SUSTAINABLE DEVELOPMENT OF SERBIAN DANUBE BIOREGIONS[1]

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Abstract

Danube Region in the Republic of Serbia has its numerous specificities regarding biodiversity, cultural, sociological and economy characteristics. Serbian Danube region can be divided into three sub-regions called bioregions. Each bioregion has its natural and cultural resources that must be preserved and improved. Aim of this work is to present cpecific features of each bioregion with special emphases on protected areas. Upper Danube bioregion is characterized by Special Nature Reserve „Gornje Podunavlje", Metropolitain bioregion is characterized by large urban areas where there is a possibility of permaculture model application and in the third bioregion, Lower Danube, the main characteristic is National park „Đerdap". In some of these regions there is a possibility of crossborder cooperation with neighbouring countries where natural goods are extending.

Key words: *bioregions, permaculture, sustainable development, serbian Danube region, biodiversity*

Introduction

Bioregionalism is a concept created during the sixties of the last century in the United States of America. In the begining of this concept, there was an activitistic approach which indicated at and emphasised the need to protect environment and limited resources, which were uncontrollably

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exploited. Today, concept of bioregionalism clearly indicates the need to rationaly and controllably use all natural resources according to their capacities which is completely in accordance with the principles of sustainable development concept.

Bioregionalism is political, cultural and ecological concept based on naturaly determined teritorial units called bioregions. Today, this idea is being accepted again and bioregional concept have its full expression in the case od territories, provinces and regions which have rich natural resources: water, different abiental values, soil and biodiversity (*Puđak, 2010*).

Bioregionalism is an understanding and approach which puts in the first plan organization and development of social life in sence of reliance on natural characteristics of areas, which is in contrast with traditional industrial - commercial understanding of human society limited within administrative - state borders. Considering that nowdays dominant production and consuming practice follows the logic „*business - as - usual*“, with fast depletion of nonrenewable resources, concepts such as bioregionalism increasingly gaining in importance.

Serbian Danube region, which follows the stream of Danube River, has its special characteristics in natural, historical, economical and sociological sence and the concept of bioregionalism in this case is entirely acceptable. In particular, must be emphasised the need for crossborder cooperation with neighbouring countries due to common natural resources, which is especially needed in the case of Upper Danube region where it is necessary to create and conduct cooperation plans with Hungary and Croatia. Alos, international cooperation can be established through common plans and programmes between serbian Lower Danube region and Romania.

Local people, who directly rely on their natural surroundings for their livelihood, develop an intimate knowledge of these surroundings. Sustainable agriculture that requires minimum external inputs, giving a sense of independence to the small farme and it can can be applied in Danube bioregions and especially in the protected areas. Small - scale local industries, low - growth economies, self - determination, self - sufficiency, non - hierarchical cooperation and participatory democracy are the cornerstones of decentralized development, which is gaining in importance in todays world of increasing globalisation. This new

paradigm of sustainable development involves abandoning consumptive growth, integrating traditional ecological knowledge into the holistic wisdom, conserving the biological and cultural diversities and adopting a decentralized bottomup approach (*Jonnalagadda Rajeswar, 2002*).

Permaculture as an idea was created during seventees of the last century from the word „*permanent agriculture*" and it was being designed by australians Bill Mollison and David Holmgren. In modern civilisation, permaculture can and should be applicable as a life style which supports the sustainable development concept which main goal is to reduce consumption and to satisfy the human needs by balancing the production and the recycling of created waste. In rural areas, permaculture should be compatible with the principles of organic production of agricultural products. In urban areas this concept considers abiental and designed transformation of building terraces and suitable areas into small „farms" according to the natural principles. Permaculture is in the function of overcoming the gap and antagonism between rural and urban areas. Permaculture in Serbia is in its beginning and it is applicable in metropolitain area such as Belgrade, Novi Sad and Pančevo.

Urbanization will continue to shape the future, as essentially all new population growth is projected to take place in urban areas, and over 60 % of the total population is expected to reside in cities by 2030. In 1996, the United Nations Development Program estimated that 800 million people are engaged in urban and peri - urban agriculture worldwide, a quarter of whom are market producers, employing 150 million people full-time and producing 15 % of the world's food (*Kyle H. Clark and Kimberly A. Nicholas, 2013*).

