

# GEOGRAPHY AND ENVIRONMENT – ANALYSIS OF INDICATORS OF SUSTAINABLE DEVELOPMENT OF TOURISM

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## ABSTRACT

National parks as the most complex category of protected resources are provided for the overall sustainable development, and coordination of geography, tourism and nature conservation is a basic development orientation of these areas in the future. In order to analyze the state of environment, but also the impact of tourism on nature, the method of indicators of sustainable development of tourism of the World Tourism Organization (UNWTO) is applied in the paper in the case of the National Park Tara (Western Serbia). The study included analysis and evaluation of indicators related to the ecological value of the area and direct impact of tourism activity on the protection of nature.

### Keywords:

*geography,*

*sustainability,*

*tourism development,*

*environment,*

*national park.*

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## 1. INTRODUCTION

Many researchers have suggested that the relationship between geography, tourism and protection is dynamic and complex (Sharples, 2009; Williams, Ponsford, 2009; Nyaupane, Poudel, 2011; Briassoulis, Van der Straaten, 2013; Holden, 2016). Eagles and McCool, 2002 (according to Brankov, 2010) argued that tourism is a fundamental element

that determines whether society has awareness and sufficient level of understanding to preserve a certain area. If we take into account the fact that recreational tourism is one of the most massive form of tourism and that recreational needs of visitors are most fully resolved in the best preserved natural areas, then the role of protected natural resources in tourist developments is clear. Here the emphasis is particularly placed on the national parks as the most complex category of protected resources. By their protected status, these areas are provided for the overall sustainable development, and the question of realization is set as a priority in the sphere of managing these facilities. The links between tourism and sustainability are complex. At large scale, prosperity increases environmental impact. At smaller, local scale, in developing nations, tourism wealth buys fishing boats, chainsaws, livestock, and labor, with costs to conservation and equity (Buck-

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ley, 2012; Lee, 2013; Jamal and Camargo, 2014).

The main objective of nature protection in national parks is to provide permanent protection and preservation of the complex ecosystems and landscapes, as well as rare species, attractive sites and natural phenomena. Since such protected natural areas attract great interest of visitors, the question of harmonizing the interests of tourism and nature conservation arises. Different authors (Jovičić, 1997; Nikolić, 1998; Eagles, McCool, 2002; Stojanović, 2005; Bushell, Eagles, 2007; Novelli, Scarth, 2007; Žujović, Brankov, 2008; Brankov, 2010; Bjeljic et al., 2012; Srdanović, Pavić, 2015) wrote about initial conditionality of tourism and the resources, which are placed under the protection (in particular the national parks). Researchers agreed that the protective function is the basic function of each of the national parks, because their formation is based on the idea of preserving original value of nature. Also, less degraded nature may be more attractive for tourist visits. Therefore, national parks provide exceptional possibility of tourism activation (Brankov et al., 2015), and their tourism function cannot be ignored in the implementation of sustainable management (Lozano-Oyola et al., 2012; Torres-Delgado and López Palomeque, 2014; Bramwell, 2015).

Serbia declared five national parks, which are partly or fully accessible for tourist visits, with the exception of sites for specific purposes, with the limits regulated by protection zones. National parks are managed by separate public companies, in accordance with the *Law on National Parks*. The subject of this research is to analyze the relationship tourism – nature protection in the National Park Tara, through the interpretation of the indicators of sustainable tourism development.

### 1.1. Research geographical area

The National Park Tara covers most of the mountainous Tara region in the far west of Serbia, on the border with Bosnia and Herzegovina (Republic of Srpska). Tara is linked by the Drina valley from the north and west, the Rzav valley from the southwest, and by the Kremna valley from the south that separates it from the Zlatibor plateau. Mountain space is a unique geographic unit, about 45 km long and up to 18 km wide in the central part of the mountain and the average altitude of 1 200 m (Figure 1).



**Figure 1.** Map and position of the National Park Tara in Western Serbia

The NP Tara was declared in 1981. It covers an area of the municipality of Bajina Bašta, and its special value is the canyon of the Drina River, built of limestone rocks up to 1000 m high. The most spacious and most attractive part of the mountain is the Ravna Tara plateau (Nikolić, 2006).

The complex structure of relief, a variety of geological ground and specific climatic characteristics led to large biogeographic richness and diversity. Unique natural conditions and isolated position of the mountain enabled the development and survival of diverse flora and fauna, with significant participation of endemics and relics. Forest ecosystems are one of the basic phenomena of the NP Tara, which cover more than 75% of the total area of the mountain.

## 2. MATERIALS AND METHODS

In order to comprehensively analyze the relation tourism – environmental protection, the Method of indicators of sustainable tourism development is applied in the paper, defined by the World Tourism Organization (UNWTO, 2004). Under this approach, the UNWTO developed about 50 problem topics (each with about 10-15 subtopics), classified into 4 categories (economic, social and cultural, environment and management), wherein sets of indicators for tourist destinations are proposed within each problem topic and subtopic. The method has been used with the goal of identifying and measuring the results of human activity within the NP Tara and indicating the possible risks and directions of future actions.

