

PERSPECTIVES OF FORESTRY DEVELOPMENT ACCORDING TO SUSTAINABLE DEVELOPMENT IN THE SERBIAN DANUBE REGION¹

Nada Mijajlović, Slavica Arsić²

Abstract

Serbian Danube region is located in the Danube area, with units marked as Upper, Middle and Lower Danube. This paper aimed to review the state of the forests in the Serbian Danube, emphasize the importance of certain forest ecosystems such as rainforests Iron Gates, forest of reserve in Upper Danube, forests of Fruska Gora and the need to protect and preserve the forest and improve the circuits on the principles of sustainable development. The paper considers the individual municipalities for each of the units of Danube region in Serbia, presented and commented upon data collected from statistical databases that were available at the state level as well as the available literature.

Keywords: *forestry, sustainable development, national park, a nature reserve, the Serbian Danube.*

Introduction

Forests are of great importance at the global level and, in the context of very current climate change, have multiple roles. The importance of forests in terms of synthesis of oxygen is well known, as a significant volume of wood that is used in industry; forests affect water circulation, the micro-climatic conditions, prevent soil erosion, they present habitat for many plant and animal species, forests are a significant factor in the

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² M.A. Nada Mijajlović, researcher associate, Institute of agricultural economics, Volgina 15, 11060, Belgrade, Serbia, e-mail: nada_m@iep.bg.ac.rs
M.A. Slavica Arsić, researcher associate, Institute of agricultural economics, Volgina 15, 11060, Belgrade, Serbia, e-mail: slavica_a@iep.bg.ac.rs

global carbon cycle as a reservoir of bound carbon. Earlier, the forest covered a much larger area but intensive logging has led to a significant reduction of the surface. To major deforestation the development of agriculture and increasing arable land in the nineteenth century had brought. By the mid-twentieth century, two-thirds of forests in Serbia were pulled out. In addition to deforestation, there has been degradation in several ways: the development of certain diseases, destruction by insects, effects of natural disasters and fires account.

In terms of the forest area Serbia is considered as the middle wooded ground. Of the total Serbia territory area according to national inventory (2009) forests was represented on 29.1% (7.1% in Vojvodina, in central Serbia 37.6%). According to international definitions, woodland is also scrub and bush and in Serbia they occupy 4.9% of the area. According to the calculations, forest land in Serbia stretches to 34.0% or 36.3% compare to the productive land area. Years of monitoring forest cover in Serbia and statistics related to these issues in relation to the referenced 1979th shows that the forest area has increased by 5.2%, which certainly is relevance in a positive impact on the environment. This increase is a result of the implementation of forest cover planned forestation, but some other factors must be taken into account as a reduction in the number of residents in the rural area and the cessation of extensive agricultural production. The question is targeting also cadastral and recording categories and land uses that are not always in line with reality. The forest coverage in Serbia is close to the global one (30%) and significantly lower than the EU, which is 46% (2000).

In comparison to some European countries, Serbia is similar to Romania (28.0%), Spain (28.8%), Norway (28.9%), France and Greece (27.9%). The forest coverage in Serbia in relation to population is 0.3 hectares per capita. Compared with other countries, it is much smaller (1.01 ha Austria, Bosnia and Herzegovina 1.38 ha, 1.31 ha, Bulgaria, Croatia 1.25 ha, 0.75 ha, Czech Republic, Finland 5.91 ha, Germany 0, 92 ha, 6.93 ha, Norway, Rumunija1, 02 ha, ha, 1.02 Slovenia, Switzerland and Russia 11.11 ha). Quality of forests is determined on the basis of their structure and origin. In Serbia, the dominant are coppices, with 64.7% of the forest area, stands of origin cover 27.5%, while artificially raised (from cultures) represent 7.8% of the forest. The average density of forests in Serbia is 939 trees per hectare.

Total number of established national inventory of woody species (important for forestry) in Serbia is 49 species. Of this number, there are 40 species of deciduous and the other, evergreen, are represented by 9. The total volume record the highest percentage of beech forest 40.5%, 13.0%, followed by bitter and sessile oak 5.9%, 5.8% of Italian oak, hornbeam 4.2%, 3.1% locust, oak 2.5% and 1.6% of ash. Spruce Coniferous has the largest capacity share of 5.2% and 4.5% of white pine and fir 2.3%. While the poplar is grown on 1.7% in volume of the total forests in Serbia, other types of trees have 1 or less than 1% share. Of the total forest area (2,252,400 ha) in Serbia state-owned is 1.194 million ha, or 53%, and other 1,058,400 ha or 47% is privately owned. (National Forest Inventory of the Republic of Serbia, 2009).