Permaculture models its designs for agroecosystems, buildings, and communities on patterns observed in nature, but perhaps more importantly, permaculture views humans and their creations and activities as part of the natural world. Permaculture is an eclectic and adaptive approach that emphasizes local and bioregional perspective and practice. The overall aim of these design principles is to develop closed - loop, symbiotic, self - sustaining human habitats and production systems that do not result in ecological degradation or social injustice (*James R. Veteto and Joshua Lockyer, 2008*).

Protected areas in Serbia

Republic of Serbia has protected certain number of natural resources in Serbia by adoption of national laws and by ratification of international agreements. Law on Environmental Protection and other laws and by-laws which directly or indirectly concern nature and natural resources normatively regulate environmental protection. Law on Nature Protection („Official Gazette of the Republic of Serbia", No. 36/09 and 88/2010) governs protection and preservation of nature, its biological, geological and ecosystem diversity. Harmonisation and regulation of by-laws in this area is in compliance with legal acts of the European Union, related to environmental protection. The most significant strategic documents adopted at the level of the State are: „National Sustainable Development Strategy" („Official Gazette of the Republic of Serbia", No.57/2008), „National Strategy of Sustainable Use of Natural Resources" („Official Gazette of the Republic of Serbia", No.33/2012), „Strategy on Biodiversity of the Republic of Serbia for the period 2011 - 2018 („Official Gazette of the Republic of Serbia", No. 13/2011) and „National Programme of Environmental Protection", („Official Gazette of the Republic of Serbia", No.12/2010).

In the light of global climate changes, protected areas are one of the main tools for mitigation of climate changes consequences. Protected areas, especially forest ecosystems and water resources, can moderate climate changes by accumulation of carbon and thus prevent its agglomeration in the atmosphere. Sustainable use of protected ecosystems has its economy importance in the sence of tourism and fisheries development, which can be especially pointed out in the Danube region.[3] Forest richness in Serbia, from the aspect of species and genetic diversity of woody plants, is unique in Europe.Total number of autochthonous species of trees and shrubs is 205, among which should be singled out endemic and endemo - relict species such as: Macedonian pine (*Pinus peuce),* Bosnian pine *(Pinus heldreichii),* Serbian Spruce (*Picea omorika)* and Turkish hazel *(Corylus colurna*). It is estimated that in Serbia there is about 1.000 plant communities. Gorges and canyons from eastern to western part of Serbia are significant refugiums of tertiary vegetation of the Balkan Peninsula and the largest part of these communities are forest ecosystems. At the

[3] WWF (Svetski fond za prirodu), Centar za unapređenje životne sredine (2012): Procena ranjivosti na klimatske promene, Beograd, http://awsassets.panda.org/downloads/cva_srbija_srpski.pdf, (23.09.2013);

same time, it should be emphasised that in Serbia there are currently 600 endangered plant species and about 500 endangered animal species. Preservation of plant and animal species is being conducted at two ways: *in situ* (preservation of biodiversity by conservation of existing communities through legal protection of natural reserves, national parks, seed stands, group of trees or individual trees) i *ex situ* (preservation of gene pool by growing of specialized cultures such as arboretums, tests of origin, progeny tests and seed plantations). For the purpose of biodiversity preservation, in the Republic of Serbia there are identified natural communities with different character: 50 natural reserves at total area of 569.000 ha; 5 national parks („Fruška Gora", „Đerdap", „Tara", „Kopaonik" and „Šara") at area of 246.000 ha and seed stands at area of 934 ha with thick net of comparative clonal plantations with domestic and foreign clones of poplar, willow and acacia.[4]

Protected areas in Vojvodina

Vojvodina as autonomous province of the Republic of Serbia has territorial jurisdiction for many protected areas with different protection regime level and most of them are located in the Danube coastal region. At the territory of Vojvodina province there is a public company "Vojvodinašume" which manages 16 protected areas at the area of 69.595,85 ha and it is also the owner of forests and forest land within seven more protected areas. PC "Vojvodinašume" manages protected areas based on legal acts, adopted by the Serbian Government (*Regulations on areas protection*) and municipalities assemblies where protected areas are (*Decisions on areas protection*). PC „Vojvodinašume" as protected areas manager, in accordance with the Law on Nature Protection („Official Gazette of the Republic of Serbia", no. 36/09), keeps the Register of protected areas and sees that all beneficiaries of protected areas (owners of private forests, owners of agricultural areas, owners of tourist objects and other users of natural and created values and services) conduct designated protection regimes.[5] Special nature reserves and Nature monuments managed by PC „Vojvodinašume", and their size in hectares are presented in the table below (Table 1). Each of this area is differently structured regarding protection regime level (Table 2).