Research was focused on the indicators defined in the problem issue related to the protection of nature and the impact of tour-

ism on the environment. Due to large number of proposed indicators within this topic, their assessment is carried out through the evaluation criteria (relevance, feasibility, credibility, clarity and comparability) and thus those that will participate in the research are isolated. Indicators proposed by the UNWTO are also additionally analyzed according to types of destinations (in particular for national parks and natural and sensitive ecological habitats), as a complement to the methodology. On this basis, the investigation included a total of 6 indicators related to the environmental value of the area: level of protected area, recognitions of international programs, protected, endemic and endangered species, damage to forest ecosystems, as well as a direct impact of tourism activity on the protection of nature: quality of river water, illegal waste disposal sites and systems for purifying and recycling.

### 3. RESULTS

As noted above, several different indicators have been analyzed in the paper in order to examine the impact of tourism on the environment, as well as the nature conservation issue in the NP Tara. After analysis, we started with their explication and the interpretation of results.

**I Level of protected area** – since one of the primary principles of nature protection is to ensure stable conditions of preservation of basic natural resources and environmentally rational use under regulated circumstances, protection defines the basic purposes and modes of use of space. If it comes to spatially greater resource, as is the case with national parks, the concept of zoning of territory is applied (Nikolić, 2006). The indicator that is related to different levels of control indicates the existence and the coverage of zones with different degree of protection in national parks, as well as the regulated regime in managing them.

Spatial plan of special purpose of the National Park Tara defines three zones of the area protection. Priorities are established for each mode in terms of activities, protection and sustainable use. Zone of the highest (I degree) protection involves the strict conservation of the most important natural and cultural historical values including 15.40% of the total surface area of the National Park. In this zone, there are 10 nature reserves, as well as certain immovable cultural resources. It is intended for scientific research, education and

limited presentations to the public. Zone of the II degree of protection means a lower level of protection, i.e. interim protection of especially valuable natural environment complexes around areas in the 1st degree and has covered 40.20% of the National Park. In this zone, there is a variety of landscape and cultural and historical sites. It involves professional activities aimed at the scientific research, education and presentation. Zone of the III degree represents the lowest level of protection. It includes 44.40% of the NP Tara and involves limited use of natural resources and controlled intervention in the area (agriculture, forestry, tourism development, recreation and sports functions, water management, transport and renewable energy sources in energetics). It contains parts of forest complexes, agricultural areas (1 300 ha), as well as the construction space of tourist centers. A wider protection zone of 37 584 ha was also established around the national park. It is provided for controlled forestry and animal husbandry, tourism, sport and recreation, water management, transport and renewable energy sources in energetics.

**II Recognitions of international programs** – international recognitions for national parks are an important indicator of their tourist value, as evidenced by the uniqueness and environmental values of a given space. The indicator that relates to recognitions of international programs indicates the acquisition of protected status according to international conventions and programs (such as the Ramsar Convention, the UNESCO Biosphere Reserves, IBAs, etc.). NP Tara gained protected status on the basis of several international conventions and documents (Special Purpose Area Spatial Plan for the NP Tara, 2010, Management Plan for the NP TARA for the period 2012-2021, 2011), owing to which it is declared for:

- *Internationally important areas for birds* – IBA (Important Bird Areas), for rare and endangered species of birds and large diversity of ornithofauna. The area is established by the program »Birdlife International« and covers the wider environment of Tara mountain with 135 recorded species (122 species of nesting birds) and about 170 assumed species;
- *Internationally important areas for plants* – IPA (Important Plant Areas), established according to the program »Plant Life International - Plant Europe«, owing to the presence of 1 100 plant species (one third of the flora of Serbia) and a large number of endemic species, relics and endangered species;
- *Selected prime area for butterflies* –

PBA (Prime Butterfly Areas) under the »Butterfly Conservation Europe« with a total of 138 identified species; and

- *Potential »Emerald« areas* – as part of an ecological network in Serbia, consisting of spatial units that have special national and international significance in terms of biodiversity conservation.

The NP Tara has also been recognized by the UNESCO. This natural area, along with the Landscape of Outstanding Features Zaovine and Nature Park Šargan - Mokra Gora, was nominated for transboundary biosphere reserve by UNESCO within the program »Man and Biosphere«.

**III Protected, endemic and endangered species** – when it comes to the protection of natural resources and the possible impact of tourism on the environment, the presence of rare, endangered and extinct species in the area of the studied protected resources is a very important indicator. These species are generally protected by law and testify about the specifics of the area from the perspective of living conditions, so they further increase the attractiveness of the national park. On the territory of NP Tara there is many rare and endangered species, endemic or relict character, which are protected by law and testify about the diversity of living conditions in the area.

