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NEW CONTRIBUTIONS TO THE KNOWLEDGE OF RISK MANAGEMENT OF SNOW AVALANCHE IN ROMANIAN CARPATHIANS. CASE STUDY: FĂGĂRAŞ MASSIF-SOUTHERN CARPATHIANS

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ABSTRACT

Due to the harsh climate and terrain factors the snow avalanche activity in the Făgăraş massif is very high. Between 1940 and 2011, 76 fatalities and 50 injuries/burials were recorded in the Făgăraş massif.Therefore, due to the accidents, to the intense winter tourism activities and after building the Transfăgărășan highway (in the period 1970-1974) especially, risk management of snow avalanche was implemented here. First, covering the forests through the creation of protective forests, second, on the Transfăgărășan highway through technical measures and thirdly on winter tourism activities through the implementation of an avalanche risk scale and by issuing snow avalanche danger level.

According to the Mountain Rescuer Public Service and the Bâlea Work Nivology Laboratory, the snow avalanche risk and the number of fatalities and injuries/burials has decreased.

Keywords: *snow avalanches, risk management, forest, Transfăgărășan highway, winter tourism activities, Făgăraş massif, Southern Carpathians, Romanian Carpathians*

INTRODUCTION

Snow avalanches are an important and very active geomorphologic process in high mountain areas and at the same time a natural hazard. The snow avalanches shape the mountain slopes. The snow avalanche activity generates significant quantities of debris and rock debris which is transported, redistributed and transferred on steep slopes or at the base of the snow avalanche tracks (Gardner, 1970; Luckman, 1977, 2007). Snow avalanches are one of the most important natural hazards acting on the mountain environment and causing several fatalities and injuries/burials a year (Höller, 2007; Keiler, 2004; Keiler *et al.*, 2005; Voiculescu, 2009). On the other hand, avalanches have an important impact on human settlements, on the economic and skiing activity and infrastructures (Bründl *et al.*, 2004; Fuchs *et al.*, 2004; Fuchs *et al.*, 2005; Jamieson, Stethem, 2002; Stethem *et al.*, 2003). In the European Alpine countries and in the North American continent special attention is paid to hazard and risk management of snow avalanches (Keiler, 2004; Keiler *et al.*, 2005; Schaerer, 1989; Statham, 2008; Stethem *et al.*, 2003, Voiculescu, Popescu, 2011; Zischg *et al.*, 2006).

Risk management of snow avalanche studies in the Romanian Carpathians and especially in the Southern Carpathians are lacking, except for the singular study of Voiculescu, Popescu (2011).

Two moments marked the study and the risk management of snow avalanches in the Romanian Carpathians. The first moment was when the Mountain Rescuer Public Service (MRPS) was established according to Ministerial Decision 140/1968. This public service is governed by district councils. The MRPS have the role to provide surveys and to coordinate and organize mountain rescues in the event of snow avalanches. This is the only service that registers all types of mountain accidents, including damage from avalanches. The second moment is represented by the Programme of Nivometeorology within the National Administration of Meteorology (PN-NAM) which is founded in collaboration with Météo France, Centre d'Études de la Neige-Grenoble. The PN-NAM runs the Bâlea Work Nivology Laboratory (Bâlea WNL) in the Făgăraş massif at 2070 m a.s.l. The main purpose of PN-NAM is to study the physical properties of the snow and its future evolution as well as snow any avalanche triggering conditions.

The objective of our work is to present the current state of risk management of snow avalanches on: (i) forests, (ii) on the Transfăgărășan highway and (iii) on winter tourism activities in the Făgăraş massif.

STUDY AREA

The Făgăraş massif is situated in the central part of Romania, in the Southern Carpathians (Romanian Carpathians) at the crosspoint of the 45°30' parallel with the 24°30' meridian, in the eastern part of the Southern Carpathians and occupies a surface of approximately 1500 km^2. The massif has the aspect of an enormous glacial ridge approximately 70 km long, East-West orientated, detaching in relief two high macroslopes, one northern and one southern (Figure 1). The Făgăraş massif is the highest range of the Romanian Carpathians (Moldoveanu - 2544 m a.s.l. and Negoiu - 2535 m a.s.l.). On the other hand, the Făgăraş massif is distinguished by a glacial relief (inherited) and by the present day periglacial processes. Morphogenetically, the Făgăraş massif has a well-individualized mountain periglacial level that covers an area of 439.6 km^2, 148.9 km^2 on the northern slope and 289.7 km^2 on the southern one (Voiculescu, 2002).

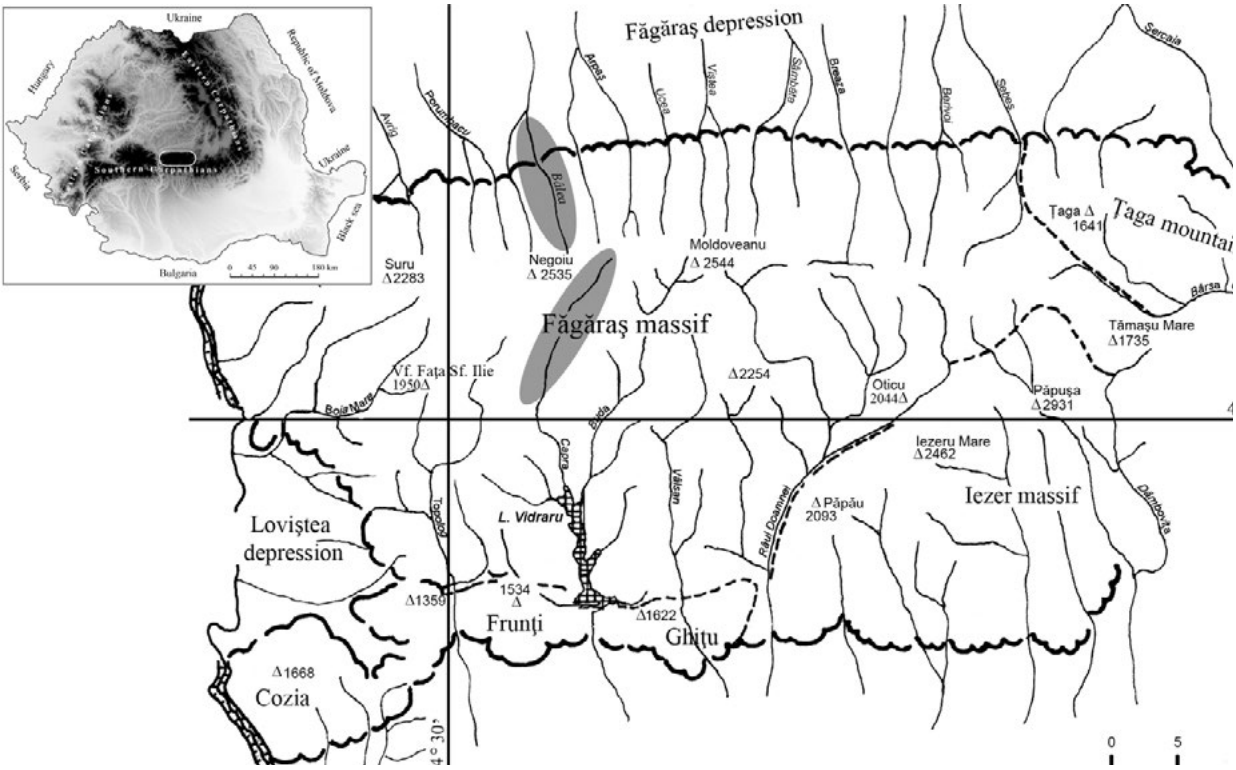

Figure 1. *Location of the Făgăraş massif: the gray areas are the Bâlea glacial area (on the northern slope) and the Capra glacial area (on the southern slope) where risk management of snow avalanches has been implemented*

CLIMATIC CHARACTERISTICS OF SNOW AVALANCHES

Romania is in the temperate-continental climate zone. The types of climatic influences determine different avalanche activity (Birkeland, Mock, 2001; Hägeli, McClung, 2004; McClung, Schaerer, 2006). As a function of its geographic position, the northern slope of the Făgăraş massif is under the influence of humid oceanic western wind and polar air invasions with very low temperatures (-30° C), strong winds and snow storms, while the southern slope is under the influence of the southern front of wind with warm air and abundant snow with considerable snow depths. As such, the regional climate also determines the avalanche activity with a powerful influence from solar radiation, temperature, and snowfall quantity and type (McClung, Schaerer, 2006; Weir, 2002). The climatic characteristics of the Făgăraş massif are shown in Table 1.

Table 1. *Climatic characteristics of the alpine and subalpine levels and of the timberline of the Făgăraş massif (average annual values)*

Weather station (m)	Period	lat. N.	long. E.	T°C			Pp (mm)	Days with snow	Days with snow cover	Depth of snow (cm)	Sunny days with snow cover
				average	min.	max.					
Vf. Omu -2505	1961-2011	45°27′	25°27′	-2.5	-10,9	5,8	1246.2	> 130	320	36.9	78.9
Bâlea Lake-2070	1979-2011	45°36′	24°37′	0.2	-8,4	8,8	1246,2	> 96	> 224	66.4	40-45
Cozia-1577	1983-1995	45°18′	24°20′	3	-6,3	12,3	844,2	> 63	150	39.5	30-35

Snowfalls are characteristic of the Făgăraş massif. These snowfalls can be classified according to their frequency, period and quantity, reaching their highest values between January (February) and April (May). The main causes for the frequent occurrence of snowfalls in the Făgăraş massif are: the movement of polar air masses, temperature drops below 0°C and, the local relief features (the elevation, the massiveness, the general orientation of the mountains, the specific exposition particularities). The snow cover is generated by the snowfalls, expressed as snowfall days. At the highest elevations, the snow depth constantly grows from October until April or even in May when it climaxes; after which it decreases until July. The best Pearson correlation is given by snow depth and elevation (R^2=0.992) and also by elevation and number of days with snowfalls: R^2=0.831 (Figure 2a and Figure 2b). The snow depth fluctuates both on a monthly and a decadal basis, depending on the altitude; it reaches the highest values between February and March, for the lowest altitudes, and for the higher altitudes, the maximum values are reached from January to April (May). On the other hand, the number of days with snow cover and the number of days with snowfalls (Figure 2c) are well correlated (R^2=0.896). Long winters are associated with big snow depth, which implies a large avalanche activity (Gratton *et al.*, 2015). The total number of days with snowfalls is: 176.2 at Vf. Omu weather station, 163,5 at Bâlea Lake weather station and 74 at Cozia weather station.

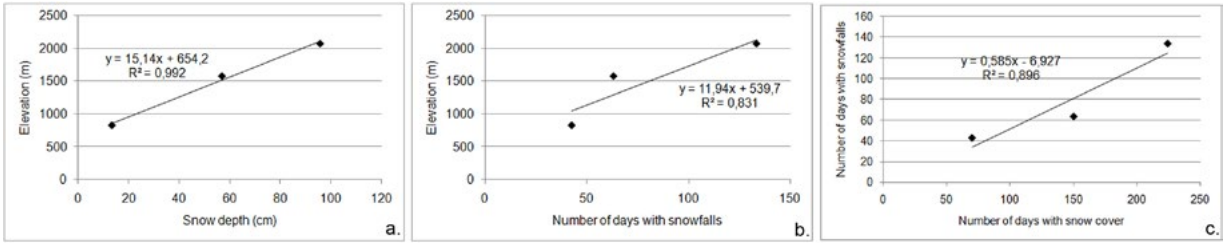

Figure 2. *Correlation between the elevation and the snow depth (a.), between the elevation and the number of days with snowfalls (b.) and between the number of days with snowfalls and the number of days with snow cover (c.) (according to Gratton et al., 2015) and snow depth variation (d.)*

RISK MANAGEMENT OF SNOW AVALANCHES: TERMS AND DEFINITIONS

The risk assessment for hazard reduction will be based on the snow avalanche events from last years (Fuchs *et al.*, 2005; Zischg *et al.*, 2005; Keiler *et al.*, 2006). For this purpose should be established risk management policies and measures. They will reduce the vulnerability of mountain infrastructure to natural hazards (Fuchs *et al.*, 2005), snow avalanches in our case.

The risk management of avalanches is based on three essential elements (Ammann, 2003; Jamieson, Stetham, 2002):

1. Historical overview of the phenomenon: (i) documents, testimonials and life experience; (ii) knowledge and inventory of all surfaces affected by snow avalanches (snow avalanche tracks, open slope surfaces); (iii) mapping of snow avalanche locations.

2. Surveillance and snow avalanche alert specialized services for: (i) issuing of weather reports (regular monitoring of snow in terms of snow depth and stability) from November-December to May-June; (ii) mapping of the vigilance within mountains groups; (iii) issuing of snow avalanche danger reports by means of using and integration of an European scale of snow avalanche danger level; (iv) implementation of standardized flags (the French system), especially in ski areas, and warning system panels (North American)

3. Prevention work is based on two strategies (Alexa, 2007): (i) period of protection - permanent or temporary and (ii) intervention points - passive and active defense.

In the Bâlea and the Capra glacial areas, some infrastructures are at risk (Table 2). The electrical and cable car towers are located in the avalanche run-out zone in the Bâlea glacial area. Should an extreme snow avalanche happen in the glacial cirque, where three hotels, the weather station and the Sibiu MRSP buildings (old and new) are located, these would be at the forefront and subsequently isolated. The 1996 and 1997 snow avalanche events already demonstrated the vulnerability of the old Sibiu MRPS building and of the hotels.

Table 2. *Snow avalanche impact on infrastructures*

Glacial area (see Figure)			
Bâlea (on the northern slope)	Impact of snow avalanches	Capra (on the southern slope)	Impact of snow avalanches
Bâlea Cascada hotel	-	New MRPS building	-
Paltinu hotel	+ (1997 event)*	Capra chalet	-
Bâlea Lake 1 hotel	+ (possible)	2 Snow sheds	+
Bâlea Lake 2 hotel	-	Paths and tourist marks	+
New Sibiu MRPS building	-	The Transfăgărăşan highway	+
Old Sibiu MRPS building	+ (1996 event)*		
Weather station	-		
Paths and tourist marks	+		
The Transfăgărăşan highway	+		
Cable-car	-		
Electric and cable-car poles	-		

** according to Sibiu MRPS*

RISK MANAGEMENT OF FORESTS

The forests in the Făgăraş massif occupy a total area of 108,431 ha, divided into: 40008.9 ha on the northern slope, or 36.9% of the total area and 68473.5 ha on the southern slope, or 63.1% of the total area. In terms of structure, the situation is shown in Figure 3.