In the context of sustainable development and conservation of the environment and biodiversity, a growing need for protected areas in the national and international instruments ratified by our State exists. Protected areas are considered in the light of climate change, one of the main tools to mitigate these effects. Preserved, especially forests, ecosystems have greater flexibility and adaptability in relation to climate change. Protected areas can mitigate climate change by preventing the accumulation of carbon being lost in the process of photosynthesis absorb de novo and associate carbon from the atmosphere. Integral ecosystems contribute to the mitigation of extreme events such as storms, floods and droughts. Sustainable use of protected ecosystem has its economic importance in terms of tourism and fisheries, as in the Danube region can be emphasized. (The assessment of vulnerability to climate change, Serbia, Belgrade, 2012.)

The wealth of forests in Serbia in the number of tree species, their biodiversity and the primary gene centers are unique in Europe. Total number of native species of trees and shrubs is 205, among which should be highlighted endemic and endemorelict (*Pinus pence*, *heldreichii* *Pinus*, *Picea spruce*, *Fraxinus pallisae*, *Forsythia europaea*, *Corylus colurna*). It is estimated that there are about 1000 plant communities. Gorges and canyons from the eastern to the western part of Serbia are important refungium of tertiary Balkan Peninsula and the most of their communities are forestry ecosystems. In Serbia, are endangered approximately 600 plant species and 500 animal species about. In Serbia, the preservation of biodiversity realized in two ways:

- In situ - biodiversity conservation or preservation of existing communities through: nature reserves, national parks, seed stands, and groups of trees or individual trees
- Ex situ - the preservation of the gene pool of specialized crops or raising the Arboretum, a living archive, tests provenance, progeny tests, seed orchards.

In order to preserve biodiversity in Serbia were isolated natural communities of different nature: 50 nature reserves, of 569.000 ha, 5 National Parks (Fruska Gora, Iron Gate, Tara, Kopaonik and Sara) on an area of 246.000 ha and 934 ha of seed stands with a dense network of parallel clonal plantations with domestic and foreign clones of poplar, willow and black locust. (Professional basis for the development of the National Forest Action Programme, 2008)

Forests as a factor in climate change

Climate change is a global problem with serious consequences at the local level. In the center of the Serbian Danube following climate change occurs:

- Absent of the usual seasonal changes, with frequent droughts and floods, which caused significant damage.
- The increases of temperature and drought have particularly negative consequences for the agricultural area of the Lower Danube and Vojvodina.
- Reduced winter snow cover and reduce indirect impact on the reduction of water resources (drinking water, as well as those designed for industry and agriculture)
- Forests are vulnerable in many ways by climate change: fires are more common and more dangerous, more frequent are disease outbreaks, epidemics and pests.

Legislation in the field of environmental protection in Serbia has been adapted internationally, especially taking into account the protected area as a special nature reserve Upper Danube and the National Park Fruska Gora and the Iron Gate on the Danube area. These are unique natural ecosystems and are rare and valuable in terms of biodiversity that they have.

Global warming has an impact on forest ecosystems so that there is more to the withdrawal of forest and cooler locations. The impact of climate change is evident in Serbia and one of the areas most exposed to the impact of these changes is considered to be the Danube-Carpathian Basin. The impacts that climate change may have on the forest are as follows:

- Pushing the limits of some forest types in relation to the geographic breadth of the house, and elevation;
- Change the size distribution of different forest types and their relationship;
- The Decline and withdrawal of certain forest communities
- Changes in the composition of plant communities
- Changes in the ratio of individual species to the light
- All of the above will have the effect of cumulative effect, which will adversely affect the conservation of biological diversity and the possibility of a rational management of these natural resources. (Medarević et al., 2007).

Forests are an important component of the global carbon cycle. Forests are in an interdependent relationship with climate and represent an important factor in global warming. The forests are the main vegetation type in terms of net source of carbon bonding and retention. Forest ecosystems and land that is associated with has a great capacity to accumulate and release carbon.