Diverse flora is one of the fundamental values of the NP Tara. The mountain is known as refuge area in which the relict plant species of warm and humid tertiary period survived. Over 1 100 plant species grow in wider area of the NP Tara, representing almost a third of the total flora in Serbia. In this area 210 species of plants are protected, of which 47 are strictly protected. By *Regulation on Protection of Natural Rarities (Official Gazette of RS no. 50/93, 1993)* in NP Tara, 21 plant species are protected as natural rarity of great importance. All protected species are subject to the prohibitions of picking, collecting, cutting or uprooting, endangerment and habitat destruction. Among endangered natural rarities, which were put under protection, the following stand out: Serbian spruce (*Picea omorika Pancic*), Heldreich's maple (*Acer heldreichi Orph.*), Yew (*Taxus bacata*), Broad bucklerfern (*Dryopteris dilatata*), etc.

Presence of a large number of endemics, species with limited natural distribution, is characteristic for the wider area of NP Tara. Previous research revealed the presence of 30 endemic species. The most famous and the most prominent feature of endemic flora of the mountain Tara is a unique species - Serbian

spruce (*Picea omorika Pancic*), relict and endemic species of conifers and »living fossil« of European and Balkan flora. It is protected from cutting and has the status of protected natural rarity. The Serbian spruce largest population in Serbia is located within the National Park Tara. Spruce inhabits shallow, skeletal, humusrich soil, at altitudes of 700-1 600 m. It occurs in different communities, mostly of mixed character, with spruce, fir, beech, white and black pine, etc. Having a continuous character, areal parts of Serbian spruce on the mountain Tara are identified and protected as a strict nature reserve, and the points with individual trees or groups of trees are protected as nature monuments. A total of 22 localities with the presence of Serbian spruce are identified on the mountain Tara.

Apart from large biodiversity of flora, numerous habitats of fauna can also be found in a wider area of NP Tara. This region recorded nearly half of all mammal species of Serbia (53 species). More than half of these species are protected by law as natural rarities: Alpine shrew (*Sorex alpinus*), Natterer's bat (*Myotis nattereri*), Liechtenstein's pine vole (*Microtus liechtensteini*), European otter (*Lutra lutra*), Brown bear (*Ursus arctos*), etc. It is assumed that 12 bat species living on Tara have not been explored in detail (*Management Plan for the NP Tara for the period 2012-2021, 2011*).

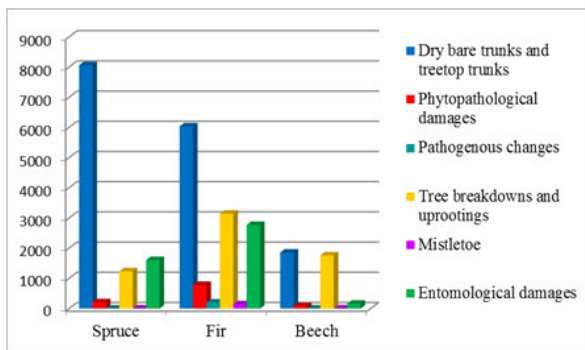
In this region 135 bird species (122 nesting birds) are identified, but it is estimated that their actual diversity is more than 170 species, and thus Tara is classified as internationally important area for the conservation of birds of Europe (IBA). National laws strictly protected about 100 species, while some are also on the list of species of European importance: Corncrake (*Crex crex*), Western capercaillie (*Tetrao urogallus*) and Eurasian three-toed woodpecker (*Picoides trydactylus*). The rare and endangered species of birds of prey are of special value are Golden eagle (*Aquila chrysaetos*), Peregrine falcon (*Falco peregrinus*), Shorttoed snake eagle (*Circaetus gallicus*) and Northern goshawk (*Accipiter gentiles*) (*Management Plan for the NP Tara for the period 2012-2021, 2011*).

Examinations of wider area of Tara revealed 13 amphibian species and 12 reptile species. At the national level 9 species are protected as natural rarities of great importance and 3 species are protected at the European level (e.g. Great crested newt, European pond turtle and Yellow-bellied toad). There are 19 fish species in the aquatic habitats of the Park. The salmonid species typical of alpine aquatic

ecosystems are of special value. It is assumed that there are about 4 000 insect species on Tara. Significant is the large number of daily butterfly species (138 species), due to which this area has been a selected area for daily butterflies in Serbia (PBA) since 2003.

**IV Damage to forest ecosystems** – as national parks, among other things, are founded on the basis of general and specific values of the dominant forest areas, an indicator of damage to forest communities is of great importance when it comes to the environmental dimension of tourism. If in addition the protective function of forests is considered, as well as the aesthetic component that contributes to the attractiveness of the area, it is clear that the state of forest ecosystems can greatly influence the choice of tourist destination. In this connection, the indicator indicates the presence of damaged forest ecosystems within protected area, as well as assets invested for their rehabilitation on an annual basis.