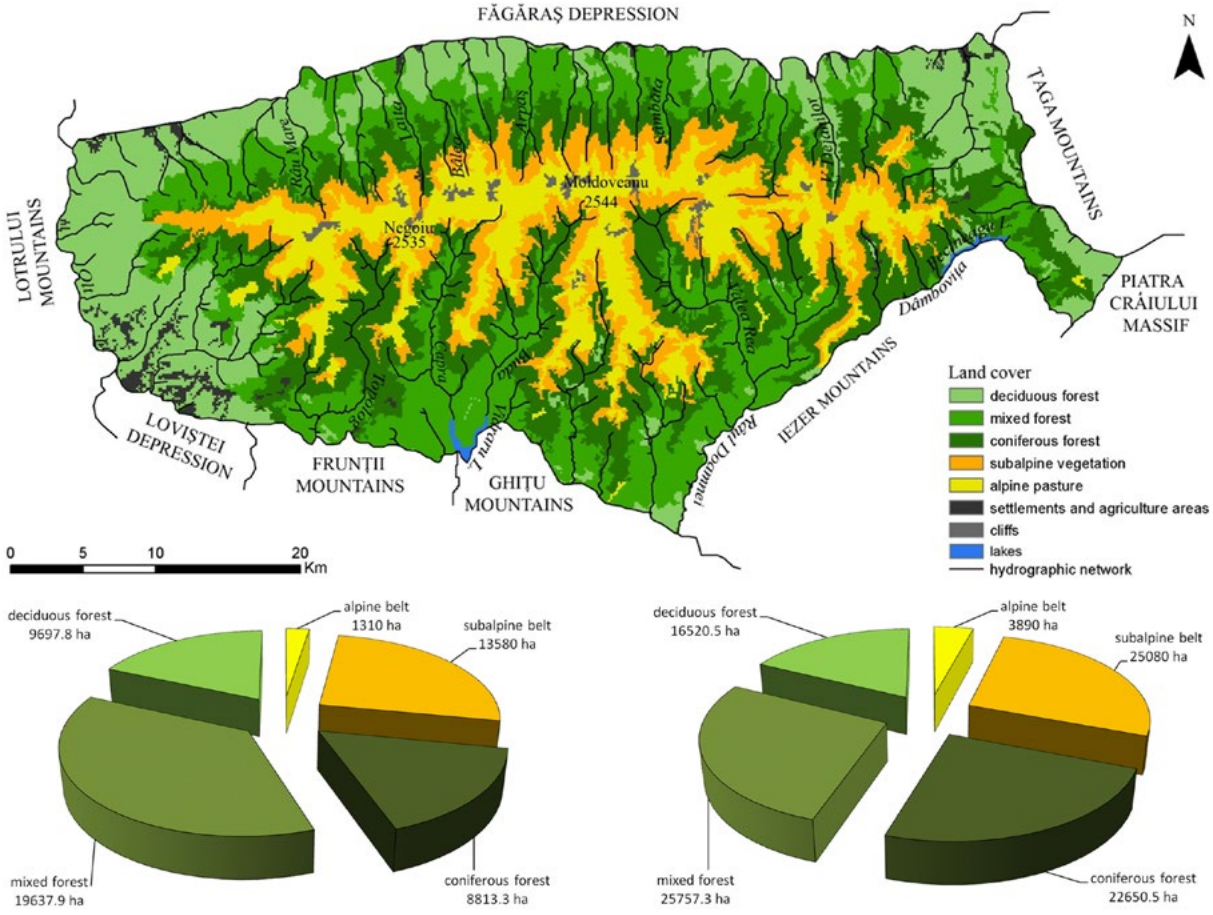

Figure 3. *The forests in the Făgăraş massif and the structure of forests of the Făgăraş massif: on the northern slope (on the left) and on the southern slope (on the right)*

According to the topographic features and geomorphological slope processes, the average elevation on the timberline on the northern slope is 1772.5 m while on the southern slope is 1786.6 m (Table 3).

Table 3. *Altitude of the timberline on the Făgăraş massif*

Northern slope		Southern slope	
Catchement area	Altitude (m)	Catchement area	Altitude (m)
Sebeş	1740	Boia Mică	1750
Porumbacu	1550	Câineni	1500
Avrig	1800	Boia Mare	1850
Doamnei	1900	Boişoara	1600
Bâlea	1750	Topolog	1550
Arpaş	1900	Negoiu	1800
Viştea	1870	Capra	1800
Sâmbăta	1800	Buda	1800
Breaza	1820	Valea Oprea	1650
Dejani	1750	Vâlsan	2000
Berivoi	1750	Valea Rea	1850
Sebeş	1640	Râu Doamnei	2000
		Brătia	1750
		Cernat	1950
		Zârna	1950

On the Făgăraş massif an inventory of 139 de of snow avalanche paths covering a total area of 403.8 ha on the northern slope and only 17 de snow avalanche paths covering a total area of 86 ha on the southern slope (Table 4) has been made.

Table 4. *Situation of the snow avalanche tracks subject to inventory*

NORTHERN SLOPE						SOUTHERN SLOPE					
Catchment areas	Number of snow avalanche tracks	Surface (ha)	Length (m)	Altitude (m)		Catchment areas	Number of snow avalanche tracks	Surface (ha)	Length (m)	Altitude (m)	
				max	min					max	min
Sebeş	6	15.6	570	1600	1200	Boia Mică	unmarked				
Râu Mare Avrig	7	14.4	650	1700	1000	Câineni	unmarked				
Râu Mare Porumbacu	10	36.1	520	1710	1280	Boia Mare	unmarked				
Laița-Bâlea	11	43.2	550	1750	1100	Boişoara	unmarked				
Arpaş	27	83.6	450	1720	1050	Topolog	unmarked				
Ucea, Viştea	34	60.3	410	1750	1150	Negoiu	unmarked				
Sâmbăta	25	80.1	500	1740	1010	Argeş, Capra, Buda	8	49.1	700	1700	950
Breaza	9	36.6	400	1710	1150	Valea Oprea	unmarked				
Dejani	unmarked					Vâlsan	unmarked				
Berivoi	9	30.6	560	1690	1330	Râu Doamnei, Valea Rea, Zârna	4	24.1	890	1890	1300
Sebeş	1	3.3	700	1650	1230	Brătia	5	12.8	500	1720	1300
TOTAL	139	403.8				Cernat	unmarked				
						TOTAL	17	86			

On the northern slope of the Făgăraş massif, where there is a higher incidence of snow avalanches, in 10 of the 11 catchement areas have been identified and mapped 139 most active avalanches tracks covering 403.8 ha. On the southern slope of the Făgăraş massif the experts have identified only 17 active avalanches tracks in 3 catchement areas covering 86 ha.

The need for forest protection was recognized for the first time in the 12th century and in the legislation from the late 19th century (Price *et al.*, 2011). In this context, the introduction of prevention measures and protective forests against snow avalanches was recognized in Europe as early as in the Middle Ages (Bebi *et al.*, 2009; Price, 1997). The first reference indicates that protective forests have emerged in Italia as early as in the 14th century (Motta, Haudemann, 2000). During the nineteenth century numerous natural hazards, including snow avalanches as well, used to destroy many inhabited and agricultural areas in the Austrian Alps, Bavaria and Switzerland. Therefore, in these countries - in 1852 in Austria and Bavaria and in 1876 in Switzerland - were imposed restrictive forest legislations to improve forest health, on the one hand, and to prevent natural hazards, on the other hand (Kräuchi *et al.*, 2000). Many mountain forests play an important role in protecting human life, economic activities and the mountain environment against dominant natural hazards like snow avalanches. Today, referring only to snow avalanches, in the Swiss National Forest Inventory, snow avalanches are 37% of all natural hazards, in the French Alps 14% and in the Bavarian Alps 42% (Brang *et al.*, 2006; Price *et al.*, 2011). In the European alpine area people speak of new forestry objectives. These focus on economical, recreational and protective aspects of the forests (Schönenberger, 2000). On the other hand, some woods play the role of a direct protective function. This function is defined if: (i) they are on slopes from which direct risks of natural hazards such as snow avalanches arise (ii) the hazards are threatening people or objects of significant value and (iii) a forest is effective in preventing or reducing these hazards (Schönenberger, 1998, pp. 197). Therefore, for risk management purpose, in the Alps were created protective forests, which provide excellent protection against snow avalanche release (Schneebeli, Meyer-Grass, 1992; Schönenberger, Brang, 2004). In the Swiss Alps alone these forests cover between 30-45% of the mountain area. 1.2% of these provide protection against snow avalanches and 2.9% against snow avalanches and rockfall (Schönenberger, 2000).

In the Romanian Carpathians also, especially on the Făgăraş massif, a functional zoning system for forests was created dividing them into two main groups: (i) a group of special protection forests and (ii) a group of protection and production forests (Pădurile României, 1981). Within the second group, a subgroup was created to differentiate the forests located in an identified snow avalanches start zone and on avalanche paths. This subgroup is very important, because in the starting zone the forest in the first place prevents and in the second place reduces any snow avalanche release. According to the literature, these forests do not entirely stop the natural hazards but attenuate their incidence and magnitude (Kräuchi *et al.*, 2000). This subgroup covers a surface of 1,946.1 ha, i.e. 2.4% of the forest areas on the Făgăraş massif. On the northern slope, this subgroup covers 1,840.9 ha, i.e. 9.9% of the slope and on the southern slope this subgroup covers 105.2 ha, i.e. 0.1% of the slope (Figure 4).

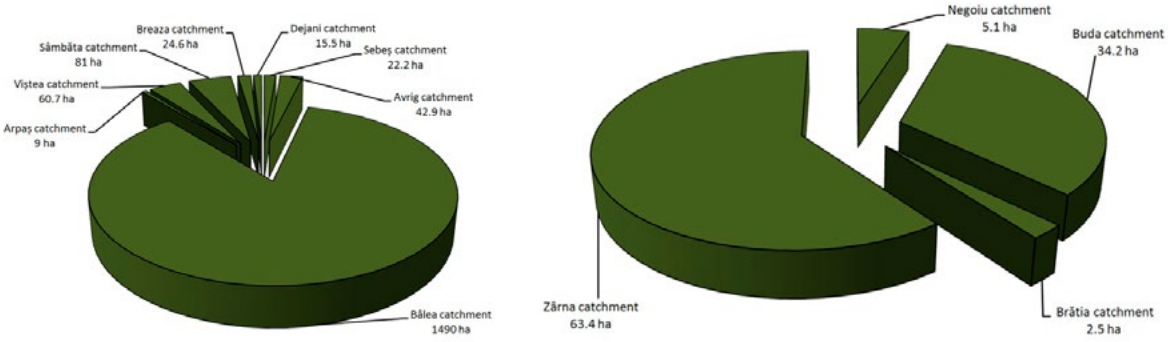

Figure4. *Surface of snow avalanche tracks: on the northern slope (on the left) and on the southern slope (on the right)*

On the northern slope in 7 cases the maximum elevation of the starting zone of snow avalanche tracks is under the timberline, in 2 cases it is located above the timberline and in one case the maximum elevation is at the same elevation as the timberline.

On the southern slope, there are 4 cases in which the starting zone elevation is located above the timberline and one case in which the maximum elevation of the snow avalanche track is under the timberline. The minimum elevation of snow avalanches that managed to enter the forest was about 1000-1050 m on the northern slope and 950-1000 m on the southern slope, such as the huge snow avalanche that blocked the Transfăgărăşan highway in March, 2005. There were exceptional circumstances when snow avalanches could reach even lower altitudes, about 700 m. During the 1954-1955 and 1962-1963 winter seasons, due to the huge snowfalls, a vast majority of the southern slopes of the Făgăraş massif were affected by avalanches. These blocked many forest tracks and the access to forest work points (Alexa, 2007).

Snow avalanche activity on the Făgăraş massif has created over the time 2 typical situations in the forests: (i) old snow avalanche paths (Figure 5) in which the snow avalanches recorded a certain frequency; and (ii) new snow avalanche paths (see Figure 5).

Another form of forest risk management, applied in other mountain areas (Brang *et al.*, 2006; Schönenberger *et al.*, 2005) includes technical measures such as wooden tripods or avalanche barriers, or deflecting dams to increase the surface roughness and thus prevent snow gliding down, on the one hand, and to enable the planting of young trees in areas affected by snow avalanches, on the other hand (Figure 6).

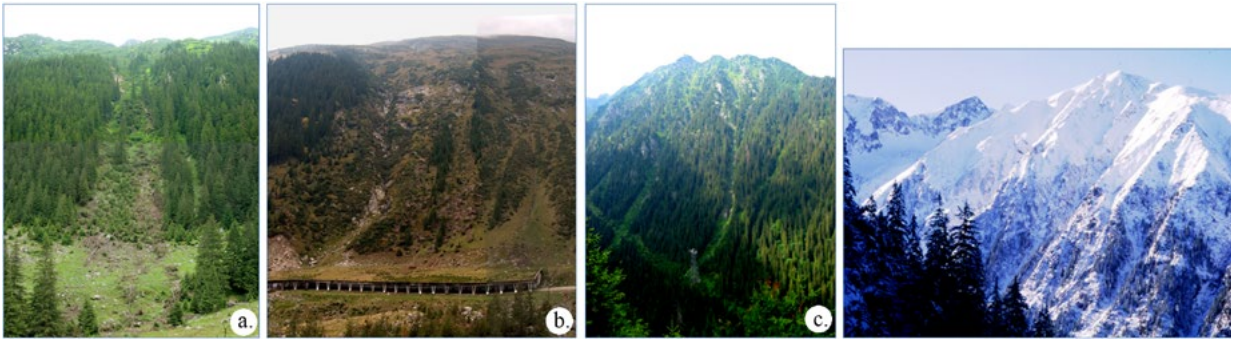

Figure 5. *New snow avalanche paths (a. and b.) and old snow avalanche paths (c. and d.) (photo by Török-Oance, 2000, Voiculescu, 2005, 2007)*

Figure 6. *Wooden tripods or avalanche barriers, or deflecting dams made use of in the Capra glacial valley*

RISK MANAGEMENT OF THE TRANSFĂGĂRĂȘAN HIGHWAY

Highway risk management in mountain areas affected by snow avalanches represents a point of interest in Europe (Ancey, 2005; Bründl *et al.*, 2004; Höller, 2007: Zischg *et al.,* 2005), in North America (Campbell *et al.*, 2007; Jamieson, Stethem, 2002; Stethem *et al.*, 2003; Weir, 2002) and in the world.

The Transfăgărășan highway was built on the Făgăraș massif between 1970 and 1974. It is 90 km long and it connects the northern slope (31.5 km) and the southern slope (55.9 km), stretching through two major Romanian regions: Transylvania and Muntenia (Figure 7). The passage from the one slope to the other is done through a 900 m long tunnel under Paltinul Peak (2399 m a.s.l.) between 2025 and 2042 m. It is 6 m wide and the declivity is between 8% and 8.6%. There are 27 small bridges and viaducts, 550 pasarelles, and 80 km of parapets.

Figure 7. *The Transfăgărășanul Highway: on the northern slope (on the left) and on the southern slope (on the right)*

The Transfăgărășan highway is affected by snow avalanches both in its alpine part and in its forest part (Figure 8). For cars and tourists safety sake the Transfăgărășan highway is temporary closed between October 1 and July 1, as determined by the Roads National Authority. In order to protect the Transfăgărășan highway and to highlight the risk management in sectors which are most vulnerable to snow avalanches, some measures have been taken. These methods, which are based on prevention work, include two strategies: duration of protection – temporary or permanent preventive measures (snow pack support structures, drainage systems to improve the roughness of the avalanche moving surface towards the Transfăgărășan highway) and passive and active defense points of intervention (snow sheds, wall support, deflecting dikes, splitter to protect electricity poles, snowpack support structures, tunnels) (Figure 9).

Figure 8. *The Transfăgărășan highway (a.) a snow shed (b.) affected by a huge snow avalanche, produced in March, 2005*

To protect the Transfăgărășan highway in the most exposed places were built a series of snow sheds, similar to those in the Alpine countries (Höller, 2007) or to the North American continent (Jamieson, Stethem, 2002). On the other hand, deflecting dikes and snowpack support structures have been created to prevent snow avalanches (Figure 11), as in the Alps Mountains or along the Trans Canada Highway (Höller, 2007; Jamieson and Stethem, 2002). Another administrative measure of passive defense is determined by the Roads National Authority which annually, between October 1 and July 1, closes the Transfăgărășan Highway to protect the road, as is the case e.g. in Canada since the early 60 (Schaerer, 1962).

The construction and maintenance of the Transfăgărășan highway raised the problem of workers' safety because they were exposed to involuntary risk. In June 1974, a huge avalanche, which was triggered after an explosion caused by military engineers, buried 14 workers alive, 6 of which died.