Forests are an important reservoir of carbon and we have to mark them as potential for mitigation of global warming due to the binding capacity and the accumulation of carbon. Forests are exposed to climate change in terms of increasing mean annual temperature, precipitation and changes in extreme weather conditions. Adverse climate changes in forest communities adapt to specific physiological mechanisms but the relationship is interdependent. Forests produce wood mass that binds and protects carbon dioxide, thereby supporting climate change. Deforestation and over-exploitation and destruction leads to releasing carbon dioxide gas as one of the greenhouse gases. Combustion of fossil fuels emits carbon dioxide into the atmosphere where its concentration is increased, leading to global warming and climate change. Trees and Forests mitigate this change by binding of carbon dioxide in the process of photosynthesis and store it in the form of various compounds in the wood mass in a process called "carbon capture to."

Forests and carbon cycling

It is considered that the level of carbon has not changed in the last six thousand years and maintaining control should take measures to ensure its ecological balance. A small change in the rate of photosynthesis, respiration and decomposition might cause changes in the level of carbon dioxide which also affects the global climate for decades. According to the theoretical basis, the increase of carbon dioxide can be stimulating and enhancing for the growth and development of plants, which means that forests will have better growth by increasing carbon dioxide in the atmosphere. Under experimental conditions, it was shown that a doubling of carbon dioxide leads to the initial increase in growth of 20-120% with an average increase of 40% (Eamus and Jarvis, 1989). However, with further increase of carbon dioxide level, effect on growth is positive but more reducing.

Investigating carbon cycle as the process, one must take into account that 20% of the wood weight is carbon, apart from the carbon present in the soil organic matter in the humus occurring decomposition of biomass. This results in enormous storage of carbon in forests, where it is twice more than in the free atmosphere, according to research by FAO. Approximately, 7.6 billion tons of carbon is emitted into the atmosphere each year, of which 6 billion tons comes from the fuel burning and 1.6 billion from deforestation (IPCC, 1992). According to the International Panel on Climate Change (IPCC), a reduction in carbon dioxide emissions is required to at least 60% to stabilize its level in the atmosphere. Serbia is a signatory to the Convention on Climate Change of the United Nations explaining what must be done to educate and raise awareness on climate change and energy conservation.

Table 1. *Carbon reserves in relation to the origin of the forests*

The origin forest	Area (ha)	Volume (m ³)	Carbon (t)
High natural stands	621.200,0	157.511.262,8	50.411.688,6
Coppice	1.456.400,0	181.188.914,2	63.733.764,2
Artificially established	174.800,0	23.787.240,6	6.091.897,6
Total	2.252.400,0	362.487.417,6	120.237.350,4

Source: *National Forest Inventory of the Republic of Serbia, 2009.*

Table 1 shows the reserves of carbon in wood volume of forests in Serbia for assessment that is presented to the National Forest Inventory. The amount of carbon that is retained in the forest depends on the growth of

biomass, which depends on various factors (changes in forest area, commercial logging, forest fires, extreme weather, air pollution, changes in land conditions, soil erosion, introduction of harmful insects and pathogenic fungi, etc.). (Karadzic, D. (2007)) in relation to the total area of forest carbon reserves amounted to 53.38 t / ha.

In Table 2 the observed data indicate that the ratio of the value and volume of individual tree species and carbon proportionate is the largest in its most common letters.

Table 2. *Reserves carbon in relation to the most common tree species*

Tree species	V –volume (m³)	Mass C-carbon(t)
Beech	146.850.828	50.663.535,6
Oak	9.242.373	2.865.135,6
Sessile	21.542.890	7.109.153,7
Hornbeam	15.157.240	5.982.645,1
Turkey oak	46.980.446	18.322.373,9
Italian oak	20.986.446	7.030.465,8
Silver Linden	1.779.096	435.755,5
Acacia	11.243.944	4.160.259,1
European poplar	6.137.862	1.288.951,1
Spruce	18.810.547	4.015.583,1
Fir	8.304.924	1.702.509,3
White and black pine	16.434.457	4.765.992,4
Total	323.471.072	108.342.360,2

Source: *National Forest Inventory of the Republic of Serbia, 2009.*

Forest management must be considered as a function of emission reduction and carbon absorption with conservation of accumulated carbon in existing forests as a great potential in the system of management.