The NP Tara is dominated by forest ecosystems in 78.8% of protected area, and by preservation and diversity of forest ecosystems it is one of the richest and most valuable forest areas of Europe. The main causes of damage to forest ecosystems and deterioration of the health status of forests in this area are as follows: drying of forests, pests of entomological and phytopathological origin, breaking and rooting out (Figure 2).



**Figure 2.** Types of forest trees damage in the NP Tara (in m<sup>3</sup>) (Adapted from the Report on the Monitoring of Forest Drying in the area of NP Tara, 2014)

On the territory of NP Tara intense drying was noted in nearly all forest ecosystems, wherein trees on shallow and skeletal soil were most threatened. The biggest impact of drought was registered on spruce and fir trees that significantly became physiologically weak due to shallow root system. In 2013, the management carried out sanitary felling, removing about 25% of the annual increment

of these two species within the regimes of II and III protection zones. Drying also affected beech trees, while all three types were registered significant damage due to breaking and uprooting. Low power of renewal and the lack of competitiveness in relation to other woody species also caused drying of several dozen Serbian spruce trees in different habitats ([www.nptara.rs](http://www.nptara.rs)).

Drying resulted in an increase of pests of entomological origin (bark beetle), which contributed to the further deterioration of the health condition of forest ecosystems. Given that this insect attacks weakened trees first, drying of forests has affected its growth, which caused that healthy trees have also become endangered. In 2014, in order to reduce the population size of this insect to acceptable one, Public Company »National Park Tara« set up pheromone traps, which had greater efficiency in the spruce forests and a small effect in the fir forests ([Report on the Monitoring of Forest Drying in the Area of NP Tara in 2014, 2014](#)).

Forest fires are one of the causes of damage to forest ecosystems in NP Tara. A wider area of the park was affected by a large fire in 2012, and the consequences are felt to this day. The fire broke out on the southern slopes of Tara, within the LOF Zaovine and was not directly affecting the protected area of the National Park Tara. Forest ecosystems in the wider territory of the mountain suffered a lot of damage, because about 1 800 ha of beech, fir, pine and spruce forests burnt in a fire that lasted 12 days. Contaminated forests were mostly privately owned, and besides large ecological damage (completely or partially destroyed forest ecosystems with numerous relict and endemic species), there was a substantial damage from the economical point of view, given that the forestry has been the main activity of local population. It is estimated that fire destroyed one third of the forest ecosystems within the NP Tara protection zone, mainly at an altitude of 1 200 meters. In 2014, in order to remediate the consequences of this fire, Public Company »National Park Tara« joined the reforestation of vulnerable territory around Lake Zaovine within the protection zone of the National Park ([www.nptara.rs](http://www.nptara.rs)).

Given the fact that 80% of all revenues of PC »National Park Tara« derived from the planned forest management, the forestry on Tara is the field in which it is invested most (about 50% of total investments). Since active forestry has a tradition of more than a century, it has been the main protected resource management activity in addition to the protec-

tion and conservation of natural ecosystems. Investments in the recovery of forest ecosystems in 2013 accounted for 17.3% of all investments of the NP Tara (Information on the PC »National Park Tara« for 2013, 2014).

**V Quality of river water** – as certain tourist activities relate directly to hydrographic objects (swimming, diving, recreational fishing, cruising, rafting, etc.), the quality of their waters significantly affects the tourist traffic. Hydrographic objects are important part of tourist offer, and the indicator referring to the quality of river water of the main watercourse in this area - the river Drina is taken into consideration.

Data of the Republic Hydro-meteorological Service of Serbia on the water quality of the river Drina in the period 2006-2010 ([http://www.hidmet.gov.rs/index\\_eng.php](http://www.hidmet.gov.rs/index_eng.php)) were used to analyze this indicator. Survey comprises the river profiles Bajina Bašta and Ljubovija, at which a systematic water quality analysis is carried out (averagely once a month). It is in this case determined on the basis of calculating the pollution index (WPI) (Brankov et al., 2012).

If the entire five-year period is cumulatively analyzed (Table 1), it can be concluded that both analyzed profiles are in the III water quality class. Analysis by years shows that the smallest pollution at the profile Bajina Bašta is recorded in the period 2006-2007 (Class II), but during next three years, water quality progressively deteriorated (Class III and Class IV). When it comes to profile Ljubovija, the Drina has been in the III water quality class during the whole period, with minor variations in the WPI values. The biggest pollution at profile Bajina Bašta was recorded in 2010, when the WPI value was 2.86, while at profile Ljubovija, the largest WPI value was recorded in 2007 (1.70).