[4] Organizacija Ujedinjenih nacija za hranu i poljoprivredu (2008): Stručne osnove za izradu nacionalnog šumarskog akcionog programa, Projekat "Razvoj sektora šumarstva u Srbiji" (Projekat GCP/FRZ/003/FIN), Beograd;

[5] Vojvodina šume - Gornje Podunavlje http://www.vojvodinasume.rs/zastita-zivotne-sredine/gornje-podunavlje, (25.08.2013);

Table 1. Overview of protected areas managed by Public Company „Vojvodinašume“ (january 2010)

Protected area	Number	Area (ha)
Specijal nature reserve (SNR)	5	69.212,50
„Koviljsko-petrovaradinski rit“		4.840,60
„Bagremara“		117,58
„Gornje Podunavlje“		19.605,00
„Deliblatska peščara“		34.829,32
„Obedska bara“		9.820,00
Nature monument (NM)	3	186,34
„Šume Junaković“		180,05
„Ivanovačka ada“		6,07
„Veštačka sastojina močvarnog čempresa“		0,22
Total area – SNR andNM	**8**	**69.398,84**

Source: *http://www.vojvodinasume.rs/zastita-zivotne-sredine/gornje-podunavlje/*

Table 2. *Overwiew of protected areas by protection regime level (january 2010)*

Protected area	Structure of areas under protection regimes (ha)			
	I	II	III	Total
Specijal nature reserve (SNR)				
„Koviljsko-petrovaradinski rit“	508,98	2.082,24	2.249,38	4.840,60
„Bagremara“	34,80	82,78	0,00	117,58
„Gornje Podunavlje“	261,62	4.843,81	14.499,57	19.605,00
„Deliblatska peščara“	2.353,80	8.218,59	24.256,93	34.829,32
„Obedska bara“	314,92	2.565,08	6.940,00	9.820,00
Nature monument (NM)				
„Šume Junaković“	0,00	58,12	121,93	180,05
„Ivanovačka ada“	0,00	6,07	0,00	6,07
„Veštačka sastojina močvarnog čempresa“	0,22	0,00	0,00	0,22
Total area - SNR and NM	**3.474,34**	**17.856,69**	**48.067,81**	**69.398,84**

Source: *http://www.vojvodinasume.rs/zastita-zivotne-sredine/gornje-podunavlje/*

According to listed data it can be noticed that under the first protection level is 5,01% of total protected area (3.474,34 ha), second protection level includes 25,73% of total protected area (17.856,69 ha) while under

the third protection level is about 69,26% of total protected area (48.067,81 ha). In the State ownership is 64.090,22 ha (92,35 %), in the private ownership 4.209,42 ha (6,07%) while in the social ownership is 1.099,20 ha or 1,58% of all protected areas. Many protected areas managed by PC „Vojvodinašume“ have international importance and status and they are territorialy linked to the Danube region in large extent:

- *SNR „Koviljsko-petrovaradinski rit“*: Important Bird Area - IBA (1989), International Commission for the Protection of the Danube (2004), Important Plant Area - IPA (2005), potentialy Ramsar site;
- *SNR „Gornje Podunavlje“*: Important Bird Area - IBA (1989), International Commission for the Protection of the Danube (2004), Important Plant Area - IPA (2005), Ramsar site (2007), PBA (Prime Butterfly Area) i potentialy MAB area;
- *SNR „Deliblatska peščara“*: Important Bird Area - IBA (1989), International Commission for the Protection of the Danube (2004), Important Plant Area - IPA (2005), Ramsar site - Labudovo okno (2006);
- *SNR „Obedska bara“*: Important Bird Area - IBA (1989), Important Plant Area - IPA (2005), Ramsar site (1977);