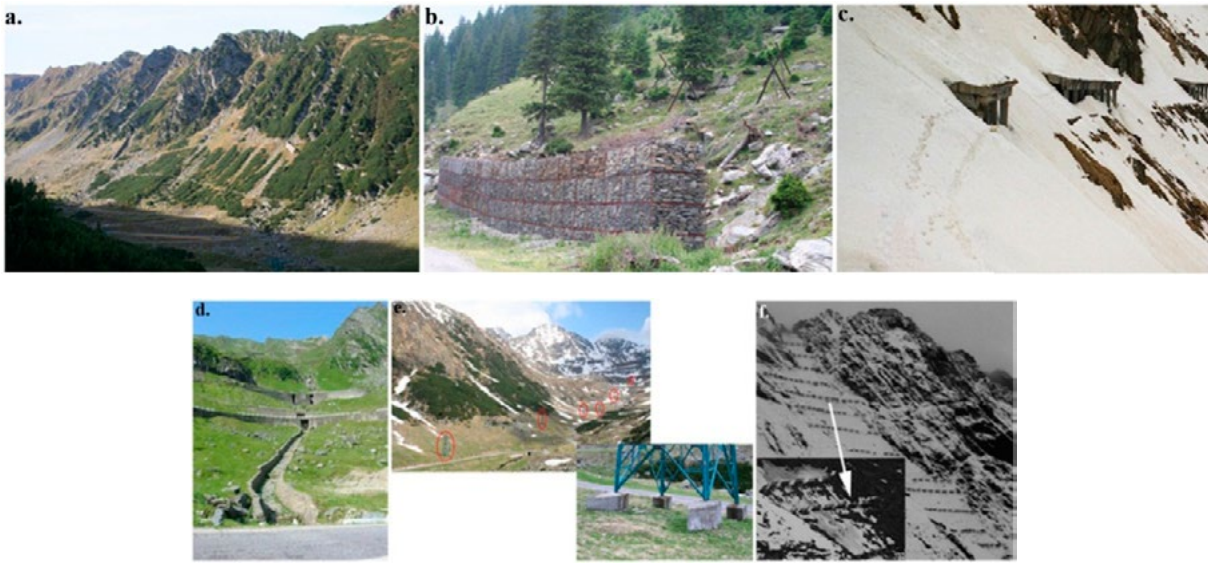

Figure 9. *Passive and active defense points of intervention: deflecting dike (a), wall support (b), snow sheds (c), drainage systems (d), splitter to protect electricity poles (e) and snowpack support structures (f)*

According to McClung (2000) and Schaerer (1989) the frequency of snow avalanches is synonymous with a return period. It is an important component of the snow avalanche risk and was defined as: It determines the exceedence probability of event occurrence at a location. This element of the snow avalanche analysis is determined by topographic and climatic parameters (Luckman, 1977; Weir, 2002). The return period of avalanches is the expected average length of time between avalanches reaching or exceeding a given location (Stethem *et al.*, 2003, p. 492). If we consider the classification of typical acceptable return periods for different facilities, then we can also consider the Transfăgărăşan highway for size 3 in the Canadian snow avalanche size classification system and typical factors and a return period interval of 5-10 years (McClung, Schaerer, 2006).

RISK MANAGEMENT OF TOURISM PRACTICES

The problem of snow avalanche risk has become very important on the Făgăraş Massif with increasing interest concerning the winter tourism activities. According to Sibiu, Victoria and Curtea de Argeş MRPS, between 1940 and 2011 were recorded 76 fatalities and 50 injuries/burials on the Făgăraş massif: 36 fatalities and 42 injuries/burials in the Bâlea glacial area, and 8 fatalities and only one injurie in the Capra glacial area (Figure 10).

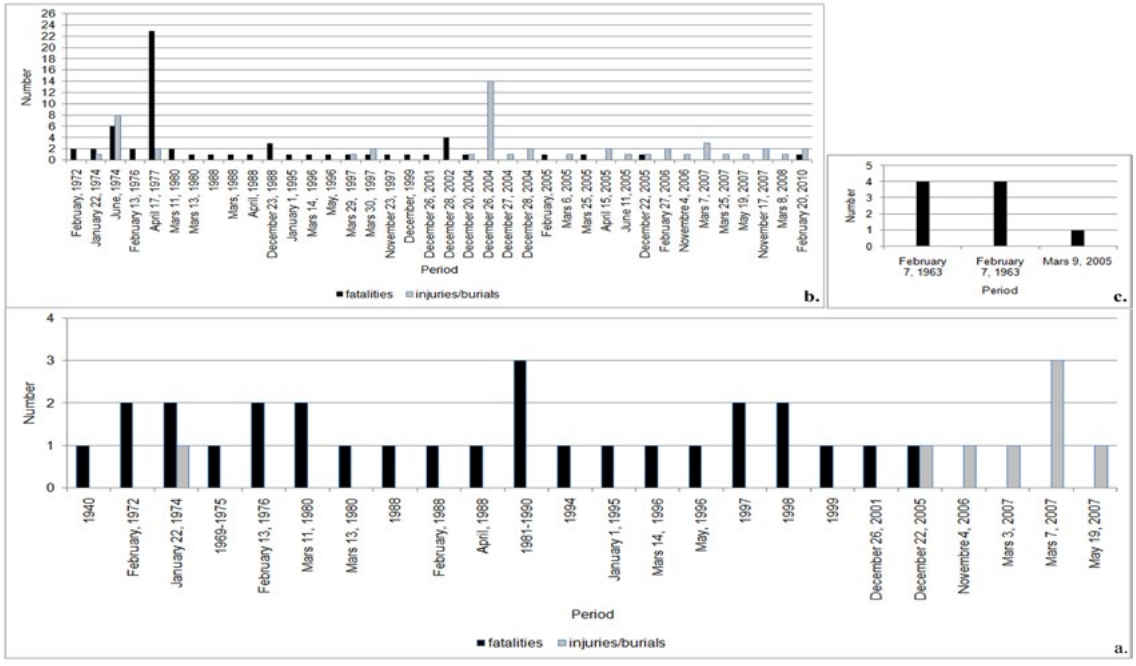

Figure 10. *Number of recorded fatalities and injuries/burials in the Făgăraş massif (a.), in the Bâlea glacial area (b.) and in the Capra glacial area (c.)*

According to the European scale (low, moderate, considerable, high and very high), PN-NAM has issued an avalanche risk danger level (Figure 11). On the Făgăraş massif at over 2000 m altitude the highest rate is recorded in March, sometimes in April but even in May, when the snow depth is the greatest.

New snow depth (from < 30 cm it does not cause almost any danger level but when it is about 120 cm and within a snowstorm, it will generate a disastrous situation for the initiation of extreme avalanches) can be used for predicting the different danger levels and snow avalanches (Schweizer, 2008). Bâlea WNL issues daily or weekly avalanche dangers, which are published in annual nivo meteorological reports that are used by MRPS, backcountry skiers, off-piste skiers and climbers and mountain road authorities of the Transfăgărăşan highway. The variations of snow depth and snowpack stability, spontaneous or triggered avalanching in correlation with fatalities and burials/injuries and the characteristics of danger levels are summarized as follows (Table 5).

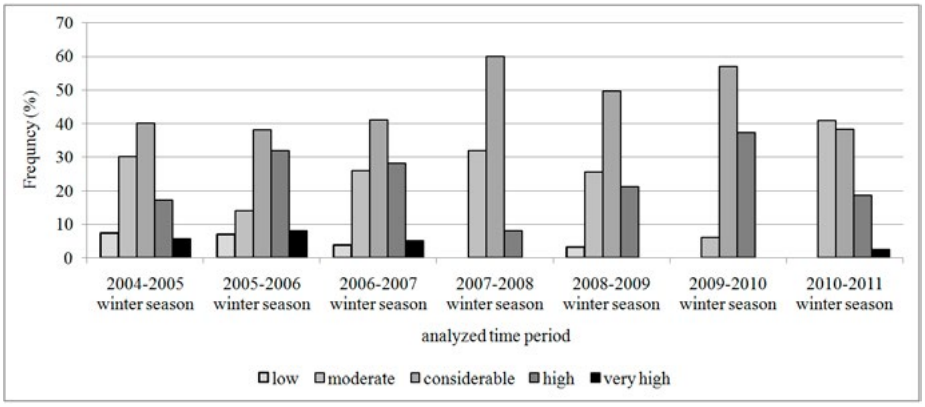

Figure 11. *The frequency of risk level on the Făgăraş massif*

Table 5. *Patterns of danger of snow avalanche activity (according to PN-NAM from 2005-2006 to 2010-2011)*

Winter season	Snow depth	Avalanche activity	Danger levels
2005-2006	very low in October and November, high in December with a surplus of 90 cm, in January with a surplus of 48 cm and in February with a surplus of 43 cm, very high in March with small fresh snow episodes and modifications by strong winds and high temperatures In April the snow depth with a slight surplus of 23 cm was very high and a maximum peak of the winter season was recorded. In the second half of April interactions of precipitation periods and cold phases were recorded. In May the snow depth was rather high with fresh snow, but in the second half of the month the snow depth decreased because of the high temperatures.	rather high concerning the snow avalanches triggered by backcountry skiers and off-piste skiers (2 fatalities and 4 buried/injured) and high for spontaneous snow avalanches (with a peak in March with 13 days with recorded snow avalanches)	In October low and moderate danger levels were issued. The moderate danger level had the highest frequency from November to January while there were considerable and high danger levels from February to April In May moderate and considerable danger levels were common.
2006-2007	Rather low in November, with a new snow of 36 cm in December In January it was high with a surplus of 58 cm. In the second half of the month new snow of 61 cm was recorded. The situation was the same in February with a strong surplus of 68 cm and strong winds. In March were recorded interactions of warm and cold phases and two strong surpluses of 53 cm and 75 cm and strong winds at the same time. In April (with a maximum peak for the winter season) and in May the snow depth was very high (with a slight surplus), respectively low (with interactions of warm and cold phases).	low concerning snow avalanches triggered by backcountry skiers and off-piste skiers (3 burials/injuries) and high for spontaneous snow avalanches (with a peak in March with 12 days with recorded snow avalanches)	In November and December low and moderate danger levels were most frequent. From January to March, Bâlea WNL issued high, considerable and moderate danger levels and in April and May - moderate and considerable danger levels.
2007-2008	Early in September and October, with a slight surplus of 28 cm and another strong surplus of 58 cm in November. In December the snow depth was increased by new snow with 44 cm and 20 cm. In January the snow depth was high with a surplus of 45 cm and high in February with another surplus of 33 cm. Between March and April (a maximum peak for the winter season was recorded) the snow depth was very high, caused by six successive surpluses (20 cm, 30 cm, 20 cm, 49 cm, 24 cm and 68 cm) and strong winds. In May the snow depth was rather high with new snow depth.	low concerning snow avalanches triggered by backcountry skiers and off-piste skiers (3 buried/injured) and high for spontaneous snow avalanches (with a peak in April with 10 days with recorded snow avalanches)	No danger levels in September and October, because the snow depth was very low. The predominant danger levels used in November were moderate and considerable. The typical danger levels in December, January and February were moderate and considerable. In March the danger levels were considerable and in April they were moderate, considerable and high. The most frequent danger level in May was considerable.
2008-2009	Very low in September. In October a strong surplus of 66 cm was recorded and then the snow has completely melted due to high temperatures. In the second half of November a new snow depth of 70 cm and strong winds were recorded. In December the snow depth was rather high (with a strong surplus of 75 cm and another one of 39 cm), high in January (with a slight surpluses of 14, 10 and 33 cm and strong winds). In March (a maximum peak for the winter season was recorded) and in April the snow depth was very high, with a new snow depth of 59 cm and of 17 cm, and strong winds respectively. Although in May a slight surplus of 11 cm was recorded, the snow depth decreased, caused by interactions of precipitations and high temperatures.	low concerning snow avalanches triggered by backcountry skiers and off-piste skiers (only one buried/injured) and high for spontaneous snow avalanches (with a peak in March with 12 days with recorded snow avalanches)	Considerable and moderate danger levels were very common with maximum frequency in October, January, February, December and May respectively. In March, due to a snow storm and new snow episodes, a high danger level was the most frequently used, while in April, Bâlea WNL issued moderate, considerable and high (low frequency) danger levels.

2009-2010	Low in October and November In December the snow depth increased with a slight surplus of 6 cm and another one of 15 cm. From January to February the snow depth increased with 60 cm and another new snow depth of 40 cm and a strong surplus of 68 cm in the second half of March. In April the snow depth was very high (with two slight surpluses of 20 cm and 17 cm) with a maximum peak for the winter season. Although a new snow depth of 20 cm was recorded in May, the snow depth decreased caused by interactions of precipitations and high temperatures.	low concerning snow avalanches triggered by backcountry skiers and off-piste skiers (one fatality and 2 buried/injured) and high for spontaneous snow avalanches (with a peak in March with 12 days with recorded snow avalanches)	Bâlea WNL did not issue any danger levels in October and November because the snow depth was very low. The use of a considerable danger level was most frequent in December and January, while the use of considerable and high danger levels was common in February and March.
2010-2011	The lowest values of the snow depth for the monitored period (2005-2006 and 2010-2011). The snow depth was very low in October and November, with a surplus during December and January. Rather high in February and March with a new surplus, high in April (a maximum peak for the winter season was recorded) with a last surplus and rather high in May.	low concerning snow avalanches triggered by backcountry skiers and off-piste skiers (only one buried/injured) and low in general for spontaneous snow avalanches, except during March (with 11 days with snow avalanche) and April (with 12 days with recorded snow avalanches)	In October and November the snow depth was very low and therefore Bâlea WNL did not issue any danger levels. In December moderate, considerable and high danger levels had the highest frequency. In January a moderate danger level was used (with a maximum frequency), while in February and March the moderate and considerable danger levels were common. In April the Bâlea Work Nivology Laboratory issued all danger levels, except a low danger level. We note that a very high danger level has been applied rarely and that only in April. I May the moderate and considerable danger levels were used.

CONCLUSIONS

Except for the Făgăraş massif and the Bucegi and Postăvaru Mountains (located in the eastern part of the Southern Carpathians), the risk management of snow avalanches is not yet a major concern for the Southern Carpathians, unfortunately.

Although many elements of the risk management are old, the Făgăraş massif is only one part of the Southern Carpathians where risk management of snow avalanches was implemented concerning the transport routes and the forests. Concerning the Făgăraş massif, as well as the Bucegi and Postăvaru Mountains, the risk scale of snow avalanches and the issuing of snow avalanche danger level were introduced, too. These elements of risk management of snow avalanches reduced the number of accidents, especially after the founding of PN-NAM in 2004.

Thus, decreasing the number of fatalities is an essential element, if we consider that the Bâlea glacial area is a very important space for winter sports and tourism in the same time. To reduce the risk, it is necessary to be extended the snow avalanches protection structures in the Bâlea and Capra glacial areas and also in other areas with tourism potential on Făgăraş (eg. the Sâmbăta glacial valley).

Given that there are no maintained or marked skiing pistes, the implementation of standardized pennons is necessary (as in the French system) (Voiculescu, 2009) or of warning panels, according to the European or North-American System (Weir 2002). On the other hand, it is necessary to be developed snow avalanche risk maps (that are lacking). Although they "*do not prevent avalanches, but they reduce the probability of damage*" (Höller 2007, p. 96).

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SUSTAINABLE PRACTICES IN AGRICULTURE AND TOURISM ACTIVITIES IN MOUNTAIN REGIONS

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ABSTRACT
The paper presents opportunities for sustainable development of mountain regions in the Republic of Bulgaria analyzing good practices and providing recommendations for future development. The most important risks in the examined sectors in their joint development are considered and classified which is used as a basis for the proposed model of risk management in integrated agriculture and tourism activities in mountain regions accenting planning, communication and information activities, monitoring and control.

Keywords: *sustainability, risk, management, integration*

INTRODUCTION
Nowadays, when discussions on economic, social and ecological sustainability put the most pressing questions for the future development of the planet and the humanity as a whole, some of the most prominent problems are particularly connected to the development of the regions suffering the problems of abandonment regarding population and land. Among the factors influencing regional development should be noticed the following: market orientation, standard wage rate, competitiveness, structure of qualification, development of regional employment structure, soft factors considering life quality (Heidelbach, 2002).