**Table 1.** WPI value in analyzed stations in the period 2006-2010

Station	2006	2007	2008	2009	2010	WPI
Bajina Bašta	0.82	1.00	1.56	2.11	2.86	1.67
Ljubovija	1.22	1.70	1.15	1.10	1.10	1.25
	III	III	III	III	III	III

Analysis of the annual WPI values showed that the Drina River was the cleanest in 2006 and 2007 (Class II and Class III), but later its water quality deteriorated - Class III in 2008 and Class III and Class IV in 2009

and 2010. When it comes to the impact of individual parameters on the degree of pollution of the river Drina, the increasing registered values of saprobic index and coliform germs confirm moderate organic pollution. Certain parameters (pH, nitrites, sulfates, ammonium and suspended sediments) are within the limits of regulated values according to the standards for Class I and do not have a significant effect on pollution. There are also increased levels of orthophosphates, which are in certain periods (2008 and 2009 at profile Bajina Bašta) 18-30 times higher than the regulated standards. Increased number of germs also indicates pollution of municipal waters from households, while the increasing levels of orthophosphate indicate pollution originated from industrial and municipal waste waters, as well as the influence of agricultural production. Pollution of the watercourse is further affected by uncontrolled dumps and large quantities of waste (illegal dumps) on the river banks.

Measured values of heavy metals in the analyzed five-year period were within acceptable limits, so their impact on the pollution of the river water is relatively small. The exception is the increased concentration of Fe at profile Bajina Bašta in 2010, with a value of nearly 40 times higher than the regulated standards for Class I.

Industrial plants have the greatest impact on the Drina river basin pollution. Although a part of the industrial units is closed today or works at minimum capacity, the river is used for pouring waste water from the plants, with the partial processing treatment or without it. Upstream of Bajina Bašta and NP Tara, in the municipalities through which the Drina and its tributaries (primarily the Lim) flow (Foča, Goražde and Višegrad), there are uncontrolled dumps placed directly along the river, whose discharges further pollute the river and from which, with the rise of water levels, trash washes and accumulates in lake Perućac. Pollution is also affected by Čehotina tributary, which is polluted by the tailings of a former lead and zinc mine »Šuplja stijena« near Pljevlja in Montenegro.

The causes of pollution affect the Drina to get to NP Tara contaminated to some extent by organic and inorganic pollutants, which negatively affects the possibility of its tourist use. However, obtained WPI values have confirmed that until 2008 the river in the area that includes the NP and downstream of it has been in the categories II and III, which are characterized by clean or moderately polluted water, while the major contamination is pres-

ent in the last two analyzed years (Class IV at profile Bajina Bašta). Since the Drina water is used for recreational purposes and bathing, it is important to note that the values of the elements that contribute most to the increase in pollution during the last two years are within the limits allowed for this kind of use of river waters. This means that despite the registered trend of deterioration of water quality of the Drina River, its tourist function has not still been violated, although this could happen in the future, if the pollution trend continued.

**VI Illegal waste disposal sites and systems for purifying and recycling** – in the context of this indicator, the presence and distribution of illegal waste disposal in the area of the NP Tara have been considered, as well as the existence of a system for purification of waste water and the recycling of waste inside the tourist facilities. Waste management is one of the key issues of tourism development. Tourist activity is often compromised by pollution of its core values - beaches, rivers or lakes. Pollution, whether it originates from the tourist facilities or the local community and industrial capacities, can degrade the site and contribute to the spread of disease and damage natural resources.

In the wider area of the NP Tara there is a problem of insufficiently developed and regulated public utilities. General infrastructure, inadequate for tourism development and the lack of system for recycling waste are indicated as the main weaknesses of analyzed area in the *Tourism Master Plan of the Mountain Tara and its Environment*. This problem was also pointed out in the *Spatial Plan for the Area of Special Purpose NP Tara*. Although the document points out that landfill is not allowed officially in the National Park, as well as within its protection zone, in some localities, however, there are illegal landfills and dumps.

This applies in particular to the growing cottage settlements (Kaludjerske bare, Sokolina, Mitrovac, Osluša, Krnja jela, Račanska šljivovica, Oštra stena, etc.), which are spreading uncontrollably, often without the necessary infrastructure. Although during the last decade the owners of houses are given the opportunity to legalize their facilities, the problem of illegal construction is still present on Tara, often accompanied by the occurrence of illegal dumps due to the unsystematic infrastructure. This is especially expressed on the banks of Lake Perućac, near the nature reserve »Derventa River Gorge«, where in 2012 there were more than 100 illegally constructed buildings. Although Public Company »National Park

Tara« set containers for waste collection in the weekend zones, illegal waste disposal sites are not completely removed. One of the main reasons for this phenomenon is underdeveloped awareness of the population in weekend zones about the ways of behavior that threaten the environment and collide over the stated environmental principles. It is difficult to sanction such behavior due to the problem of identifying the pollutant. Public Company NP Tara organizes cleaning actions of these landfills, where, in addition to employees, members of non-governmental organizations, environmental associations and the local population also participate.