Very important activities which are connected to the activities of environmental preservation and protection in Vojvodina, are activities related to planing and development of hunting. Within PC „Vojvodinašume“ are hunting grounds at area of 109.824,34 ha, which is 5,1 % of total hunting grounds in Vojvodina (2.152.635,60 ha). At this area is functioning 17 hunting grounds managed by five lumber camps (LC „Novi Sad“ - Novi Sad; LC „Sombor“ - Sombor; LC „Banat“ - Pančevo; LC „Sremska Mitrovica“ - Sremska Mitrovica and „Vojvodinašume - Lovoturs“ Novi Sad - Petrovaradin). Of this hunting area, 27.462,33 ha or 25,01% is fenced. Fenced hunting grounds serve for intensive and modern farming of autochthonous species such as deer and wild boar and alochthonous species such as fallow deer and mouflon. Accompanying species in public hunting grounds is roe deer, present in significant number. In economic sence, the most important is intensive production and breeding of big game because it is directed to foreign hunters/tourists.[6]

[6] Vojvodinašume - lovstvo, (http://www.vojvodinasume.rs/lovstvo, (26.09.2013). http://www.vojvodinasume.rs/lovstvo/

Upper Danube bioregion

Within the borders of the Republic of Serbia, Upper Danube is a bioregion which is characterized by specific ramsar flood sites, unique in Europe. This region represents one natural unity with Danube areas in Croatia and Hungary and it is one of the potential candidates for Biosphere Reserve.

Special Nature Reserve „Gornje Podunavlje“ is a large flood area at the far north - west of Vojvodina and it represents one of the most preserved wetlands through entire stream of Danube River in Serbia. It extends to 19.648 ha, along the left bank of Danube River, including nearly 70 km of the river stream. It is a part of large flood valley which also spreads in neighboring Hungary and Croatia and after delta, it represents the most important wetland through entire Danube River stream. Upper Danube is one of the last shelters for species linked to flood areas.

Within the borders of the Upper Danube region is special nature reserve „Gornje Podunavlje“ (protected by Regulation on the Protection of „Gornje Podunavlje“ Special Nature Reserve, „Official Gazette of the Republic of Serbia“, No. 45/01). This special nature reserve is a natural good of exquisite value under the state protection as the category I of protected natural goods. According to IUCN classiffication it is in IV category as Habitat and Species Management Area. This reserve, at area of 19.648 ha, represents the left Danube valley plane from state border with Hungary to Bogojevo, at the territory of Sombor city and Apatin Municipality. Special Nature Reserve „Gornje Podunavlje“ is a part of large wetland complex. This is one of the last large flood areas in Europe. Within this reserve are „Monoštorski rit“ (Monostor marsh) and „Apatinski rit“ (Apatin marsh), composed of various plan communities presented by forests, meadows, swamps and marshes, right next to Danube River and on its meanders. This flood area is very narrow due to land drainage and it represents only the remains of former large marsh ecosystems. Large impact of human activities in this area reflects also in plantation of forests which are then being used also as a hunting grounds. At large areas (over 1.000 ha), in areas „Tikveš“ and „Karapandža“, are planted oak forests and by establishment of hunting - lumber camp „Jelen“ in 1952, managing of forestry, hunting and fishiery in this area started. It was understood that this forest complex must be managed integrally and more coprehensive because it was valuable natural resource and natural rarity.

Today, it can be stated with certainty that Special Nature Reserve „Gornje Podunavlje“ is one of the last shelters for plant and animal species linked to flood areas. Regarding fauna, this area has 51 mammal species, 248 bird species, 50 fish species, 11 amphibian species, 9 reptile species and large number of invertebrates. Because there is over 60 daily butterfly species, this area is placed in the list of Prime Butterfly Areas. Regarding flora, there are over 1.000 plant species whith presence of endangered species such as: *Eranthis hyemalis*, *Hottonia palustris* and *Hippuris vulgaris*. Reserve is a habitat of thick almost impassable marsh forests composed of autochthonous poplars. Thick autochthonous forests of poplar and willow are relict which is confirmed by 40m high and 10m thick trees. The largest population of european deer (*Cervus elaphus*) is located here and this area is considered to be one of the last authentical marsh ambients. Also, some of the best hatcheries in entire Danube River stream are settled in „Gornje Podunavlje“. Development of hunting tourism and good predispositions for fishing are certainly potentials of this area.