Danube forest ecosystems in Serbia are rich in flora and fauna. Danube area, as a big powerful body along the river, is characterized by marshes and wetlands filled with diverse flora and fauna. A flooded area along the Danube is reduced due its conversion into agricultural land and drainage, and has a reduced diversity of native flora and fauna. Forests have undergone changes and old willows were replaced by European poplar. Although the Danube area is rich with protected areas and numerous plants and animal species, the importance of preserving wetlands and floodplains is underlined. These areas are ornithological reserves of rare and endangered species.

Upper Danube basin

Under the area of Upper Danube basin within its borders, has a special nature reserve of the same name (protected by the Regulation on the protection of a special nature reserve "Upper Danube," Official Gazette of RS, 45/01). This special nature reserve is a natural resource of great importance and is one of the first categories of protected resources. By classification of IUCN it is placed in category IV as Habitat and Species Management Area. The reserve represents an area (19. 648 ha), placed on the left valley plain of the Danube from border with Hungary to Bogojeva, covering the city of Sombor and the Municipality of Apatin.

Special Nature Reserve of the Upper Danube is a large marsh complex. This partly hydromorphic area is also a part of Hungary and Croatia, and considered as one of the last major flood areas in Europe. In the composition of this nature reserves enter Monoštor and Apatin marsh. These marshes are composed of a number of plant communities such as forests, meadows, ponds and wetlands along the Danube River and its meanders. This wetland was drained and thus is very narrow, representing the rest of the great marsh ecosystem. The impact of human activities in this area is reflected in the establishment of forest plantations. These planted forests at the same time are used as hunting grounds. Over large areas (over 1000 ha) on rewired "Tikveš" and "Karapandža" oak was raised. Establish of the hunting association on the forest farm "Jelen" in 1952. opened a new era in management regarding forestry, hunting and fishing in this area. It has been realized as an imperative that these complex forest must be managed comprehensively and integrally, as this is a valuable natural resource and rarity.

Today we can say that this is a special nature reserve and one of the last refuges for plants and animals associated with floodplains.

In terms of fauna presented in the reserve, there are, 51 species of mammals, 248 species of birds, 50 species of fish, 11 species of amphibians, 9 species of reptiles, many invertebrates. In terms of flora it is considered that there are more than 1000 species of plants. The reserve is home to dense almost impassable marshy forests composed of native poplars. The reserve is represented and some endangered species *Eranthis hyemalis*, *Hottonia palustris* and *Hippuris vulgaris*.

It is quite obvious that reserve must be investigated not only in terms of biodiversity and natural values but in terms of tourism. There is a great potential in the authentic cultural heritage of this area, which makes it very authentic as destination. Developing hunting tourism and fishing represents certainly a big potential in this area. The high level of awareness and knowledge of local people about the need and importance of the protection and conservation of these ecosystems on the principles of sustainable development must be noted. <http://www.gornjepodunavlje.info>

In view of the research the forestry Apatin, Bač, Bačka Palanka, Beočin and Sombor city will be presented. (Table 3.)

Table 3. *The total forest area in some municipalities of the Upper Danube basin*

Municipality/year	Forest area (ha)		
	1979	2005	2008
Sombor (city)	7.076	6.644	6.626
Apatin	2.984	4.877	4.350
Bač	3.140	4.114	4.616
Bačka Palanka	2.810	10.277	4.808
Beočin	5.287	5.640	5.815

Source: *Municipalities in Serbia, Statistical Office of the Republic of Serbia.*

In relation to the forest area it is noted that the trend of increasing forest area and reforestation is being implemented. It is observed that the city of Sombor has a biggest forest area of all municipalities and that the existing data on other municipalities with smaller areas and that the oscillations (if the data is reliable) is the largest in the Bačka Palanka.

Apatin municipality has under forests (of the total 332 km²) 4350 ha, which represents 13% (below the national average). Special contribution to biodiversity of this municipality is famous Apatin marsh. Sombor is a city with territory of 1.178 km² and 6626 ha of forest (which represents 5.62%). Bač is a municipality in the investigated area, which has 12.6% of its territory covered with forest (total area of 36.500 ha of forest is 4.616 ha), (Municipalities in Serbia 2010). Largest forests are placed in the southern and the western part of a municipality. Among trees and shrubs the most represented is American ash, domestic poplar, locust, oak and oak as well as natural communities, having also a plantation forest.