One of the long-standing problems in the wider area of NP Tara is a surface waste in the Drina canyon and the so-called 'floating landfills' that are formed on Lake Perućac. Due to presence of different pollutants in the upper course of the Drina River and its tributaries, on the territory of Montenegro, Bosnia and Herzegovina and Serbia, Lake Perućac and the zone of NP Tara are contaminated with several dozen m<sup>3</sup> of floating waste per year. Besides the negative environmental consequences, there are other significant problems - failure of HPP »Bajina Bašta« in 2010 due to the accumulation of waste. Vulnerability of the lake is the highest in early spring, when the water level of the river is the highest due to rainfall and snow melting. Each year municipality of Bajina Bašta organize cleaning of waste from the lake in cooperation with the local population, but a permanent solution has not been found. A possible guideline that is imposed is the interstate agreement between Serbia, Montenegro and Bosnia and Herzegovina on joint management of the Drina river basin.

The accommodation and catering facilities on the territory of NP Tara do not have their own systems for wastewater treatment. The exceptions are the hotels in Kaludjerske bare (the Omorika and the Beli bor) in which, starting from 2004 waste water is purified by biodisc purification system. Technological process of work of these devices is based on the presence of microorganisms that process fecal and other wastewater in the II A water quality class (rank of water quality of the river Drina). A small number of facilities in the NP Tara have impermeable septic tanks that are emptied as needed. The Public Company began construction of sewerage network for its own tourist facilities in Mitrovac (visitor's center, lodge, hunting lodge), but it has not been regulated and finished yet.

Travel companies, hotels and restau-

rants in the wider area of NP dispose waste in containers that the households use, and municipal utility companies or managers of the resource protection are responsible for their organized removal. The recycling of these wastes is not made within tourism capacities, however, utilities in Bajina Bašta and Užice have introduced wire containers for separate collection of plastic, which is at a later stage of waste management recycled at the regional landfill.

#### 4. DISCUSSIONS

After analysis of selected indicators, it is necessary to access their understanding and the interpretation of results, in order to focus future actions in the sphere of management of protected areas. This process involves the defining of reference points, i.e. criteria by which to assess the value of certain indicator or threshold values, which identify critical change of indicators.

In this case, determining the so-called 'acceptable range of values' has been carried out, in the range of which it can be spoken about the possible sustainability of the given indicator in the future. If the indicator outside the identified range is in the negative sense, this is a signal for future appropriate actions, which should improve the situation and bring it to a sustainable level. Defining acceptable range is carried out by consulting the results of modern tourist research and projects, based on the use of indicators of sustainable tourism with specified acceptable values for each of them - Samoa Sustainable Tourism Indicator Project (SSITP) and Kangaroo Island Tourism Optimization Management Model (TOMM) (UNWTO 2004). In addition, the value of specific indicators is evaluated on the basis of reference point, for the defining of which a successful practice example was used - Plitvice Lakes National Park in Croatia. By the degree of protection of nature, but also the achieved economic indicators, this protected area set a quality sustainable model of the interaction between tourism and natural features (Ružić, 2011).

Results of the evaluation of indicators are shown in the Table 2. Due to the presence of precisely defined three-stage protection regime in NP Tara, the indicator relating to this issue has been assessed as »good«. Priorities in the field of permitted activities and protection are set up for each regime, and sustainable management is set up as the ultimate goal. Zoning is done in such a way that the en-

vironmentally most valuable areas are strictly protected, and the use of space for tourist and other purposes is permitted to a limited extent.

**Table 2.** Interpretation of indicators of nature conservation and the impact of tourism on environment in NP Tara

Issue theme	Indicator	Inter-pretation
Nature conservation and impact of tourism on environment	The percentage of the protected area subjected to different levels of control	GOOD
	Recognition of international programs	GOOD
	Protected, endemic and endangered species	GOOD
	Damage to forest ecosystems	BAD
	The quality of river water	ACCEPTABLE
	Illegal waste disposal sites and systems for purifying and recycling	BAD

As the biogeographic characteristics of NP are its core values, the indicator relating to the presence of protected, endemic and relict species is very well rated. Similarly, to the referent NP Plitvice, where the presence of these groups is significant and exceeds 1% of the total biogeographic diversity, in the studied national parks the endemic and relict species are numerous, as well as those that are protected by the national laws and international conventions due to vulnerability. In connection with this indicator is the indicator that relates to the recognition of international conventions and programs, as they are based on the presence of these biogeographic categories.