As specific areas, mountains cover 20% of the planet. They are the home of 10% of the world's human population; provide 50% of the freshwater for home consumption, irrigation of crop lands or industrial use (Hussain *et al.*, 2005). Additionally they provide essential resources and storehouses of genetic diversity. Being under severe threats of climate change, deforestation, overexploitation of natural resources and unsustainable agricultural practices, the final results impact not only the environment, but also the economic and social life in these regions. Mountain areas are on the second place after coasts and islands as popular tourist destinations attracting tourists for many reasons as climate, clean air, unique landscapes and wildlife, scenic beauty, local culture, history and heritage, and the opportunity to experience snow and participate in snow-based or nature-related activities and sports[1].

Mountain regions are specifically touched by the urbanization processes and new approaches towards the economic sectors that could be developed in them are needed integrating environmental aspects and local specificities[2]. The potential of agriculture and forestry development in mountain regions, because of the essence of resources they have, should be considered on one side, and the opportunities of the integration to sustainable tourism activities, on the other, which would provide the added value needed but also the impacts should be considered very carefully. Mountain region development is further influenced by the globalization challenges and the strivings for sustainable development and overcoming the uneven development of rural areas, and particularly mountain regions being part of the last ones.

Sustainable tourism, sustainable agriculture, sustainable forestry, nature conservation, local crafts, etc. are viewed as opportunities for mountain region development in discussions on conceptual issues of destination management as: land use planning, zoning control, business permits, access control, etc. putting the accent on the accessibility impacting social inclusion, life chances, economic development, and quality of living (Guzik, 2010). The need of holistic and integrated approaches in mountain region development is underlined in a long-term scope, as well as strategic, planning, cooperation, monitoring and risk management (Guzik, 2010).

The significant territorial and demographic discrepancies in mountain region management presume the elaboration of specific approaches and instruments in regional, local, national and community policies (Patarchanov, 2013), considering the spatial peculiarities. More attention is needed for sustainable development and restoration of the environment in the mountain areas because of the economic backwardness and fragility of the terrain forcing sometomes migration due to food insecurity. Looking for economically viable crops, sustainable horticultural farming is inevitable in mountain areas for maintaining environmental restoration and food security[3]. The need of planning activities in a nature protective and integrated approach is underlined (Deniz *et al.*, 2011) considering alternative tourism potentials.

Development of rural regions in the new program period 2014-2020 in Bulgaria, including much of the mountain and difficult to be reached regions, will be marked by the special support measures in the field of environmental protection, good agricultural practice and raise of attractiveness not only through encouragement of agricultural activities, forestry and protected areas but also through diversification of activities, incl. tourism development. The foreseen integrated approaches should be substantiated by a number of analyses before establishing regional policies and strategies.

Current study makes some analyses of good practices in literature, weak points and problems for mountain region

1 Tourism and mountains. A Practical Guide to Managing the Environmental and Social Impacts of Mountain Tours. United Nations Environment Programme, 2007.
2 Agriculture in Mountain Regions – a contribution to the „Year of the Mountains 2002". COPA/COGECA Working Party on Mountain Regions and Less-Favoured Areas.
3 Sustainable Horticultural Farming in the Mountain Regions - A Case for the Pindar Basin of Central Himalaya.

development in Bulgaria and concludes on the main risks in the integrated development of agriculture and tourism in mountain regions underlining the importance of risk management.

DATA AND METHODS

The investigation makes a deskstop study of the literature in the field of mountain region development especially concerning agriculture and tourism. Analyzing presented good practices and misktakes, some of the most prominent weak points in mountain regions development are formulated along with relevant problems, as well as main risks.

RESEARCH FINDINGS

Mountain regions are places for rest and inspiration but also a huge source of natural resources and agricultural produce which is the basis of employment and incomes for the mountain population. Emerging insustainability of current patterns of resources use and production practices regarding understanding and identification of factors and processes contributing to sustainability / insustainability of mountain agriculture and related activities, basic issues affecting long-term sustainability of mountain regions, agriculture, mountain farmers and their strategies and implications, innovations in different sectors, resource characterization and zonation are considered and success stories are presented in relation to sustainable development of sustainable mountain agriculture[4].

Purposeful policies supporting the overcoming of limitations are imposed by the specific geographical peculiarities and climate change – the main resons for making each activity more expensive. The farms in mountains are usually oriented to the high quality of production and natural resources management favoring preservation of biodiversity and lanscapes[5]. Taking into consideration the significant impacts (both positive and negative) of agriculture on the environment, the investigations of the forms, factors and effectiveness of eco-management in agricultural holdings in the country as a whole and of different types should be expanded and embrace all the farms in the country (Bashev and Vanev, 2014). Reviewing recent trends in the growing regional economy affecting farming, the characteristics of growth in population and non-farm employment that influences land use and farmers' businesses, as well as use of the recources, make the adoption of sustainable agriculture more feasible. On the other hand sustainable agricultural practices may help farming to remain economically viable (Erickson *et al.,* 2002).

In the last few decades the tendency in the development in Bulgaria was towards decrease of the significance of agriculture, especially in the less-productive areas as the mountains, and a shift to the sector of services accompanied by the urbanization processes and negative demographic trends. It should be however noticed that this is not the case only in Bulgaria. The risks of abandonment of mountainous areas and the impacts of urbanization are also discussed for Switzerland, for example, in a study (Price *et al.*, 2015) presenting different scenarios for risk areas for urbanization and land abandonment (Figure 1): globalization and low growth, high growth and pressure scenario, global cooperation, and self-sufficiency, which are presented below in a more general way.

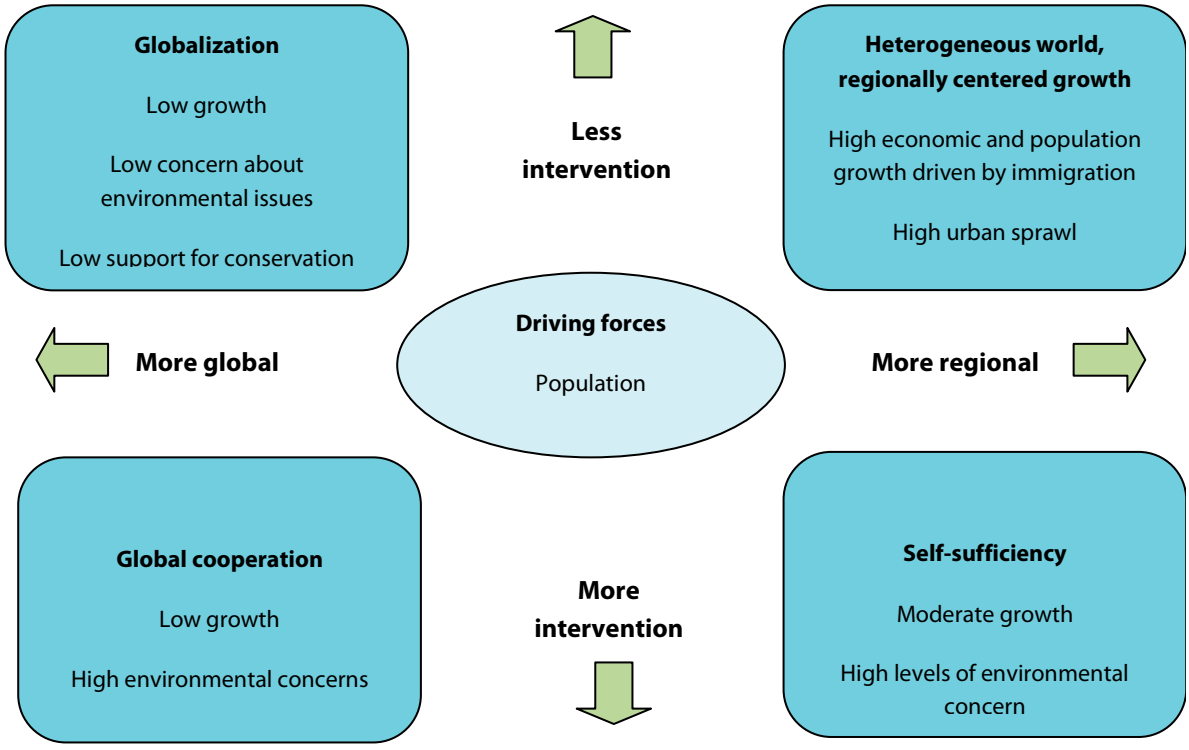

Figure1. *Scenario storyline axes (According to Price at al., 2015 with modifications)*

4 Strategies for the sustainable development of mountain agriculture: an overview.

5 Funding opportunities for mountain agriculture in the period 2014-2020

Whether some of those would be the case for mountain development in Bulgaria it is now difficult to say as far as the country is at the beginning of a new program period still establishing relevant policies, strategies and program documents dealing with the problems of sustainable, inclusive of intelligent growth[6] and putting very general goals which however should be entered into practice by the proper detailed planning and distribution of responsibilities, as well as funding activities.

The country's future development is underlined by the aims of knowledge-based economy, smart specialization, entrepreneurship encouragement and small and medium-size enterprises, incl. small farms. The farms having up to 10 ha represent 94% of all in the country and small farms dominate in less-favored and mountain regions which contribute to the preservation of landscape and local culture and provide the predominant part of the work places and incomes, thus having a potential for the balanced social and territorial development of the country[7]. Furthermore, the agricultural lands with high natural value in Bulgaria are mainly distributed in semi-mountain and mountain regions considered from the points of view of biodiversity preservation and the establishment of NATURA 2000. On the other hand the development of tourism is viewed as a potential which is not used although at the moment the national tourist product is dominated by the mass tourism (sea and mountain) which are characterized by the negative impacts of the tourism expansion[8].

Investigating the structure, performance and sustainability of agriculture in mountain regions through population growth, employment growth and structural characteristics of mountain farms – size, products, farmers, and farm typology, the following issues are considered: conservation programs and practices, alternative marketing and sources of income, production practices, farm financial performance and motivation (Erickson *et al.,* 2002).

Examining mountain tourism by focusing on economic, ecological and social dimensions of sustainable development, presentation of important case studies suggesting attractive examples and mistakes to avoid aims at inspiring both policy makers and practitioners to move towards sustainable tourism development in mountain regions, benefiting local communities while inspiring visitors from around the world[9].

The potential of tourism development in mountain regions and its socio-economic and environmental impacts are discussed in a study pointing out some of the indicators of tourism-induced change (Table 1).

Identification of tourism potentials is closely related to the achievement of destination competitiveness on tourism market and future actions should be related to promotion of tourist products within the regions, respect of principles for sustainable development, protection of natural environment, urgency of defined policy, priorities and activities (Nestoroska, 2012).

Responsible tourism is "the most economically, socially and environmentally efficient approach, a real opportunity for exploiting and promoting local products and services" (Petrovici, 2014). Responsible tourism's goals could be formulated as follows: stimulating interest in nature, traditions and communities, respect towards environment minimizing the nagative and maximizing the positive impacts (Petrovici, 2014) through harmonization between nature and a traditional living environment, unique customs and lifestyle of communities as part of the tourist attractions.

Table 1. *Indicators of tourism-induced changes (Modified by Nepal, 2002)*

Tourism as a conservation tool	Tourism as a social catalyst	Tourism as an income and employment opportunity
• Sustainable management of resources • Environmental improvement • Local awareness about environmental and social probems • Biodiversity conservation efforts • Strengthening local culture and heritage • Substantial revenues for government to invest in conservation and development • Local community development projects	• Upward mobility of those in the lower social strata • Increased self-reliance, confidence and motivation for community development • Increased local participation in conservation • Participation in planning processes • Redefinition of local economy structure	• Return of young people to villages • Local economic benefits, particularly to strategically located villages • Some economic benefits to neighbouring regions – spread effect • Some impacts on other economic sectors

Studying challenges and opportunities for tourism development in mountain regions good practices are presented in several sections: cultural diversity and social change, social equity and economic development, environmental resources and management, policies and social institutions for sustainable mountain tourism, concluding on "moving from hopes and fears to sustainable realities"[10]. Considering tourism and promotion in the aims of building a positive image and increasing the visibility of tourist destinations, public relations "may represent a bridge towards change, a means for adjusting to the new attitudes triggered by change" (Petrovici, 2014).

Considering that a tourist product is a conventional designation of the complex of tourist services offered at a common price, the product "rural tourism" is about the creation of packages of services, systems of reservation and monitoring targeted to certain groups, and the development of the agrotourist market in Bulgaria requires the consolidation of rural tourism objects in a network and a trade mark guaranteeing quality and trust in the establishment of a specific agrotourist product assuring improvement of the social and economic conditions in the rural regions, diversification of the activities in

6 *Europe 2020 Strategy for smart, sustainable and inclusive growth*

7 *Partnership agreement of the Republic of Bulgaria outlining the support from the European structural and investment funds for the 2014-2020 period*

8 *Ibid.*

9 *Tourism in Mountain Regions. Hopes, Fears and Realities. 2014.*

10 *Tourism in Mountain Regions. Hopes, Fears and Realities. 2014.*

agriculture and a high life standard, as well as capacity building and avoidance of rural abandonment (Nikolova *et al.*, 2010).

Diversification of agricultural producers' activities including agritourism is an opportunity for stabilization of the incomes and more. There are numerous benefits from the development of agritourism: it may strengthen the local economy, create job opportunities and new businesses; develop and promote training and certification programs to introduce young people to the agriculture and environment (Privitera, 2010). Regarding good practices and effective implementation of protection of environment for integrated rural development the best example in Bulgaria is the networking between organic production, wildlife and tourism in the New Thracian gold project (http://newthraciangold.eu/).

As regional weak points concerning the mountain regions in Bulgaria four key fields are determined (Heidelbach, 2002, with modifications): population, plant and animal production, forestry and investments bearing a number of problems some of wich are underlined in Table 2:

Table 2. *Regional weak points (According to Heidelbach, 2002, with modifications)*

Field	Problem
Population	Age structure
	Agriculture as dominant economic sector
	Educational level
	Sex distribution
	Environmental conditions
Plant and animal production	Climate and soil factors
	Plant protection
	Agriculture mechanization
	Limited variety of crops
	Races
	Processing and marketing opportunities
Forestry	Value
	Protection
Investments	Financial means
	Know-how

Risks are summarized in three main groups: risks for mountain regions, resources and population, risks for agriculture and tourism and risks for tourists and demand (Table 3). Some of the risks are the case for the first two groups: unsustainable practices, human recources qualification and background, personal characteristics and convictions, motivation, impacts of tourism and tourists, while the accessibility and safety risks are in force for all three groups.

Table 3. *Classification of risks in the development of agriculture and tourism sustainable activities in mountain regions*

Risks for mountain regions, resources and population	Risks for agriculture and tourism	Risks for tourists and demand
Population growth	Business risks – production, management, marketing	Individual perceptions
Un/employment growth	Seasonality of production / demand	Destination image
Environmental pressure	Policy implementation risks	Information provision
Macroeconomic policies	Financial performance	Political situation
Unsustainable practices		Macroeconomic situation
Human resources qualification and background		Security issues
Personal characteristics and convictions		Social risks
Motivation		Cultural risks
Tourism and tourists' impacts		Fair competition
Accessibility		
Safety risks - natural disasters, weather conditions, climate change, crime, terrorism, etc.		

In the discussions about the future development of mountain regions and the opportunities of application of sustainable practices of joint development of agriculture and tourism as being the main economic sectors having great potentials for avoidance of abandonment and low development, macro and micro dimensions of economic and environmental aspects of sustainable development should be considered, as well as the issues connected to regional accessibilty, population and

labor force mobility, and social impacts.

DISCUSSION

The development of agriculture and tourism is scrutinized from the the point of view of the need of reducing any negative economic, social and environmental impacts, on one hand, and on the other, the need of bigger incomes for the local population in the rural regions. Sustainable growth predisposes the inclusion of local community in planning and decicion taking concerning support to economic development, environmental protection and culture and historical heritage conservation. Rural development policies triggered by the fast expanding urbanization processes and rural abandonment consider sustainable / responsible practices in agriculture and tourism development focused on preservation of the environment and the local communities but also on building confidence in the society as a whole.