Forests are being built here in order to protect from pop lion and strong winds. Alleys were also erected along the roads and on farms. In a municipality of Backa Palanka, as it is largely under the influence of human activities, the original natural environment and biocenosis loess terraces were turned into fields. Some parts of the former municipalities have preserved the authentic look and natural vegetation particularly in steppe grasslands and thickets, especially in the Danube. At loess terrace less forest area consisting of acacia trees and shrubs and oak, are presented. The largest forest is Popina (Bagremara). The forest area represents only 8.36% (57.500 ha of municipal area is 4.808 ha of forest).

The municipality located in Beočin is on the shore of Danube, subjacent of Fruška Gora. Forest within the municipality is 31.3% of the total territory (18. 600 ha of forest is covered 5815 ha). Most of the forests are deciduous and are located in the National Park Fruška Gora. According to the plans at the municipal level, the reforestation of the forest management will be carried out targeting: regeneration to appropriate indigenous species, the capacity of existing forests increment, and rationalization of the forest funds exploitation.

The Middle Danube Region

In the Middle Danube basin, designated as metropolitan areas, some municipalities and cities that are related to this field were considered. Both urban and agricultural activities in this area have greatly changed and are not like its original appearance. Now on the threshold of the New Sad the National Park Fruška Gora is placed as an Important Bird Area (IBA) and Important Plants Area (IPA). This mountain (539 m highest point) is rich with oak, hornbeam, beech, linden and other trees species. Flora of the protected area has over 1,500 plant species. The plant communities of the National Park are inhabited by over 50 endangered plant species. It should be noted that it was found more than 30 species of orchids, of which 18 species of international importance. In addition to dendroflora a fragmented steppe species might be found. Among fauna presented a protected species of insects, amphibians and reptiles, which are on the Red List of Threatened Species, might be found. Avian species are represented with 211 ones of which 130 are nesting. Fruška Gora is one of the most important areas for rare birds nesting in the Pannonian Plain and Serbia. Only in Fruška Gora eagle nest one of the endangered species. Of the many species of mammals protected species of bats, ground squirrel and mole rat should be set aside. Within the researched

area Irig municipality (capital of Fruska Gora) has forests on 17.82% (total territory is 23,000 ha of which 4099 ha is covered with forest). (Table 4) In terms of flora and fauna this municipality is conditioned by relief, climate, hydrograph, etc. factors. In addition to forest Fruska Gora has grass plant communities. Here, the presence of a large number of herbs species might be found. Plant communities are a good habitat for wildlife and accordingly the hunt is possible.

Table 4. *The total forest area in some municipalities of the Middle Danube basin*

Municipality/year	Forest area (ha)		
	1979	2005	2008
Irig	4007	3914	4009
Indija	831	354	694
Ruma	5975	7464	7831
Pećinci	4648	8307	8756
Pancevo (city)	1085	1292	3160
Smederevo (city)	2617	2910	1521

Source: *Municipalities in Serbia, Statistical Office of the Republic of Serbia.*

Indija municipality is very poor with forest (1.64%); existing forest is placed along the bank of the Danube and complex of forests in Čortanovci belongs to the National Park Fruška Gora. In terms of fauna there is a little wildlife (deer, rabbits, foxes, hamsters and other small rodents) presented ; birds such as grouse, quail, pheasants are controlled by hunting societies. The Danube hosts perch, carp and sturgeon of fish species. In Smederevo, as one of the municipalities investigated in the Middle Danube Basin Forest Fund, exist a problem but it was reduced to 3.16% (according to the latest statistics of 481 km² of the total area of the municipality only 1.521 ha is covered with forest). Forests in this municipality are mostly planted with climatogenous farneto and bitter oak.

In the town of Pančevo ecosystems with many species of flora and fauna that are endemic and relict can be concluded. In terms of tree species it is prevalent European hybrid of poplar, white willow and black poplar, red oak, elm juniper (unique autochthonous conifer of Pannonian Plain). Among herbaceous plants it should be also mentioned Banat peony, Pančić wormwood, sandy immortelle, swamp and marsh communities have rush,

trask, screens, white and yellow water lilies, on the loess dryer plateau residents are: foxglove, thistle, pigweed, mustard, dandelion, and yarrow. Venison has a large (deer, roe deer, wild boars, foxes, wolves rarely) and small game (badger, hamster, otter, nutria, rabbit, skunk, weasel and hedgehog). The steppe habitats of rare species are such as desert ants, ant lion, prairie gerbil, ground squirrel, mole rat, steppe polecat. In the city of Pančevo, as highly urban environment, the decrease in forest reserves from 12. 925 ha (2006.) to 3.160 ha (2008.) can be registered. This fact can not be ignored given the importance of forest assemblies for this polluted environment. Reforestation activities must be intensified, and also prevent unplanned and uncontrolled logging and harvesting of existing forest reserves.