Also, this reserve must be considered not only from the aspect of biodiversity and natural values but also from the aspect of tourism. Large potential exists in cultural heritage of this areas which makes it very authentical destination. Local population has high awareness about the need and significance of preservation and protection of these ecosystems on the basis of sustainable development principles.[7]

Within this bioregion there is Special Nature Reserve „Bagremara“, which is put under legal protection in 2007 by adoption of Regulation on protection of Special Nature Reserve „Bagremara“ („Official Gazette of the Republic of Serbia“, No. 12/07), as natural good of I protection category. This protected area is located at the territory of Bačka Palanka at total surface of 117,58 ha, while the protected zone, as integral part of protected natural good, is at the area of 271,16 ha. SNR „Bagremara“ is the only habitat of plant species winter aconite (*Eranthis hyemalis* Salisb.) in Serbia. Winter aconite is a perennial early spring plant from the family of crowfoots (Ranunculaceae) for which is determined that it represents natural rarity and therefore it belongs to the category of extremely vulnerable species in the Republic of Serbia. At the territory of „Bagremara“ there are two protection regimes and there are very serious

[7] Vojvodina šume - Gornje Podunavlje http://www.vojvodinasume.rs/zastita-zivotne-sredine/gornje-podunavlje, (25.08.2013);

measures, at the entire area of the Reserve, aiming to preservate this natural good: maintenance of stability and protection status of the forests, revitalisation of natural autochtonous forest communities, establishment of species monitoring and control of invasive species.

Metropolitain area

Within the metropolitain area that is Middle Danube Bioregion there are large urban areas such as Belgrade, Novi Sad and Pančevo. This area is largely transformed by agricultural and urban activities and it does not resemble to original appearance.

Within this beioregion there is a special nature reserve „Koviljsko - Petrvovaradinski rit“ as a complex of swamp and forest ecosystems at area of 4.840 ha. This special nature reserve is located in south - east Bačka, in inundation area of Danube River, and due to large number of bird species (172 species), it has been declared as international important bird area in 1989. Also, since 2004, it is at the list of protected areas conditioned by flood and important for Danube Basin and it is also a candidate for the List of Wetlands of Ramsar Convention. In this nature reserve are preserved orographic and hidrographic shapes characteristic for marsh areas (distributaries, river islands, swamps, marshs etc.) as well as plant communities (meadows, forests etc.) with specific flora and fauna. Due to nearness of Novi Sad (20 km) and Belgrade (60 km) as well as good traffic connections, this reserve is real tourist attraction (especially for fish hunting because here live about 46 fish species). Important cultural - historical building at this area is Kovilj Monastery from XIII century.

Near Novi Sad there is a National Park „Fruška Gora“, marked as internationaly important area for bird and plant species. This is hilly - mountain area where the highest top is 539 m and it is rich with oak, hornbeam, beech and linden forest. Flora of this protected area includes over 1,500 species and in plant communities of this national park live over 50 protected species. It should be stated that here there are over 30 species from the family Orchidaceae, of which 18 have international importance. Within the fauna there are protected species of insects, amphibia and reptilia, which are at the IUCN[8] Red List of Endengered Species. Birds are presented with 211 species of which 130 are nesting

[8] IUCN - The International Union for Conservation of Nature

birds. NP „Fruška gora“ is one of the most significant areas for nesting of rare birds in Pannonian Basin and Serbia. Only at this place, endangered species Eastern Imperial Eagle (*Aquila heliaca*) is nesting. From numerous mammal species there are protected species: bats, ground squirrels and lesser mole rat.

Situation regarding forests in Novi Sad, which is highly urban area, is not satisfactory. Out of total area of the City, under forest is 2,618 ha that is 3,74%. Considering numerous pollutants in this area it is necessary to increase forest area which must be one of the priorities at the level of Novi Sad.

Total forest area at the territory of Belgrade, including urban and periurban municipalities, is 39,141 ha that is 12,2%. Forest area per inhabitant is 0,025 ha but for the purpose of its positive ecological function expression on the environment, minimal forest area per inhabitant must be 0,33 ha. So, afforestation is one of the priorities at the territory of Belgrade. Modern approach to climate changes as one of the possible solutions sees in larger afforestation in urban areas such as Belgrade. According to the study of prof. Brian Stone from the Georgia Institute of Technology, it is proposed to plant more million trees to create cities forests which would be part of the solutions for global climate changes[9].