Considering mountain regions from the point of view of sustianbale development, the Adelboden Declaration on Sustainable Agriculture and Rural Development in Mountain Regions recommends policy and actions in political, legal and institutional, social and cultural, natural, economic environment, capacity building and knowledge to be improved accounting for the specific exposure of mountains to poverty, marginalization and conflicts, as well as their competitive advantages and interdependencies with lowlands.

Thus, future development of mountain regions requires a holistic and integrated approach in policies and strategies development taking account of the risks and risk management, adopting long-term perspectives, involving all stakeholders, producing and sharing knowledge and providing continuous monitoring.

The proposed model of risk management in integrated agriculture and tourism activities in mountain regions is focused on the need of good planning, provision of information and communication, underlying the importance of feedback, monitoring and control (Figure 2).

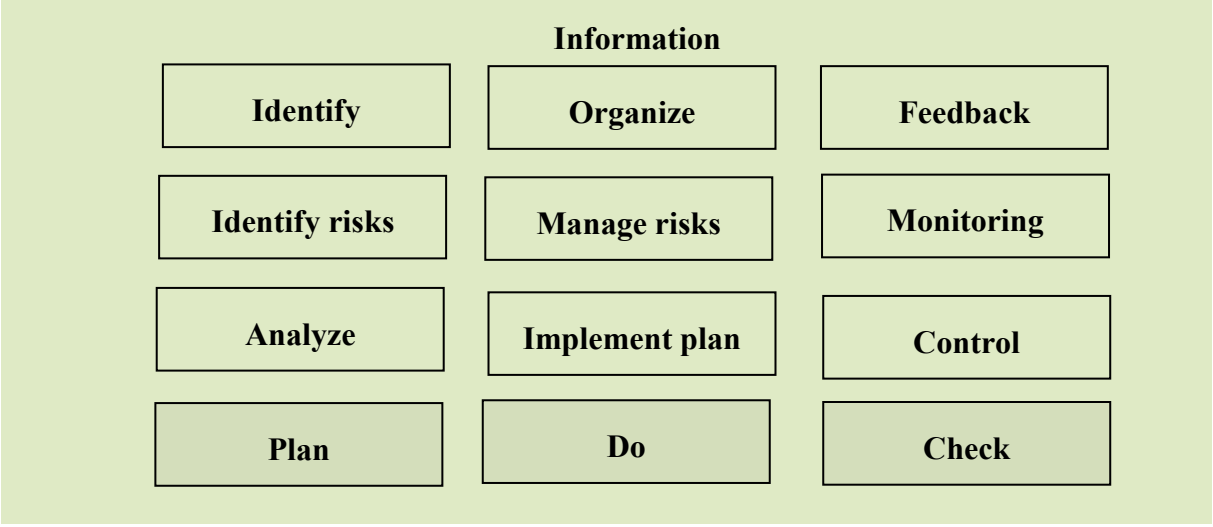

Figure2. *Proposed model of risk management in integrated agriculture and tourism activities in mountain regions*

The above discussions support the main recommendation of the need of an intergated strategy (based on national development, regional development and national agricultural, forestry and tourism policies) for sustainable mountain region development based on risk assessment and management and assuring an effective system of monitoring and control, encouraging sustainable invetsments and fair competition conditions, improvement in infrastructure and accessibility, use of modern communication and information technology, and educational capacity building.

CONCLUSION

For sustainable development of mountain regions first of all there is a need of assuring encouraging environment through businesses development and targeted investments in specific "green" activitities increasing capacities for better financial performance. An integrated strategy for mountain regions sustainable development should be developed focusing on risk assessment and management and establishment of early warning and relief systems for monitoring and mitigation of threats. The significance of provision of information and assurance of motivation should be considered along with the training and educational activities targeted at the building of specific capacities. The policy on tourism development should be based on identifying the tourism potential of the mountain regions avoiding spontaneous tourism development and increasing competitiveness of mountain destinations in the field of alternative forms of tourism experiencing sustainable practices in preservation of natural values and the cultural heritage, raising the attractiveness and fostering economic and social development, applying good practices and specific promotion activities.

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VARIATIONS OF SOUTHEASTERN EUROPEAN MOUNTAIN CLIMATE DUE TO DECADAL SOLAR CYCLES

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The mountain regions in Southeastern Europe are unique natural regions of great beauty and ecological value, and home of the headwaters of major rivers. They constitute a major ecological, economic, cultural, recreational and living environment in Europe, shared by numerous peoples and countries.

The strong mountain climate changes and their negative effect on the quality of life are investigated by means of the Palmer Drought Severity Index (PDSI), the precipitation and the temperatures are calculated over the Alps, Carpathians, Balkans and Caucasus, and the decadal variations of the Total Solar Irradiance (TSI). A linear model of the solar influence on the climate, based on the correlation between the mountain PDSI variations and the solar cycles oscillations with 11-, 13-, 22-, 45 and 76-year periods is created. This model is used to predict the periods of danger of wet or dry conditions over Southeastern Europe for the next 90 years.

Keywords: *climate changes, PDSI, precipitation, temperature*

INTRODUCTION

The global warming, accelerated after 1980, leads to glaciers melting, sea levels rising, large field areas drying and significant changes in all ecosystems, weather and climate. Nowadays it is believed that humans have caused most of the past century warming by releasing heat-trapping gases. The hypothesis of greenhouse gases explains the major part of the observed increase of the mean air temperature, but many authors point out that other sources of significant climate variations are the solar cycles and connected with them changes of the total solar irradiance, solar wind, interplanetary magnetic field, cosmic rays, space dust, ionospheric effects and etc. The solar cycles strongly affects all Earth systems and they can drive a great number of geodynamical processes connected with the convections of the Earth fluids on the surface and inside the Earth. Many climate and weather parameters are affected directly by the variations of the solar activity. The climate response to the solar activity consists of cycles whose periods are close to the well-known solar periods of 11a, 22a, 45a, 77a, 200a etc., and their harmonics. The climate variations are mostly due to the total solar irradiance variations. The TSI variations significantly affect water evaporation and the global water cycles. The global water redistribution between the oceans and the continental polar ice leads to periodical changes of the principal moment of inertia *C*, followed by earth rotation variations, according to the low of the angular momentum conservation. The solar excitation affects biannual, decadal, centennial and millennial cycles of climate and Earth rotation (Chapanov et al., 2010a; 2011; 2012a, b, c; 2014a, b; 2015).

Chapanov et al., 2012, 2015 point out that the local variations of river stream flows are influenced by the solar activity directly by means of total solar irradiance variations and non-directly by means of solar wind and interplanetary magnetic field variations, followed by geomagnetic disturbances, cosmic particles, local variations of temperature, humidity, rainfalls, climate and weather, etc. The dominant factors of the long term variations of the river stream flows are 11-, 22- and 45-year solar influences on the local and regional climatic changes, represented by the local PDSI variations, calculated for the mountain area of the river basins (Chapanov et al., 2012, 2015).

The Southeastern European (SEE) Mountain Regions are an important reservoir of biodiversity and habitats in Europe. A great number of protected areas - national parks, nature parks, reserves and nature monuments are located in this region. From a socio-economic point of view mountain regions are observed to be the poorest areas in the SEE countries, but with potential for the implementation of successful economic practices and activities. There is an opportunity to set measures for the development of the region and, in particular, for trans-border integration and co-operation. Regional cooperation is of high importance as the EU integration differs among the countries and synchronization of this activity, originally triggered through the EU accession process, is needed to avoid future imbalance of developments in border regions.

The goal of this paper is to create models of interconnection between the long-term variations of the Palmer Drought Severity Index, the precipitation and temperature over the Mountains of South-East Europe and the solar activity cycles with periods 11, 22, 45, 77 years and their harmonics. The result of this work is better understanding of the decadal wet/drought cycles, driven by the solar activity and improving the knowledge about the flood and drought trends in this century.

DATA AND METHOD OF ANALYSIS

The variations in the Southeastern European Mountain climate due to decadal solar cycles is investigated by monthly mean values of gridded PDSI, precipitation and temperature. The Palmer Drought Severity Index (PDSI) is involved by Palmer (1965) to represent the severity of dry and wet spells over the U.S. based on monthly temperature and precipitation data as well as the soil-water holding capacity at that location. The global PDSI data (Dai et al., 1998; 2004) consist of the monthly surface air temperature (Jones and Moberg 2003) and precipitation (Dai et al., 1998; Chen et al., 2002) over global land areas from 1870 to 2006. These data represent PDSI values in global grids 2°.5´2°.5. Monthly gridded European fields for the 500 hPa geopotential height, temperature, and precipitation covering the last 235 years (December 1765 - November 2000) have been reconstructed by Casty et al., 2005, 2007; Mitchell and Jones, 2005. This field covers regions of the North Atlantic and Europe (80-30°N and 50°W-40°E).

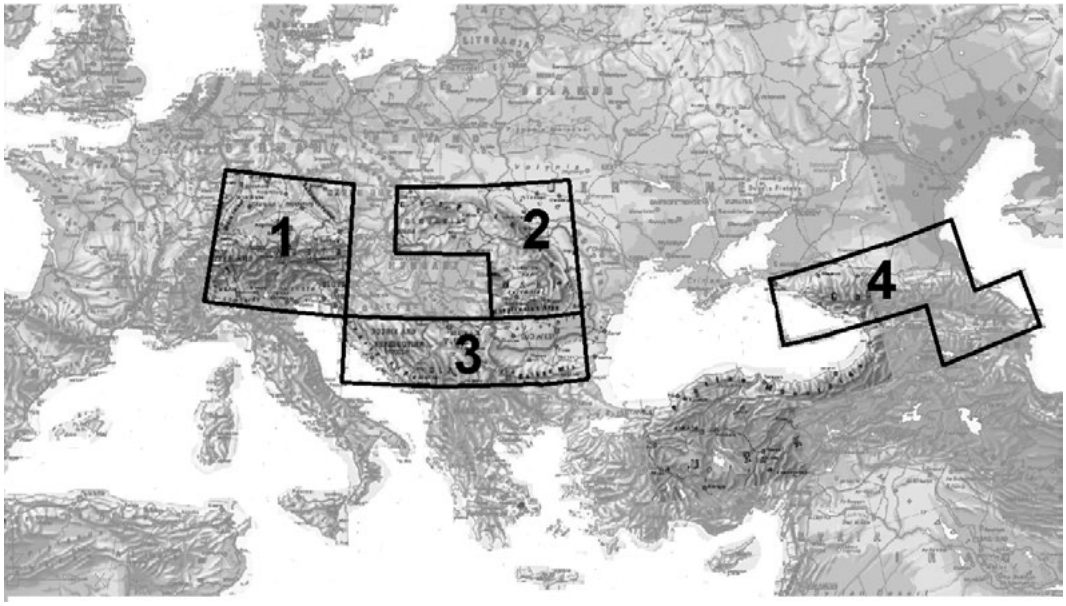

Figure 1. *Mountain area (Alps -1, Carpathians -2, Balkans – 3 and Caucasus -4) covered by trapezoid grids of climate data determination:*

1) Longitude 7.5° - 15.0°E Latitude 45.0°- 50.0°N
2.1) Longitude 17.5°- 27.5°E Latitude 47.5°- 50.0°N
2.2) Longitude 22.5°- 27.5°E Latitude 45.0°- 47.5°N
3) Longitude 15.0°- 30.0°E Latitude 42.5°- 45.0°N
4.1) Longitude 37.5°- 47.5°E Latitude 42.5°- 45.0°N
4.2) Longitude 45.0°- 50.0°E Latitude 40.0°- 42.5°N

The Alps, Carpathians, Balkans and Caucasus are connected with the most SEE-rivers and their climate regime determines the cycles of extreme wet or dry events. Figure1 represents trapezoid areas formed by 2°.5´2°.5 grids over Mountain drainage areas of SEE-rivers. The detailed variations of PDSI of the Alps, the Carpathians and the Balkans are presented in (Ivanov and Zhelezov, 2013; Chapanov et al., 2014b), according the zones from Figure1.

The time series of the PDSI, precipitation and temperature variations are determined by the mean values from all grid data from the selected area. The mean values are computed by means of the robust Danish method (Kubik, 1982; Juhl, 1984; Kegel, 1987; Poits, 1988). This method allows to detect and isolate outliers and to obtain an accurate and reliable solution for the mean values. The trapezoid zone of the Caucasus is expanded by additional two 2°.5´2°.5 grids in order the accuracy of computation to be improved. The PDSI variations over the new Caucasus zone are given in Figure4. The monthly mean values of precipitation and temperature for the period 1766-2000 over the Alps, the Carpathians and the Balkans are given in Figure2.

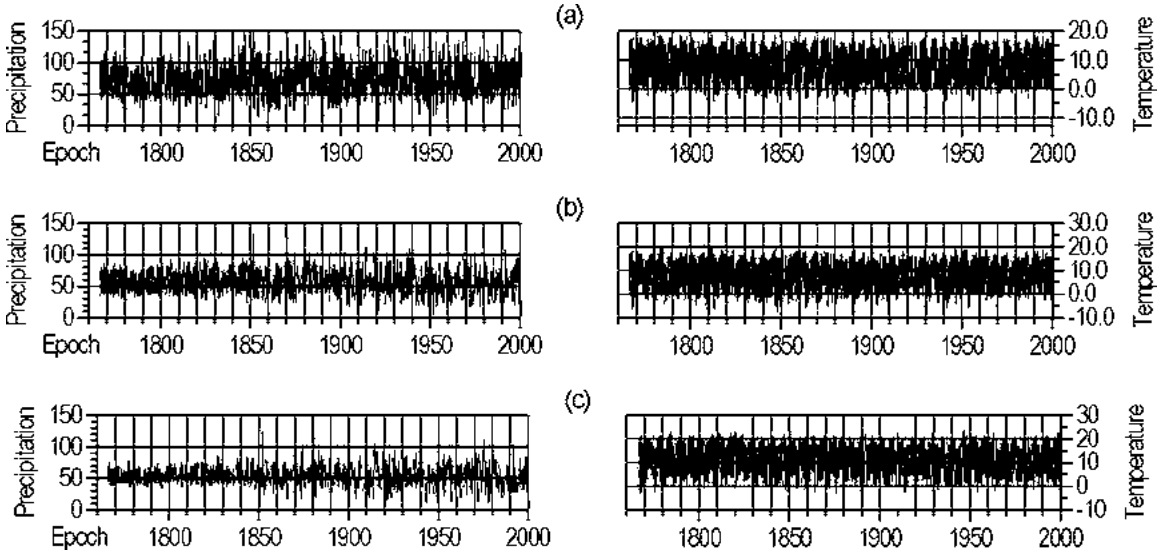

Figure2. *Monthly mean values of precipitation and temperature for the period 1766-2000 over the Alps (a), the Carpathians (b) and the Balkans (c)*

The long term variations of precipitation data in Figure2 are hidden by high-level random noise, while the long term variations of temperature are significantly less than the seasonal oscillations. These problems are solved by averaging in a moving window, which is widely applied for filtration of the high frequency noise from the time series. Let consider time series $f(t_i)$ with epoch's t_i and step Dt. The remove of all oscillations with periods below T is possible by n-points running average ($n=T/Dt$), which yields new time series $g(t_i)$

$$g(t_k)=\frac{1}{n}\sum_{i=k}^{k+n-1} f(t_i),$$
$$t_k=\frac{1}{n}\sum_{i=k}^{k+n-1} t_i, \quad k=1,\ldots,N-k. \tag{1}$$

This method had been successfully applied in the processing of high-dense Earth orientation data and gravimetric time series in (Chapanov, 2005).

The use of the robust estimation methods in the processing of the geo observations is necessary not only the observations with gross errors and significant deviation from the normal distribution to be detected. Another important advantage of the robust estimation is accounting of the observations with small deviation from the normal distribution. As Rey (1978) points out, the methods of robust estimation are stable as in the case of small deviations of the distribution function as in the case of the observations with gross errors. The application of the robust estimation method is a necessary condition to obtain estimates with adequate accuracy. The Danish method is very flexible and convenient to determine the mean values of the observations or other parameters, which are constants in the time. This method is iterative and the observation weights are functions of the absolute value of the observation corrections from the previous iteration (Kegel, 1987; Kubik, 1982).