The total forest area in the Belgrade area (urban and suburban municipalities) is 9141 ha (relative to the entire territory of 3205 km² of the area that represents 12.2%). Area covered with forest per capita is 0.025 ha. Minimum optimal forest area per capita of a region is 0.33 ha making thus an optimum to the positive ecological functions of forests in environmental conservation. To activate reforestation in Belgrade is certainly a priority. Contemporary open attitude and approach to the problem of climate change has one of the solutions to raise larger plantation forest management in urban areas such as Belgrade. Study by Professor Brian Stone's (Institute of Technology, Georgia) has proposed planting of millions of trees that would create a new city forest, which would be part of the solution of climate change at the international level. (<http://openalex.blogspot.com/2009/11/urban-forestskey-to-international.html>)

The situation in terms of growing stock in Novi Sad urban environment is certainly not satisfactory (total city area of 699 km² is covered with forest on 2 618 ha, representing only 3.74%). Regarding to many pollutants in this city it is needed to increase the protection of the forest fund and it is one of primary activities at the city of Novi Sad.

The Lower Danube basin

Within the Lower Danube, still referred to as the Carpathian area, the five municipalities Golubac Kučevo Majdanpek Kladovo and Negotin were taken for analyzing. (Table 5) The central part of the area is occupied by sparsely populated, wooded hills and mountains and the National Park Iron Gate. Each of these municipalities belongs partially to the national park. Iron Gate is a national park that meets the geomorphological, hydrological and natural science requirements for national park status (Official Gazette 36/09) . Iron Gate National Park is the territory placed in southeast of the Europe and the

north-eastern of Serbia, on the border with Romania. Đerdap lays on the right bank of the Danube from Golubac to Karataš near Kladovo occupying 100 km in length. (www.djerdap.np.org/start.html)

As the main feature of the Iron Gate overgrown forests (64%) is considered, with forest communities rich and diverse. From over 1. 100 plant species should allocate relict and endemic. *Corylus Colum* is one of the relict species, which here forms thick and old phytocenoses with other relicts. Eternal green trees and shrubs in the Iron Gate are represented by holly (*Ilex aquifolium*), olive (*Daphne laureola*) and yew (*Taxus baccata*). Together with relict species in these communities one can meet modern species of trees and shrubs. Approximately there are fifty plant communities in this area of which 35 are relict. Vegetation characteristic of this national park is that different types of woods alternate at a short distance. Large differences were observed in the forests of silicates in relation to the forest on a limestone base. In addition to the previously mentioned species *Corylus columna* relict communities are made up of the following types: Lilac (*Syringa vulgaris*), walnut (*Juglans regia*), silver linden (*Tilia cordata*), maple (*Acer monspesulanum*), downy oak (*Quercus pubescens*), hackberry (*Celtis australis*), sumac (*Corinus coggigrya*). Most important with particular emphasis on forests are Moesian beech (*Fagus moesiaca*), oak (*Quercus petraea*) and hornbeam (*Carpinus betulus*). It is considered that the scientific significance have a relicts of the mixed forest community types:

- Beech, *columna*, walnut and other species
- Oak, ash, *columna*, lilac and other
- Forests lilac, *columna* and other
- Forests hackberry, walnut and other species with lilac
- Forests of maple, linden and other types of nuts
- Beech forests with walnut and other species
- Forests consisting of oak, hornbeam, lilac and other species.

It can be based on these forest communities to conclude that in this national park, there is very interesting mosaic of forest types and communities of interest in the scientific and tourist sense. Iron Gate is the largest national park in Serbia and as such is protected by a special legal document. Local plan for use of the National Park represents the goals and objectives of nature conservation and development, and measures to improve conditions and sustainable use of the area. According to this document zone with three levels of protection were determined. In addition, the National Park was established as Iron Gate IBA (Important Bird Areas), IPA (Important Plant Areas) and