When it comes to the indicator which is related to the damaged forest ecosystems in the studied NP, the situation is quite different, given the present process of drying of forests (primarily conifers) in Serbia, culminating in the period 2012 - 2013. Unlike the Plitvice Lakes National Park, where extremely small-scale drying was registered during the ten-year period (2003- 2013), in the NP Tara there is an intensive long-term drying in nearly all forest ecosystems. Forests of spruce and fir are the most vulnerable and physiologically



weakened, with about 14 000 m<sup>3</sup> of dry trees in 2014. If we add to this the consequences of a fire in 2012, during which the forest ecosystems of the wider territory of the mountain Tara suffered a lot of damage (about 1 800 ha of fir, beech, pine and spruce forests burned), it is clear that the analyzed indicator is not on a sustainable level.

Indicator of the quality of the river water is in an acceptable range, and the obtained WPI values have confirmed the tendency of deterioration of water quality in the Drina River (Class II and Class III to 2008, and then transfer to Class IV). It should be emphasized that its tourist function has not been violated, although this could happen by further pollution. As the river water is used for bathing and recreational purposes, any further deterioration of its quality would damage the living world and sustainable tourism development of the area.

The analysis identified unsustainable state of indicator of the presence of illegal waste disposal sites and systems for purifying / recycling. Illegal landfills and dumps represent a real problem for the studied area, and are usually located along the banks of the rivers and in the weekend settlements. Although they are regularly cleaned and removed, the newly created ones replace them, and the problem of their rehabilitation receives permanent frames. The accommodation and catering facilities in the territory of the studied NP (except the hotels Omorika and Beli bor in Kaludjerske bare) do not have their own systems for treatment of waste waters, which discharge untreated into the city sewers. The hotel facilities and restaurants, as well as all tourism enterprises do not carry out their own recycling of solid waste, which is not in compliance with current environmental standards.

## 5. CONCLUSIONS

Global analysis of the indicators confirmed that the NP Tara has strong environmental attributes and that tourism in the studied area did not make any significant damage to the environment. Application of indicators has enabled the identification of the results of actions that have been undertaken so far, as well as the upcoming and existing problems, which provides guidance for future management actions in a sustainable direction.

Although in the NP Tara there is a good basis for planning the development of tourism on sustainable bases, it is necessary to find

solutions to identified problems and developmental brakes. This refers to the problem of forming illegal waste disposal sites, the permanent solution of which is not in sight. The negative impact of tourism on the environment is also reflected in the fact that the tourist facilities and facilities managing national parks do not have devices for wastewater treatment or to recycle solid waste. In order to put further development of tourism under environmental control, it is necessary to prepare such devices and improve the collection and treatment of solid waste. A good move would be an initiative to form specific points at which waste would be collected and then recycled.

Public company responsible for managing the protected area puts effort to coordinate tourism development with nature protection through the operation in terms of limiting tourist activities and controlled visits to the 1st protection zone sites. This operation should become the main development orientation of the national park, i.e. environmental criteria should not be ignored when trying to establish a sustainable tourism offer. It is emphasized that sustainable tourism is not a static target, which can be reached after a planned number of years, but the process towards the desired future, with the changes that emerge over time. All future actions need to be planned in accordance with this premise.

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### Conflict of interests

Authors declare no conflict of interest.

## REFERENCES

- Bjeljac, Ž., Čurčić, N., & Brankov, J. (2012). Tourism Evaluation of IBA Areas in the Serbian Part of Banat. *Forum Geografic*, 11(2), 161–167. <http://dx.doi.org/10.5775/fg.2067-4635.2012.034.d>
- Bramwell, B. (2015). Theoretical activity in sustainable tourism research. *Annals of Tourism Research*, 54, 204–218. <https://doi.org/10.1016/j.annals.2015.07.005>
- Brankov, J. (2010). *Ekološki turizam u zaštićenim objektima prirode u Banatu*. Beograd: Geografski institut »Jovan Cvijić« SANU.
- Brankov, J., Jovičić, D. & Milijašević, D. (2015). Sustainable Tourism in National Park “Đerdap”.