Let p_0 be the weights of the observations at the zero iteration, v_0 - the corrections of the observations after first estimation by the least-squares method, and m_0 - the standard. Then the weights of the observations at the next iterations i+1 are computed by the formula (Kegel, 1987)

$$p_{i+1}(v_i)=p_i e^{-0.05\left(\frac{v_i\sqrt{p_i}}{\mu_i}\right)^6}, \; i=0,1,2,\ldots n \tag{2}$$

Kegel (1987) use the following scheme

$$p_1=p_0,$$
$$p_{i+1}(v_i)=p_i e^{-0.05\left(\frac{v_i\sqrt{p_i}}{\mu_i}\right)^{4.4}}, i=2,3, \tag{3}$$
$$p_{i+1}(v_i)=p_i e^{-0.05\left(\frac{v_i\sqrt{p_i}}{\mu_i}\right)^{3}}, i=4,\ldots.$$

In the process of the iterations the weights of the observations and the standard decrease continuously. The iterations stop when the standard reaches the empirical value m_s which leads to the acceptable number of observations with small value of the weights (p_i<0.1). The robust normal points application for geo time series processing yields high frequency noise filtration, outliers detection and significant improve of the time series accuracy level. This method is widely applied for processing of high density geodetic data for determination of the oscillations of the verticals (Chapanov et al., 2010b).

The long term variations are derived from the data by means of partial Fourier approximation based on the Least-Squares estimation of Fourier coefficients (Chapanov et al., 2012a, c; 2015; Ron et al., 2012). The Partial Fourier approximation

$F(t)$ of discrete data is given by

$$F(t) = f_0 + f_1(t - t_0) + \sum_{k=1}^{n} a_k \sin k \frac{2\delta}{t_E - t_B}(t - t_0) + \\ + b_k \cos k \frac{2\delta}{t_E - t_B}(t - t_0), \quad (2)$$

where t_0, t_B and t_E are the mean, first and last epochs of observations, f_0, f_1, a_k and b_k are unknown coefficients and n is the numbers of harmonics of Fourier approximation, which covers all oscillations with periods between $(t_E\text{-}t_B)/n$ and $(t_E\text{-}t_B)$. The application of the Least-Squares estimation of Fourier coefficients needs redundant number of observations, so the number of harmonics n is chosen significantly smaller than the number N, corresponding to the Nyquist frequency, which is ½ of the sampling rate of the discrete signal. The small number of harmonics n yields to LS-estimation of the coefficient errors, too. The period of the first long-periodical harmonic in (2) depends on the observational time span in case of classic Fourier approximation, but here it is possible to decrease the value of the first harmonic, so the estimated frequencies may cover the desired set of real oscillations. This method allows flexible and easy separation of the harmonic oscillations into different frequency bands by the formula

$$B(t) = \sum_{k=m_1}^{m_2} a_k \sin k \frac{2\delta}{t_E - t_B}(t - t_0) + b_k \cos k \frac{2\delta}{t_E - t_B}(t - t_0), \quad (3)$$

where the desired frequencies ω_k are limited by the bandwidth

$$\frac{2\delta m_1}{t_E - t_B} \le \omega_k \le \frac{2\delta m_2}{t_E - t_B}, \quad (4)$$

so it is possible to compare common climate, orbital and solar cycles. The superposition of several oscillations from a given frequency band allows to compare both phase and amplitude variations of the common cycles.

The filtered long term variations of precipitation and temperature for the period 1766-2000 over the Alps, the Carpathians and the Balkans (Figure3) are calculated in two steps. The first step removes all high-frequency noise and oscillations by running average in 2-year time window and robust estimation based on the Danish method. The second step determines the long term oscillations of the filtered time series by means of the partial Fourier approximation with 100 harmonics.

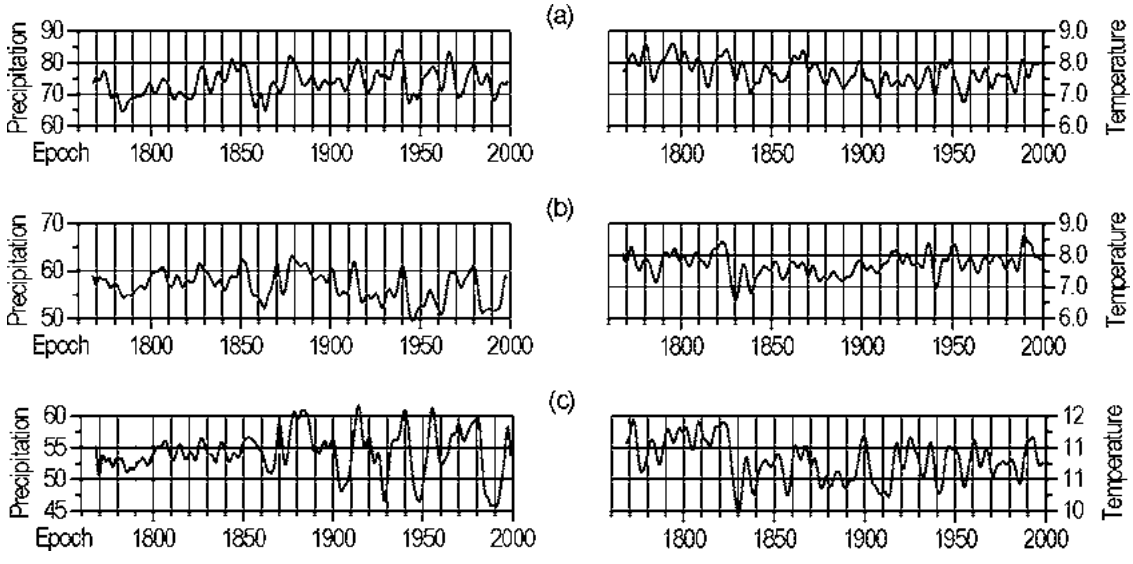

Figure 3. *Filtered long terms of precipitation and temperature for the period 1766-2000 over the Alps (a), the Carpathians (b) and the Balkans (c)*

The filtered long term variations of PDS data over the Caucasus are also calculated in two steps, where in the second step is applied partial Fourier approximation with 50 harmonics (Figure4).

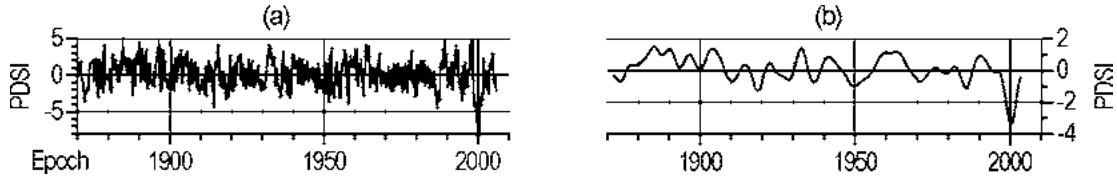

Figure 4. *PDSI monthly mean values over the Caucasus for the period 1870-2005*

A MODEL OF CLIMATE RESPONSE TO SOLAR CYCLES

Chapanov et al. (2014b) determine strong correlation between TSI and Mountain PDSI oscillations with periods 11, 13, 22, and 45 years. The known solar cycles are with periods of 11 years (Schwabe cycle), 22 years (Hale cycle), 45 years (equatorial solar asymmetry cycle), 70-100 years (Gleissberg cycle), 208 years (de Vries cycle), 231 years (Suess cycle), etc. The TSI oscillations with period 13 years may appear as 18-th harmonics of the Suess cycle, or 16-th harmonics of the de Vries cycle, or 6-th harmonics of the Gleissberg cycle (78 years). We may accept that the duration of the Gleissberg cycle is equal to the 7 Schwabe cycles. Then the mean value of the 13-year TSI oscillations will be 7/6 of the mean Schwabe cycle duration. The 11-year solar influences on climate changes are connected with the TSI increase during solar maxima. During 1761.5 – 2001.1 we have 23 solar maxima and 22 Schwabe cycles with mean duration 10.89a, while during the period 1870.6-2001.1 the mean Schwabe cycle is 10.87a (Figure5). The precipitation and temperature data in Figure 3 had some jumps and different behaviour before 1870, so we may consider only climate indices after 1870 when the basic mean value of the Schwabe cycle is 10.87a, which corresponds to 76.1-year duration of the Gleissberg cycle, whose 6-th harmonics is equal to 12.69a.

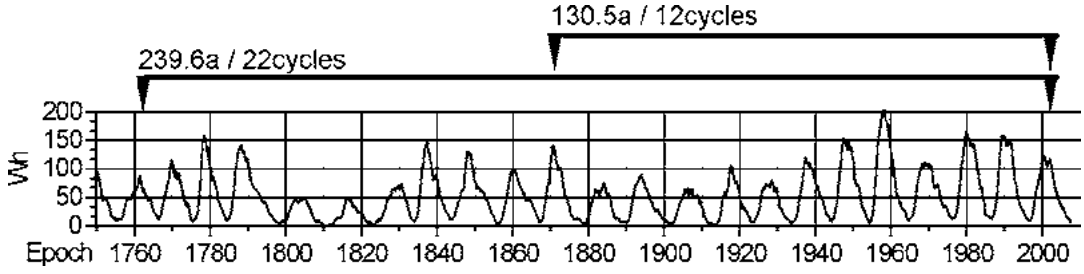

Figure 5. *Smoothed Wolf's number variations and time intervals between solar maxima in 1761.5, 1870.6 and 2001.1*

Finally the model of the decadal cycles of climate response to the solar activity consists of Gleissberg cycle with duration 76.1a and 15 harmonics, accomplished with the Hale cycle (with double Schwabe period or 21.74a) and the equatorial solar asymmetry (with double Hale period or 43.48a). The coefficients of this model are determined by a partial Fourier approximation of the climatic data in the form

$$F = f_0 + f_1(t-t_0) + \sum_{j=1}^{5} a_j \sin j\frac{2\delta}{P_G}(t-t_0) + b_j \cos j\frac{2\delta}{P_G}(t-t_0) + \sum_{k=1}^{2} c_k \sin\frac{2\delta}{P_{ESA}}(t-t_0) + d_k \cos\frac{2\delta}{P_{ESA}}(t-t_0), \quad (5)$$

where t_0 is the mean epoch of observations F, P_G=76.1a is the period of the Gleissberg cycle and P_{ESA}=43.48a is the period of equatorial solar asymmetry. The unknown coefficients f_0, f_1, a_j, b_j c_k and d_k in (1) are estimated by the method of the Least Squares.

PREDICTION OF MOUNTAIN CLIMATE CYCLES

The calculated time series of PDSI, precipitation and temperature over the Alps, the Carpathians, the Balkans and the Caucasus for the period 1990-2100 by the model (5) are shown in Figs. 6 and 7. The time series of all climate indices of the Balkans and the Carpathians are highly correlated, so the climate cycles over these two mountains belong to one and the same climatic zone. A part of decadal precipitation variations are anti-correlated with the temperature variations. According to the Palmer classification of drought and wet conditions we may expect severe events over the Carpathians region and extreme events over the Balkans (Figure6).

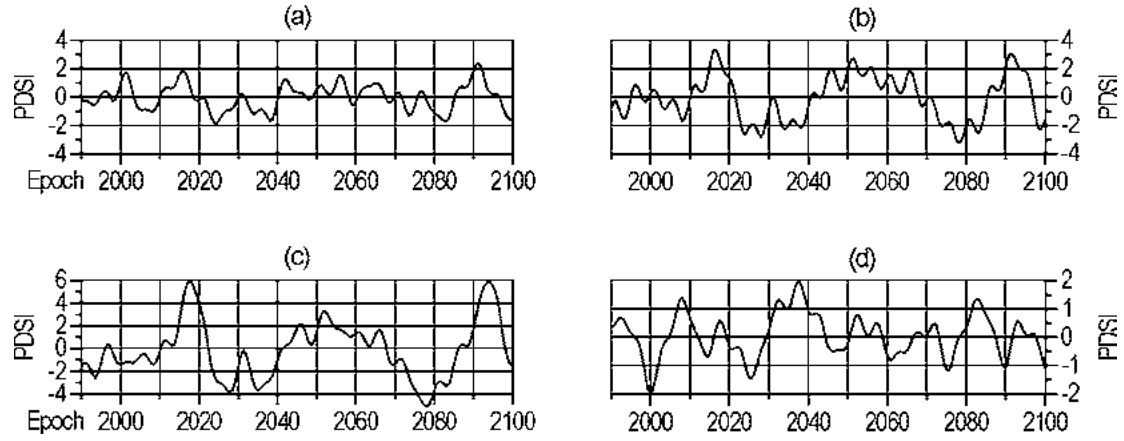

Figure 6. *Long terms forecasts of PDSI variations for the period 2000-2100 over the Alps (a), the Carpathians (b), the Balkans (c) and the Caucasus (d)*

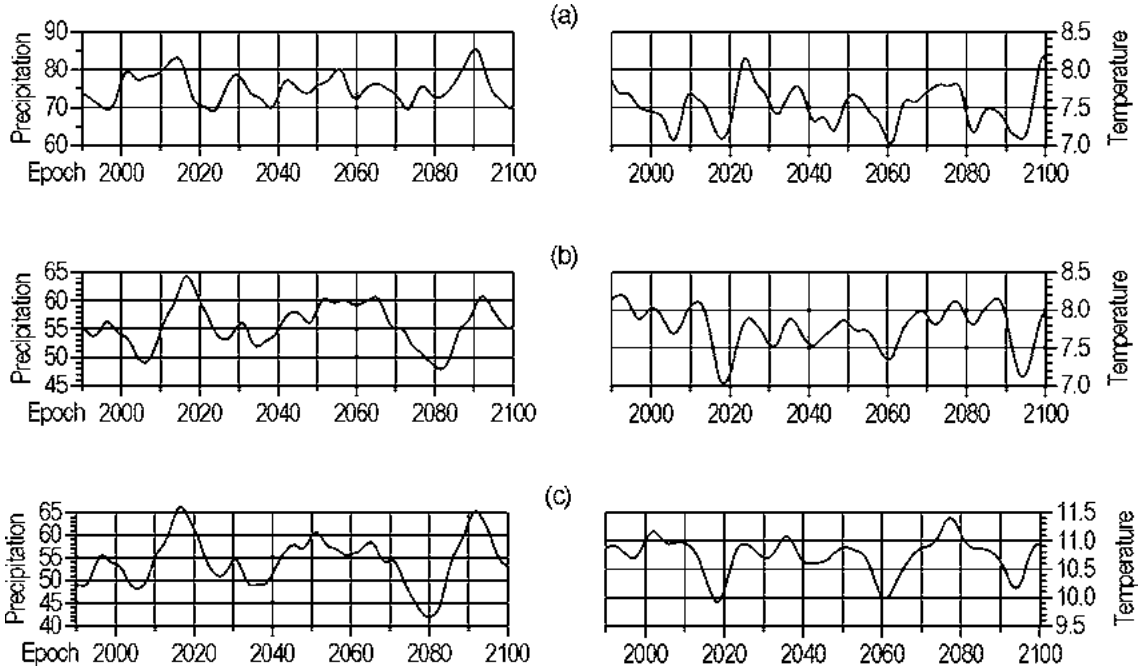

Figure 7. *Long terms forecasts of precipitation and temperature variations for the period 2000-2100 over the Alps (a), the Carpathians (b) and the Balkans (c)*

CONCLUSIONS

The PDSI, precipitation and temperature gridded data give good opportunity for long term climate variations study over a given local area. The monthly mean precipitation data contain high level random noise, while the temperature data are dominated by the seasonal variations, so all short periodicities below and around 1 year should be removed before the long term determination. The precipitation and temperature long term variations over Southeastern Europe are consistent with the PDSI oscillations for the period after 1870. The use of whole precipitation and temperature data since 1766 leads to wrong determination of climate variations, significantly different from the corresponding PDSI variations for the same region.

