvice Lakes NP has not been explored in the desired and potential extent. Apart from using the site's key phenomena to generate new knowledge at higher academia level both at national and wider levels; the site is a perfect source of information for school students.

Projects

Compilation of active conservation projects

№	Organization/ individuals	Project duration	Brief description of Active Projects
1	Forestry Faculty, University of Zagreb / Prof. dr. sc. Joso Vukelić		Phytocenological exploration of forest vegetation
2	Institute Rudjer Bošković (IRB) / Dr.sc. Nada Horvatinčić		The impact of climate change and state of environment on biologically induced formation of travertine and sedimentation processes in Plitvice Lakes
3	Institute for Medical Exploration (IMI) / Dr.sc. Snježana Herceg Romanić		Monitoring of organic and inorganic pollution in the environment of Plitvice Lakes

Compilation of potential site needs

№	Site need title	Brief description of potential site needs	Support needed for following years
1	N.A.	Evaluation of the tourism carrying capacity for the whole NP, and especially for the areas of Veliki slap, Korana canyon, Bijela and Crna Rijeka, including Plitvički Ljeskovac, Galovački prsten, Prošćansko and Kozjak Lakes and development of an efficient visitor management system, including development of a more dispersed network of trails to reduce concentration of visitors in one area. Development of a systematic research and monitoring programme for habitats and key species and improvement of cooperation with national universities or those from outside the country.	

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