- Serbia – Attitudes of Local Population. *Journal of the Geographical Institute "Jovan Cvijić" SASA*, 65, 2, 183 – 199. <https://doi.org/10.2298/IJGI1502183B>
- Brankov, J., Milijašević, D. & Milanović, A. (2012). The assessment of the surface water quality using the water pollution index: a case study of the Timok River (the Danube River basin). *Archives of Environmental Protection*, 38 (1), 49 – 61. <https://doi.org/10.2478/v10265-012-0004-x>
- Briassoulis, H., & Van der Straaten, J. (Eds.) (2013). *Tourism and the Environment: Regional, Economic, Cultural and Policy Issues (2nd Ed.)*. Dordrecht: Springer-Science and Business Media. <https://goo.gl/dUzPzd>
- Buckley, R. (2012). Sustainable tourism: Research and reality. *Annals of Tourism Research*, 39(2), 528–546. <https://doi.org/10.1016/j.annals.2012.02.003>
- Bushell, R., & Eagles, P.F.J. (Eds.). (2007). *Tourism and protected areas: Benefits beyond boundaries: the Vth IUCN World Parks Congress*. Oxford: CAB International. <https://goo.gl/BqzZv8>
- Eagles, P.F.J., & McCool, S.F. (2002). *Tourism in National Parks and Protected Areas: Planning and Management*. Wallingford: CABI Publishing. <https://goo.gl/gQul6M>
- Holden, A. (2016). *Environment and Tourism (3rd Ed.)*. London and New York: Routledge, Taylor & Francis Group. <https://goo.gl/ZJKuAy>
- Information on the PC »National Park Tara« for 2013. (2014). *Bajina Bašta: PC »Nacionalni park Tara«* (in Serbian).
- Jamal, T., & Camargo, B. (2014). Sustainable tourism, justice and an ethic of care: Toward the just destination. *Journal of Sustainable Tourism*, 22(1), 11–30. <http://dx.doi.org/10.1080/09669582.2013.786084>
- Jovičić, D. (1997). *Razvoj turizma i zaštita prirode u nacionalnim parkovima*. Beograd: Velarta.
- Lee, T. H. (2013). Influence analysis of community resident support for sustainable tourism development. *Tourism Management*, 34, 37-46. <https://doi.org/10.1016/j.tourman.2012.03.007>
- Lozano-Oyola, M., Blancas, F. J., González, M., & Caballero, R. (2012). Sustainable tourism indicators as planning tools in cultural destinations. *Ecological Indicators*, 18, 659–675. <https://doi.org/10.1016/j.ecolind.2012.01.014>
- Nikolić, S. (1998). *Priroda i turizam Srbije*. Beograd: Eko centar, Zavod za zaštitu prirode Srbije.
- Nikolić, S. (2006). *Turizam u zaštićenim prirodnim dobrima Srbije*. Beograd: Zavod za zaštitu prirode.
- Novelli, D. M., & Scarth, A. (2007). Tourism in protected areas: integrating conservation and community development in Liwonde National Park (Malawi). *Tourism and Hospitality Planning & Development*, 4(1), 47 – 73. <http://dx.doi.org/10.1080/14790530701289697>
- Nyaupane, G. P., & Poudel, S. (2011). Linkages among biodiversity, livelihood, and tourism. *Annals of Tourism Research*, 38(4), 1344 – 1366. <https://doi.org/10.1016/j.annals.2011.03.006>
- Public Company »Nacionalni park Tara«. Retrieved on February 28, 2017, from <http://www.nptara.rs/en/>
- Regulation on Protection of Natural Rarities. (1993). Official Gazette of RS no. 50/93. (in Serbian).
- Report on the Monitoring of Forest Drying in the area of NP Tara in 2014. (2014). Bajina Bašta: PC »Nacionalni park Tara« (in Serbian).
- Republic Hydro-meteorological Service of Serbia. Retrieved on September 14, 2011, from [http://www.hidmet.gov.rs/index\\_eng.php](http://www.hidmet.gov.rs/index_eng.php)
- Ružić, V. (2011). Marketing zaštićenog područja – studija slučaja: Nacionalni park Plitvička jezera. *Zbornik radova Međimurskog veleučilišta u Čakovcu*, 77 – 83. <http://hrcak.srce.hr/74962>
- Sharpley, R. (2009). *Tourism Development and the Environment: Beyond Sustainability?*. London: Earthscan. <https://goo.gl/9MvaUC>
- Special Purpose Area Spatial Plan for the NP Tara, Management Plan for the NP TARA for the period 2012-2021. (2011). Belgrade: Ministry of Agriculture and Environmental Protection.
- Srdanović, M., & Pavić, D. (2015). Tourists' attitudes on tourism offer in north-western part of Montenegro. *Journal of the Geographical Institute "Jovan Cvijić" SASA*, 65, 2, 201 – 214. <https://doi.org/10.2298/IJGI1502201S>
- Stojanović, V. (2005). *Održivi razvoj u specijalnim rezervatima prirode Vojvodine*. Novi Sad: Departman za geografiju, turizam i hotelijerstvo, PMF, UNS.
- Torres-Delgado, A., & López Palomeque, F. (2014). Measuring sustainable tourism at the municipal level. *Annals of Tourism Research*, 49,122-137. <https://doi.org/10.1016/j.annals.2014.09.003>
- UNWTO (World Tourism Organization) (2004). *Indicators of Sustainable Development for Tourism Destination: a Guidebook*. Madrid: WTO.
- Williams, P. I., & Ponsford, I. F. (2009). Confronting tourism's environmental paradox: Transitioning for sustainable tourism. *Futures*, 41, 396 – 404. <https://doi.org/10.1016/j.futures.2008.11.019>
- Žujović, B., & Brankov, J. (2008). Ecological trends in contemporary tourism of Vojvodina. *Proceedings of XIX Biennial international congress: Tourism & hospitality industry „New trends in tourism and hospitality management“*, 7-9 May, Opatia, Croatia, 1313 – 1323.