The PDSI, precipitation and temperature data are used to predict decadal oscillations of the climate over the Mountains of Southeastern Europe for this century by means of model of climate response to the decadal cycles of the solar activity. The model includes first 15 harmonics of the Gleissberg cycle, whose duration of 76.1 years is chosen to be equal to 7 mean 10.87-year Schwabe cycles. The model includes also cycles of Hale (with double Schwabe period or 21.74a) and the equatorial solar asymmetry (with double Hale period or 43.48a). The model of climate response to the decadal solar cycles is proved by the predicted maxima of all PDSI and precipitation time series in 2015-2018 and the real floods and heavy rains almost in whole Europe during the last two years.

According to this model, the centennial climate forecast for Southeastern Europe points out to two dry events over the regions connected with the Balkans and the Carpathians in 2022-2040 and 2070-2085. The wet conditions for these regions are expected in 2040-2065 and 2085-2095. Floods are possible in 2050 and 2090-2095, especially for the region of the Balkans. Dry events over the Caucasus region are expected in 2020-2030, 2060-2070, 2075 and 2090; wet events are expected in 2030-2045 and 2080-2087. The chosen region of the Alps covers the drainage basin of the Danube only, so

its climate forecast is not valid for the whole mountain, but the obtained time series point out to dry events in 2020-2040 and 2075-2085 and wet events in 2085-2095. According to the Palmer classification of drought and wet conditions we may expect severe events over the Carpathians region and extreme events over the Balkans.

The Alps, the Carpathians and the Balkans have a common forecast for cold events around 2018, 2030, 2040, 2060 and 2095. The warm periods are around 2025, 2035, 2050 and 2075. These results about the decadal climate variations are connected with the solar cycles only and the real centennial trends should contain the anthropogenic global warming effects, too.

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TRANSBOUNDARY PROTECTED AREAS IN BULGARIA - PARKS FOR LIFE IN EUROPE

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ABSTRACT: Bulgaria is one of the few European countries with well-preserved nature. Due to its geographical location Bulgaria has an extremely rich biological and landscape diversity. Bulgaria has always participated in world and European initiatives, namely: the Ramsar Convention on Wetlands, the Convention for the Protection of World Cultural and Natural Heritage, UNESCO's Man and Biosphere Programme, CORINE, Biotope, Natura 2000, etc. One of the most recent ideas is the creation of transboundary protected areas in the EU.

Here are presented four transboundary protected areas in Bulgaria, which allow for cross-regional collaboration between states in various spheres of life.

Keywords: *environmental policy, transboundary protected areas, protected areas management*

INTRODUCTION

Being located at the crossroads of three vast biographic regions (the Mid-European forest, the Eurasian Steppe and the Mediterranean region) and having a relief characterized by many mountains and forest eco-systems, Bulgaria has a rich biologic and landscape diversity.

Bulgaria declared its first protected areas (the reserve "Silkosiya" in the Strandzha Mountain and "Parangalitsa" in Rila) in 1933 and in 1934 - the first national park (Vitosha) on the Balkan Peninsula.

In 1936, the Law for Nature Conservation entered into force, which treats the international legal norms for the types of protected areas.

In the beginning of the 70-s, there was an increase of the interest in the protected mountain areas and wildlife. In this period, Bulgaria participated actively in various international initiatives and signed different international conventions and programs, such as:

- The Ramsar Convention on Wetlands (1975),
- The Convention for the Protection of the World Cultural and Natural Heritage,
- The Man and Biosphere UN International Program of UNESCO.

In 1992, the Law for Nature Conservation was passed. It provides a framework for the state policy and management, and is consistent with the international standards for nature conservation.

As a result, in 1995 a network of reserves was created, covering 4, 5% of Bulgaria's territory. Thus Bulgaria ranked first in Europe, having the largest relative area of reserves and the largest number of biosphere reserves of international importance.

In 1998 the Law on Protected Areas was passed, which introduced the modern categorization of the protected areas, thus providing management regimes for each protected area. They were developed on the basis of specialized scientific and economic information, taking into account the interests of the local population and the opportunities for sustainable development and the use of natural resources.

In this line, Bulgaria had to consider also the problems related to the global strategy and the UN program for the protection of the environment through changes in the policy of institutional development and use of natural resources as well as the conservation of biological and landscape diversity.

Bulgaria signed the CORINE Biotopes program in 1994. The NATURA 2000 program was first applied in parallel with the Emerald initiative. It is through that the protected areas fall within the priorities of Europe and are included in the international program known as Pan- European strategy for the conservation of biological and landscape diversity. Beside integration of the European priorities into the national strategies for biodiversity, it also includes sustainable use of the natural resources of the environment and coordination of the efforts in the conservation of the natural environment in a given region, such as the Balkans.

The Law on Forests and the Law on Protected Areas treat the creation of new protected areas and expansion of the requirements thereof. With the enlargement of the EU the so-called transboundary areas are constantly developed.

In compliance with the strategy of the Pan- European ecological network, the European practice is applied by creating 4 transboundary protected areas in Bulgaria as follows:

THE AREA OF THE WESTERN STARA PLANINA MOUNTAIN

It includes the territories under an agreement between Bulgaria and Serbia located within the area of the Peace Park covering mainly the Chiprovtsi and Berkovski part of the Stara Planina Mountain. In the future, new transboundary recreation areas will be formed in the triangle Sofia-Nis- Skopje as recommended by the European Union.

THE REGION OF THE STRANDJA MOUNTAIN

It covers the Strandja Nature Park, which includes 5 natural reserves:
- Uzunbodjak, one of the largest reserves,

- Silkosiya - the oldest reserve,
- the Vitanovo, Sredoraka and Tisovitsa reserves.

The successful implementation of the Green Corridors project, which promotes the natural and cultural heritage in the region of Bourgas-Kirklareli, is an important fact for this region as there have been created nine ecotourism routes, which are already in operation.

The favourable natural characteristics of this transboundary area present opportunities for sustainable development of different forms of tourism. What's more, there are many natural and anthropogenic resources which allow for diversification of the existing tourism products and services in support of transboundary collaboration, thus making the transboundary area a unique tourist destination.

THE AREA ALONG THE COURSE OF THE DANUBE

The area in this part is subject to special protection under the Agreement of 1999 between the Ministry of Environment and Waters of Bulgaria and the Ministry of Forests and the Environment of Romania, as well as the Memorandum for the protection of the Danube River. The Silver Lake is located there, which is considered as world natural heritage, also as a wetland of international importance by the Ramsar Convention and a biosphere reserve according to the UNESCO list.

According to the EU project for that region, more protected areas are planned to be created, such as the Kamadinu Island in Romania and the Luliaka Island in Bulgaria.

Under another initiative of UNDP from 2000, MOEW of Bulgaria, the Ministry of Environment and Spatial Development of Moldova, the Ministry of Water, Forests, and EP of Romania and the Ministry of Environment and Natural Resources of Ukraine, should coordinate their actions for the creation of the so-called „green corridor" along the lower course of the Danube and at the Black Sea coast.

The EU Strategy for the Danube region (EUSDR) aims to boost the development of the region in the direction of promoting culture and tourism and contacts between the peoples.

It is a great challenge to provide for a long term sustainable development regarding both people and nature. This is especially true for the protected areas in the valley of the Danube with their priceless natural resources.

Tourism along the Danube is varied depending on the natural landscape and history. Presently, most tourist activities on the Danube are mainly concentrated on cities and culture, cruises and cycling.

Birdwatching is the main attraction in the Danube Delta.

The task and the challenge of the protected areas is to develop tourist activities related to sustainable regional development so that it can contribute to their management and nature conservation with a particular attention to environmentally sensitive areas.

THE AREA OF THE PIRIN AND THE RHODOPE MOUNTAINS.

Within the territory of Bulgaria and Greece, this region offers particularly valuable places of great importance from a biological viewpoint, as well as recreationally and in terms of culture and history not only for the two countries, but also for Europe and for the world.

This area covers the Maritza delta in Turkey and Greece and the Eastern Rhodopes in Bulgaria in the east, covering the Central and Western Rhodope Mountains located between Bulgaria and Greece, and then the Pirin mountain in Bulgaria, Slavianka, which is both in Bulgaria and in Greece in the west and finally – the Ograzhden Mountain (in Bulgaria and Macedonia) and the Belasitsa mountain in Bulgaria and Greece. Its importance is evident from the fact that it is referred to as a transboundary ecological area of the Common European home.

In the Bulgarian part of the Rhodope Mountains, there are 18 reserves, 26 protected areas and over 30 nature sights and, in the Greek part, there is the Franco reserve of the so-called Virgin Forests as well as numerous nature sights, which are subject to protection.

This approach is entirely in line with the action plan for the protected areas in Europe.

The transboundary mountain areas between Bulgaria and the other Balkan countries are the basis of the so-called Parks for Life of Europe.

The aim is to ensure an adequate and well-managed network of protected areas in Europe in order to conserve the overall landscape and biological diversity of the continent. In order to accomplish this aim, the system of protected areas should be integrated with other spheres of national life, which means that the protected areas have to be included in the national and regional policies of the relevant sectors such as forestry, transport, tourism, etc.

For this purpose, a systemic approach is to be applied in which the so-called populated landscapes are to be given a priority status because of the specific conditions in Bulgaria. They are specific because by the IUCN categorization they belong to the category of protected landscapes, but there are people who live there and they have been used by man for a very long time. These areas help for the conservation of nature, as well as for maintaining the ways of life by serving as models for sustainable use of land. So the management plans are particularly important for these areas.

To sum up, the following conclusions and recommendations can be formulated:

1. The European institutions highly value the nature of Bulgaria and especially its rich biological and landscape diversity, which is of exceptional importance for the European biodiversity.

2. There are important legislative frameworks for nature conservation in the mountainous areas in Bulgaria, which can be developed as a broader institutional basis in Europe and worldwide.

3. The transboundary protected areas are a natural environment, suitable for the development of various alternative forms of tourism.

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SLAVYANKA/ORVILOS AND STARGACH/PERIVLEPTO MOUNTAINS (SOUTHWESTERN BULGARIA/NORTHERN GREECE) – LAND USE, HEMEROBY AND NATURE PRESERVATION ACROSS THE BORDER

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ABSTRACT

This study aims at exploring the features of the local land cover, identifying degree of human impact on landscapes using the hemeroby index and making an overview of the current measures taken in terms of nature preservation in the Slavyanka/Orvilos and Stargach/Perivlepto mountains in Southwestern Bulgaria and Northern Greece. Since these mountains are divided by the Greek-Bulgarian country border, comparisons between the two sections are made in all of the investigated topics areas. Problematic areas are identified and solution recommendations are provided.

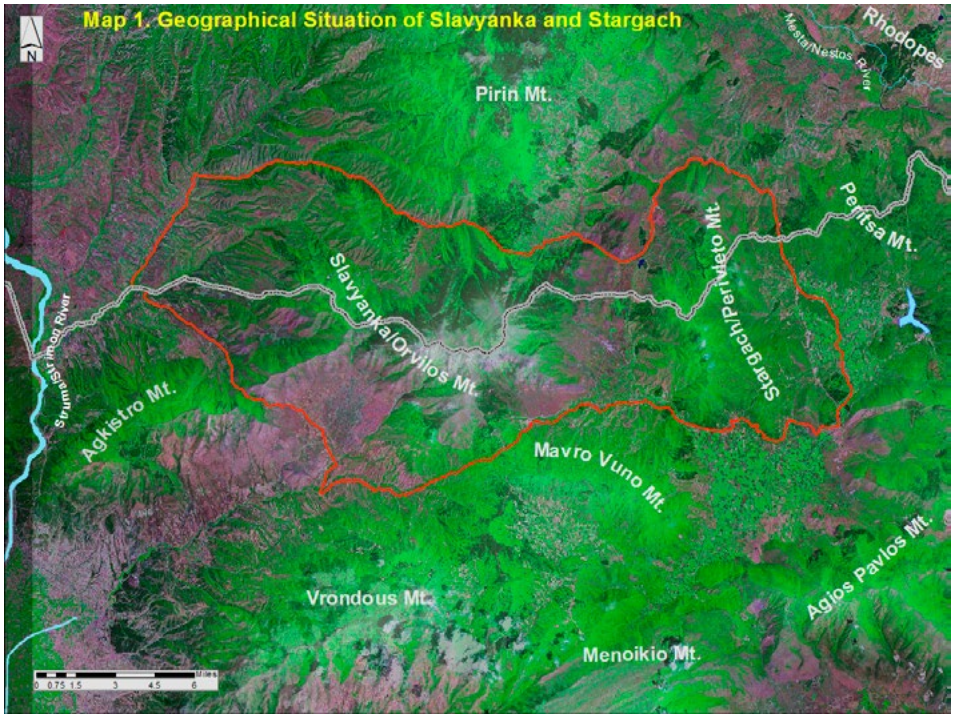
Keywords: *Slavyanka, Orvilos, Stargach, Perivlepto, border, land cover, hemeroby, NATURA2000*

INTRODUCTION

Mountain areas have always been of great interest in geography and environmental sciences. As such areas Slavyanka/Orvilos and Stargach/Perivlepto consist of a wide variety of landscapes, invaluable habitats of rare and endangered species.

Studying the human impact type and level in such areas and the actions taken to regulate, limit and control it are of ever-growing importance to scientists, authorities and local population. These and other stakeholders are challenged with the task of maintaining the environmental balance in mountainous territories, whose impact on the environment usually spreads far beyond their own borders. An additional challenge is at hand, when these areas administratively belong to different countries. Such is the case with the Slavyanka/Orvilos and Stargach/Perivlepto mountains, divided by the Greek-Bulgarian border.

For these reasons the present study has set a few goals: to explore the features of the local land cover, to identify the degree of human impact on these landscapes using the hemeroby index and make an overview of the current measures taken in terms of nature preservation. While achieving these goals the authors will strive to explore the differences and commonalities on both sides of the border and potentially identify problematic topic areas and provide solution recommendations.



Physicogeographical Profile of the Study Territory

The study territory is located in the southern part of the Balkan Peninsula, both in South West Bulgaria and North Central Greece. Its total area is 437km^2, of which 255km^2 belong administratively to Greece and 182km^2 – to Bulgaria. The distance between western- and easternmost points is 39.5km and the maximum meridian distance – 18.5km. The physicogeographical borders of this territory predominantly follow river valleys. In the south these are the rivers Batak dere, Krusovitis, Hasanitsa, Sine and Vatitopou. The eastern border follows the river Milorevma, its right-bank tributary Silironeron

(Greece) and Oreshki dol (Bulgaria). In the North Stargach and Slavyanka are separated from Southern part of Pirin Mountain by the Matnitsa, Burovitsa and Kalimanska rivers valleys, while the western border stretches along the Pirinska Bistritsa river. Slavyanka's saddle-type connections to neighboring mountains are the following: Parilska saddle in the North with Pirin mountain, Kali saddle in the Southwest with Agkitsro (Sengelska) mountain and Beli Preseki saddle in the South with Mavro Vuno (Cherna Gora) mountain; Stargach is connected to Peritsa mountain (Асенов 2013) in the East through the Mitnitsata saddle. Both mountains are divided by the very wide and flat saddle Padarchovitsa/Kambos. Slavyanka/Orvilos' highest point is Gotsev/Tsolias peak (2212mamsl) on the Greek/Bulgarian border and Stargach/Perivlepto's highest point is Strangats/Stargach peak in the Greek part of the mountain. Slavyanka/Orvilos is one of the highest mountains both in Bulgaria and Greece and its relief is mainly low- and middle-mountainous (between 600 and 1600mamsl), but it also has a large high-mountainous part (>1600mamsl). Compared to Slavyanka, Stargach/Perivlepto is way lower in altitude, with a predominantly low-mountainous relief (between 600 and 1000mamsl). In the entire investigated territory only 1.5% are below 200mamsl, 21% in the 200-600mamsl, 50% in 600-1000mamsl, 22% in 1000-1600mamsl and 6% in the >1600mamsl range.