PBA (Prime Butterfly Areas) and is a part of the EMERALD area network (Emerald Network of Areas of Special Conservation Interest - ASCII) - significant with point application of Convention on European wildly Flora and fauna and natural Habitats (Bern Convention) conservation in Serbia. The area of this park is placed on the Preliminary List of the World Cultural and Natural Heritage (UNESCO), is a candidate for the Biosphere (MAB), and is in the list of the Carpathian region (Framework Convention on the Protection and Sustainable Development of the Carpathians). (Spatial Plan of Special Purpose for national park "Iron Gate", 2011.) All regulations must be given to the importance and implementation of activities to protect this national park has to be implemented. It is believed that the health of these forests is unfavorable. Epidemic drying in much of the national park have moderate intensity while it is prominent in the sessile oak forests. Causes of drying are pests (gypsy moths and other insects), and fungal infections of origin. Forests are exposed to climate change and the impact of pollutants.

Table 5. *The total forest area in some municipalities of the Lower Danube basin*

Municipality/year	Forest area (ha)		
	1979	2005	2008
Kladovo	28.114	18.017	25.423
Majdanpek	64.769	80.592	80.592
Negotin	27.454	27.530	27.530
Golubac	16.554	16.554	16.498
Kučevo	35.915	34.911	34.880

Source: *Municipalities in Serbia, Statistical Office of the Republic of Serbia.*

The Golubac municipality has an area of 368 km², of which forests are covering 174.06 km², which makes 47.4% of the territory (which is above the national average, of app. 28% - Rural Development Strategy Plan, 2009-2013.). The forest fund is predominantly covered with 82.2% of beech and less with 9.5% of oak. The Danube River is a key natural resource and greatest comparative advantage of this municipality. (Table 5)

According to official statistics (Municipalities in Serbia 2010. forest area in the municipality of Negotin is 27. 530 hectares (which is 25.28% of the total area of the municipality, the data has not changed in the last five years). The plan for reforestation activities is actual where emphasis will be placed on the protection, rehabilitation, controlled harvesting and sustainable use of forests. Since there are four hunting (Negotinska Krajina, Deli Jovan Alija

and Vrat) in which the big game (mouflon, fallow deer, European deer, chamois, wild boar, deer) and small game (pheasant, rabbit, quail) are grown, it is planned to increase and track the number and diversity of game, contributing to the conservation and enhancement of biodiversity of the area. Development opportunities, which contribute to diversification of agricultural activities in the municipality of Negotin are collection, cultivation and processing of a variety of herbs and berries.

Within the municipality, which has Kučevo 721 km² are significant areas covered with trees seizing 348.8 km² (48.34%). Forests are a resource base for the timber industry, thus representing a priority for sustainable development in this municipality. Kladovo Municipality has favorable agro-ecological conditions reflected by the presence of vast plains and river terraces (Donji Ključ) and elevated areas of forests and pastures (Gornji Ključ). Forest is covering more than 40% of the municipality's land of which the largest part belongs to the NP "Iron Gate" and "Srbija forest". It is considered that there is significant potential for gathering berries and herbs in this municipality. Majdanpek municipality is placed in mountainous part of the Carpathians, covered with 68% of forests (2.3 times bigger than the national average). Raw forest potentials in Majdanpek are underutilized, stacked wood is used for the production of fuel wood, charcoal and cellulose. The plans of the municipality focusing on diversification of economic activities to increase activated population has included intensification of the following activities (for which there is real potential and opportunities): collecting medicinal herbs and forest fruits as related to the production of organic food, cosmetic and pharmaceutical industries development.

Conclusion

A Forest ecosystem in the Serbian Danube region, discussed in this paper, represents a part of the whole European Danube region and must be preserved as it is ratified in international and national regulations specified. Modern approach to the problem of forest ecosystems must be comprehensive and current climate change must be taken into account. Interaction of climate change and the carbon cycle in nature is intrinsically linked with the state and the sustainable use of forests in the global and local levels. In the Serbian Danube region significant numbers of forests are preserved in their natural state representing thus a resource that should be preserved and enhanced. The world trend of increasing urban forest plantations can be achieved in the metropolitan area associated with the great industrialized cities such as Belgrade and Novi Sad.

The concept of sustainable development of the basic principles that must be respected assume the active role of human activity on the local level, so the local population must have a high level of awareness on environmental protection in order to achieve the set goals of sustainable development at a global level. Forests are placed particularly in the Lower Danube region natural resource with high biodiversity. Serbian Danube area is also interesting from the tourist point of view representing a natural phenomenon that must be protected and preserved respecting the principles of sustainable development.

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