At area of Pančevo city there are ecosystems with relict and endemit flora and fauna species. Among woody species dominate hybride Populus euramericana, white willow, black poplar, pedunculate oak, elms and common juniper which is the only wild conifer of Pannonian Basin. Herbaceous plants include *Paeonia officinalis L. subsp. banatica, Atremisia pancicii, Stipa joannis;* in marsh and pond communities there are *Typha latifolia, Phragmites australis, Nymphaea alba* and *Nuphar lutea;* at drier loess plateau there are: *Cynodon dactylon, Arctium sp., Amaranthus retroflexus, Sinapis sp., Taraxacum officinale* and *Achillea millefolium*. Hunting game includes big game (deer, roe deer, wild boar, fox, wolve) and small game (badger, hamster, otter, nutria, rabbit, skunk, mole and hedgehog). In steppe habitats there are rare species such as: desert ants, antilion, steppe gerbil, ground squirrel, lesser mole rat and skunk steppe.

[9]Urban forest key to international climate responses http://openalex.blogspot.com/2009/11/urban-forestskey-to-international.html, (23.09.2013);

At the territory of Pančevo city, as highly urban area, there is a reduction of forest areas from 12,925 ha in 2006 to 3,160 ha in 2008. This fact can not be neglected considering the importance of forests for reduction of aero-pollution at the territory of Pančevo city. Afforestation activities must be intensified and unplanned and uncontrolled deforestation must be prevented.

Nature monument „Ivanovačka ada" is a protected natural good at the territory of Pančevo city. It is located at river island, in Danube flood area, near Ivanovo village, and it represents the remains of once dominante wetland forests. This nature monument is a long zone with 2 -7 km width and composed of two forest segments. „Ivanovačka ada" has importance in preservation of habitats characteristic for river islands where live animal and plant species adjusted to specific flooded forest areas. Natural rarity in this area is protected animal species such as White - tailed Eagle (*Haliaeetus albicilla*).

Rare plant species - Creeping Yellowcress (*Rorippa sylvestris)* as pannonian subendemic plant inhabits wet meadows, edges of field roads and partially saline habitats. Here one can find wild Common Grape Vine (*Vitis vinifera*) which is rare in the flora of Vojvodina. In forests are dominant the following species: White Elm (*Ulmus laevis*), Green Ash (*Fraxinus pensylvanika*), black poplar (*Populus nigra*), white willow (*Salix alba*), pedunculate oak (*Quercus robur*) and Narrow - leafed Ash (*Fraxinus angustifolia*). Entire area of „Ivanovačka ada" is under protection regime and controlled usage of natural resources and activities.

Lower Danube bioregion

Lower Danube bioregion is a specific area from more aspects. Central part of this area is sparsely populated, wooded, hilly - mountainous teritory of National Park „Đerdap". Administratively, this national park is under authority of several municipalities: Golubac, Kučevo, Majdanpek, Kladovo and Negotin. NP „Đerdap" is an area which fulfils geomorphological, hidrological and natural conditions for the status of national park („Official Gazette of the Republic of Serbia", No. 36/09). National Park „Đerdap" is a teritory at the southeast Europe and at the northeast Serbia it borders with Romania.[10]

[10] Vojvodinašume - lovstvo, (http://www.vojvodinasume.rs/lovstvo, (26.09.2013).

Spatial plan of National Park „Đerdap“ determines goals and tasks regarding protection of nature and measures and conditions for improvement and sustainable development of this area. This document sets zones with three protection levels. Besides this, National Park „Đerdap“ represents Important Bird Area (IBA), Important Plant Area (IPA), Prime Butterfly Area (PBA) and it is a part of the Emerald Network of Areas of Special Conservation Interest, which is important from the aspect of application of Bern Convention in Serbia (Convention on the conservation of European wildlife and natural habitats). Area of this park is at the preliminar list for World Cultural and Natural Heritage (UNESCO), it is a candidate for Biosphere Reserve (UNESCO's Man and the Biosphere (MAB) Programme) and at the list of Carpathian Areas (The Framework Convention on the Protection and Sustainable Development of the Carpathians).

Although there are specific forest communities in this area, their health condition is not satisfactory. Drying out of forests is moderatly presented in large part of the National Park while in sessile oak forests is more intensive. Causes of drying are pests, mostly gypsy moth, and fungal infections. Also, forests are impacted by climate change and air pollutants. NP „Đerdap“ is rich with forest communities (64% of the total territory is under forest), which are very diverse. There are over 1.100 registered plant species among which are many relict and endemic species. Turkish hazel (*Corylus colurna*) is one of the relict species which builds here, together with other relicts, thick and old phytocenosis. In Đerdap Gorge there are evergreen species: holly (*Ilex aquifolium),* spurge - laurel (*Daphne laureola*) and European yew (*Taxus baccata*). Besides relict species in these communities are also “modern” species of plants and shrubs. Of about 50 plant communities at this area, 35 communities have relict character. Besides already mentioned species *Corylus colurna,* relict communities are consisted of the following species: common lilac (*Syringa vulgaris*), walnut (*Juglans regia*), Small-leaved Lime (*Tilia cordata*), Montpellier Maple (*Acer monspesulanum*), Pubescent Oak (*Quercus pubescens*), European nettle tree (*Celtis australis*) andsmoke tree (*Corinus coggigrya*). Very important are also forests of moesian beech (*Fagus moesiaca*), sessile oak (*Quercus petraea*) andcommon hornbeam (*Carpinus betulus*). Main characteristics of this national park is that there are many diverse types of forests at small area and there are large differences in plant communities between forests at silicates and forests at limestone. In this national park there is a very interesting mosaic of forest types and communities attractive from scientific and tourist aspects.

Tourist offer of the Lower Danube is rich and certainly deserves larger marketing activity. Lepenski vir is a significant cultural an historical tourist attraction. It is a prehistoric locality and one of the largest mesolithic and neolithic archaeological sites in Europe. Lepenski vir is settled on the right bank of Danube River, in Đerdap Gorge, in the central part of the Balkan Peninsula. This locality is considered to be the cradle of the european civilisation and one of the main recognizable feature of it is Trajan's memorial plaque, stone inscription of roman emperor which built here path, bridge and rest area for his legions. From geographical aspect, this locality is interesting because Danube River is the widest, the deepest and the narrowest here.

Đerdap and Negotin Krajina is, thanks to rich tradition and culture monuments, cultural center of the eastern Serbia. Rajačke pimnice are, besides city center and memorial house of Stevan Stojanović Mokranjac, the most visited destinations in this area. Negotin Krajina has several tourist attractions such as: wines of Krajina, authentic architecture, rich hunting grounds and the Festival „Day's of Mokranjac". Nature Park Vratna is special by its Vratna River Gorge where there are three giant stone gates and over four hundred plant species. Biodiversity is rich with tertiary relict species and endemites. Here there is a an Eco-camp and all activities are controlled and in accordance with preservation and protection of this natural wealth. Besides this, Negotin Krajina can also be interesting for its mountain path at the Deli Jovan mountain which leads to the mountain top of 1.138 m (Mijajlović et al., 2013).

Besides present tourist capacities the plan is to expand tourist offer at the level of respective municipalities: Golubac, Kladovo, Negotin, Kučevo and Majdanpek. Tourist offer, besides already mentioned natural attractions at Danube River, is expanded by autochtonous products such as wines of Negotin Krajina and branded Homolj honey.

Conclusion

In the process of european integration Serbia has largely adopted certain legislative regarding the protection of natural resources and the environment. Based on the presented natural goods and cultural-historical monuments, it can be concluded that the Serbian Danube region can be divided into three specific bioregions: Upper Danube, Metropolitain area and Lower Danube.Within the Upper Danube there are natural habitats linked to flood areas of Danube River with unique marsh ecosystems and special nature reserve which has features of MAB areas. In cultural, economy and social sence, this area has special features and it represents tourist attraction. Metropolitain area with highly

developed economy and large urban areas presented with capital city Belgrade followed by Novi Sad and Pančevo are the main characteristics of this bioregion. Tendency of permaculture development as a way to develope intraurban and periurban agriculture is a trend which gaining in importance, so, such approach can be helpful in overcoming the antagonosm between rural and urban areas in Metropolitain area. Lower Danube is a bioregion which has specificity of National park and forest complexes which must be protected and preserved but also utilized on the principles of sustainable development.

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