Lithological characteristics of the study territory show that in general Slavyanka and Stargach are very different from each other. The larger part of the Orvilos Mountain is built by carbonate rock formations (marbles), whereas Perivlepto's rock cover consists mainly of silicates (gneisses). Marbles in Slavyanka and northernmost parts of Stargach have created good conditions for karst processes development. Relief formation and surface and underground water flows are strongly influenced by these processes.

The local climate is transitional-mediterranean with a mountain influence in the higher parts of Slavyanka (Енциклопедия Пирински Край 1995), with a stronger mediterranean influence on the south-facing slopes of the mountains.

The high altitude parts of the study territory is covered with Umbrosols and the predominant soil types in the forest zone are (altitude high to low): Mollic Cambisols, Cambisols and Chromic Cambisols. Westernmost lower altitude areas of mainly arable land are covered with Chromic Cambisols and Fluvisols, while the area between both mountains (Padarchovitsa/Kambos saddle) shows following predominant soil types: Rendzic Leptosols, Fluvisols (Танов 1956) and Stagnic Nitisols (Сарафов 2010, Филчева и Сарафов 2014).

From a biogeographical perspective the study territory is located in a transitional area between Europe's Continental and Mediterranean region, while higher altitude parts of the mountains are part of the Alpine biogeographic region (EEA 2011).

METHODS OF STUDY

The authors have used Corine Land Cover data obtained by computer aided visual interpretation of ortho-rectified multispectral satellite images for the year 2000 (EEA 2000). The extraction and analysis of land cover and land use data is performed in GIS environment using ArcGIS 10 software.

The authors have used simple share calculation and comparison methods to show the differences between the two country sections in terms of Corine Land Cover type, landscape hemeroby, NATURA2000 areas and nationally designated areas (CDDA).

To identify the degree of human impact on landscapes the authors have used the hemeroby index. This index was first introduced by the Finnish botanist Jalas (1955), then further developed by German ecologist Sukopp (1976) and successfully applied on CLC-based landscapes in different studies for Germany (Steinhardt et al. 1999, Glawion 2002, Walz & Stein 2014), Austria (Rüdisser et al. 2012), Hungary (Csorba & Szabo 2009) etc. Main purpose of the hemeroby index is to determine the degree and dynamics of human impact on landscape. Degrees of hemeroby are divided into 7 landscape categories: ahemerobe (natural), oligohemerobe (close to natural), mesohemerobe (semi-natural), β-euhemerobe (relatively far from natural), α-euhemerobe (far from natural), polyhemerobe (strange to natural) and metahemerobe (artificial). In the present study hemeroby degrees are assigned to landscapes based on CLC following the nomenclature of Walz & Stein (2014), while a small number of degree assignment corrections are made as exceptions, based on local specifics of the study territory.

LAND COVER FEATURES

Most recent and comprehensive study of the land cover on a European level is EEA's Corine Land Cover (CLC) Programme. It offers a clear classification structure of the Earth surface's cover – the visible part of the landscape. CLC's classification is simplified, well-structured and widely recognized, which makes this data the perfect choice for the basis of the present study. Unfortunately, the latest version of the CLC (dated 2006) data could not be used, because there are no CLC results available for Greece for this year. This makes CLC from year 2000 the latest dataset available for both countries (EEA 2013).

Surface distribution as a share of the entire territory of each land cover type has been calculated for both the Bulgarian and Greek administrative sections of Slavyanka and Stargach, as well as data encompassing only their purely-mountainous territories. Data is presented in Table 1 below. Land cover is shown on Map 2 and a Bulgarian-Greek comparison is made in Chart 1.

Table 1. *Share (%) of Corine Land Cover (CLC) types of different parts of the Slavyanka/Orvilos and Stargach/Perivlepto mountains*

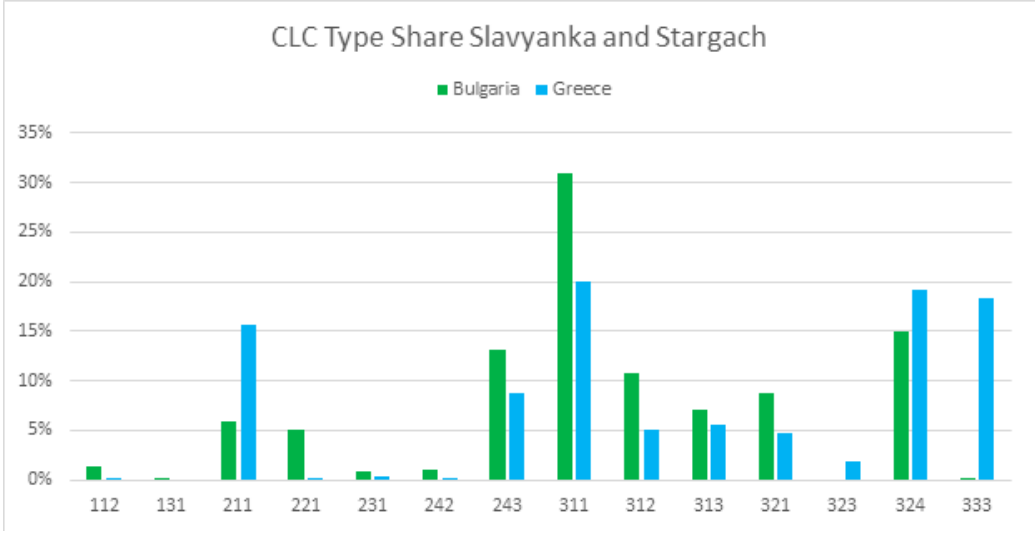
CLC Level 1	CLC Level 2	CLC level 3	BG*	GR*	Ent.*	MO*
1 Artificial surfaces	11 Urban fabric	112 Discontinuous urban fabric	1.4	0.2	0.7	0.2
	13 Mine, dump and construction sites	131 Mineral extraction sites	0.1	-	0.1	0.1
2 Agricultural areas	21 Arable land	211 Non-irrigated arable land	5.9	15.7	11.6	1.7
	22 Permanent crops	221 Vineyards	5	0.1	2.1	-
	23 Pastures	231 Pastures	0.9	0.3	0.6	0.1
	24 Heterogeneous agricultural areas	242 Complex cultivation patterns	1.1	0.1	0.4	0.1
		243 Land principally occupied by agriculture, with significant areas of natural vegetation	13.1	8.8	10.6	6.4

3 Forest and semi natural areas	31 Forests	311 Broad-leaved forest	30.9	20.1	24.6	31.1
		312 Coniferous forest	10.8	5	7.4	10.3
		313 Mixed forest	7	5.6	6.1	8.0
	32 Scrub and/or herbaceous vegetation associations	321 Natural grasslands	8.8	4.8	6.5	6.5
		323 Sclerophyllous vegetation	0	1.8	1.1	0.9
		324 Transitional woodland-shrub	14.9	19.2	17.4	20.5
	33 Open spaces with little or no vegetation	333 Sparsely vegetated areas	0.2	18.4	10.8	14.2

*Abbreviation Key:

BG *– Bulgarian only part of the territory;* ***GR*** *– Greek only part of the territory;* ***Ent.*** *– Entire territory of study;* ***MO*** *– Mountainous relief part only (Assumption: altitude greater than 600mamsl and/or above the upper limit of the mountain foot)*

Chart 1. *CLC type share (%) compared in the Bulgarian and Greek part of the territory being investigated*



Looking at the numbers provided above, a few important conclusions can be drawn, as outlined below.

The distribution of land cover types on CLC Level 1 is comparable in the Bulgarian and Greek part – approximately 1% for (1) "Artificial surfaces", approx. 25% for (2) "Agricultural areas" and approx. 74% for (3) "Forest and semi-natural areas". This is an expected outcome, considering the fact that we are investigating a mountain territory. If we focus on the strictly mountainous relief section, we see that the share of agricultural areas drops significantly there, as the forest one rises, just because calculations for this territory leave out lower-altitude and thus easily accessible areas by humans. For the mountain-only parts the mentioned ratio has the following look – 0.5% / 8% / 91.5%, respectively. In the territory of study there are no Level 1 CLC type (4) "Wetlands" or (5) "Water bodies".

With regards to the CLC sub-levels it is important to focus on the distribution of land cover types within the (3) "Forest and semi-natural areas" category, since it is the predominant land cover type in Orvilos and Perivlepto mountains. The CLC Level 2 type (31) "Forests" spreads over almost 50% of the Bulgarian part of the study area, while the combined share of (32) "Scrub and/or herbaceous vegetation associations" and (33) "Open spaces with little or no vegetation" is 24%. The Greek part, however, offers a very different picture and the above outlined ratio here is 30% to 44%, respectively. It is obvious also from Map 2 and Chart 1 data, that the difference in this regard comes from the CLC type (333) "Sparsely vegetated areas", which covers very insignificant (almost none) areas in the Bulgarian part, whereas its share in the Greek section is almost one fifth.

SPARSELY VEGETATED AREAS IN SOUTHERN ORVILOS

As a matter of fact Orvilos' south slope (333) "Sparsely vegetated areas" type landscape is among the five largest of this type on the Balkan Peninsula, with a surface area of 54km^2. The only 4 larger landscapes of this CLC type are found the the Askio (Sinyak) and Olympus mountains in Northern Greece, the Sinjajevina mountain in Montenegro and on the Gökceada (Imbros) island in the north Aegean Sea, now part of Turkey (EEA 2013).

Such 333-type landscapes are widely dispersed along the entire Balkan Adriatic coastal mountains. Most of them are, however, small in surface area, but many in numbers. Such landscapes are also very typical for the subalpine and alpine zones in the highest mountains and are also predominant for the Anatolian Physicogeographical Region.

These facts are reviewed in order to be able to correctly determine the location factors for the mentioned Orvilos south slope sparsely vegetated landscape. In Orvilos the main landscape-forming factors here are the following:

- Southern slope aspect
- Carbonate rocks (marbles) and karst processes
- Transitional mediterranean climate

Of all the five landscapes mentioned above, four are inland ones (except Gökceada) and all of these four are karst areas, formed on either limestone or marble rocks. The Orvilos one in particular is unique, mainly because of the altitude difference it covers – 600 to 2200mamsl. Its vegetation characteristics are also an indicator of mediterranean climatic

impact – one of the northernmost displays of it in both Greece and Bulgaria.

CLC-based Landscape Hemeroby

In line with the goals set for this study – the degree of human impact on the landscapes of Slavyanka and Stargach is to be investigated. In order to present results in a straightforward manner, the hemeroby index has been chosen. Reasons for this choice were that it has a strong ecological foundation, it is easily interpretable and well received (Борисова и др. 2014, Steinhardt et al. 1999) and has thus become increasingly popular over the past 2 decades.

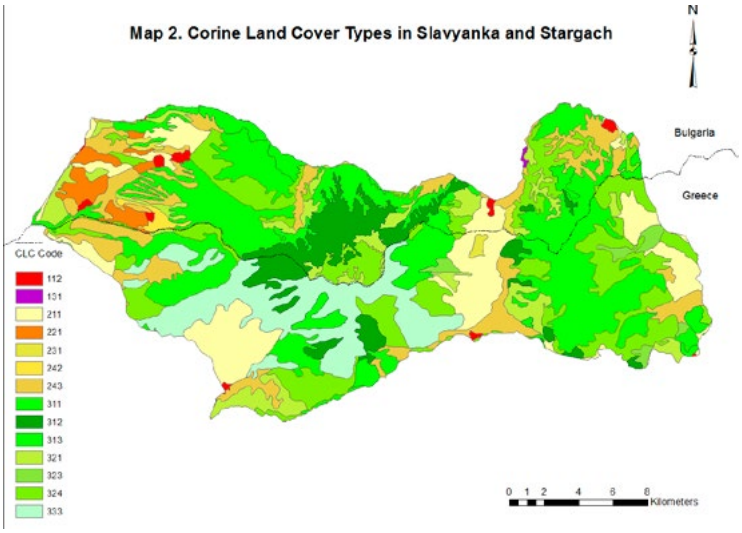
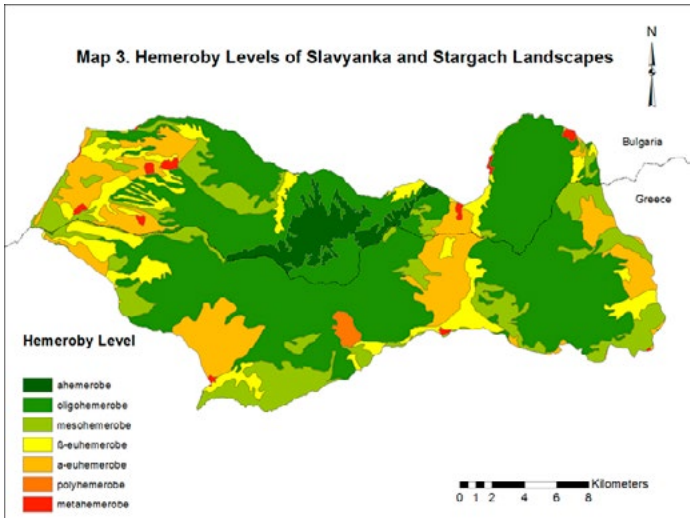


Table 2. *Share (%) of landscapes with different degree of hemeroby in Slavyanka/Orvilos and Stargach/Perivlepto mountains*

Degree of Hemeroby	BG	GR	Ent.
ahemerobe (natural)	10	-	4
oligohemerobe (close to natural)	54	56	55
mesohemerobe (semi-natural)	11	18	15
β-euhemerobe (relatively far from natural)	10	9	10
α-euhemerobe (far from natural)	12	16	14
polyhemerobe (strange to natural)	-	1	1
metahemerobe (artificial)	2	0.1	1

Spatial distribution of landscapes with different hemeroby levels, as outlined in Table 2 and Map 3 is expected, considering the mountainous character of the study territory. Orvilos and Perivlepto are a distant area from both countries' perspective, they are not very well-known by tourists and visitors are there isn't a large number of permanent residents in the settlements. This has a positive impact on landscapes in high parts of the mountains, which are very well preserved and the "Ali Botush" reserve's role on the conservation of Slavyanka's northern slopes has given the authors a strong enough reason to assign to its coniferous forest landscapes the highest possible degree or hemeroby. The low visitor rate and number of residents, however, does not diminish the role, which these people, as well as settlements have on the anthropogenic transformation of landscapes in the lower-altitude parts (mainly territories west of Slavyanka, Paradchovitsa/Kambos saddle, Achladochori valley and east of Stargach). Despite their small share in the whole territory, metahemerobic, polyhemerobic and



euhemerobic landscapes have a multiplied effect on the less-impacted ones. This effect's impact is usually expressed using area-weighted hemeroby (Walz & Stein 2014, Csorba & Szabo 2009) or distance coefficients (Rüdisser et al. 2012). Such calculations are, however, not a focal point of this study.

In general Orvilos and Perivlepto mountains show a low degree of human impact, confirmed by results in Table 2, according to which more than 50% of landscapes are either ahemerobe or oligohemerobe. This is also confirmed by Kitev in his northern slope of Slavyanka study of anthropogenic impacts on landscapes (Kitev 2014).

Greece and Bulgaria show many similarities in terms of spatial distribution of these landscape categories. As seen in Table 2, each hemeroby category has a comparable share in each country's section, the only greater exception being the ahemerobe landscapes, which are found only in the Bulgarian part. In contrast, the Greek part has way fewer artificial (metahemerobe) landscapes, which is an important fact, mainly because of their multiplied effect on neighboring areas (as already described above).

NATURE PRESERVATION

Directly related to the degree of human impact are the actions being taken to preserve natural landscapes and ecosystems. The most significant initiatives in this regard are the European wide NATURA2000 network, as well as each country's network of nationally designated areas (CDDA), see Table 3 and Table 4 below.

Table 3. *NATURA2000 sites in Slavyanka/Orvilos and Stargach/Perivlepto (EEA 2013)*

Site type	Site code	Site name	Area (km2)
Sites of Community Interest (SCI) under the Habitats Directive	BG0000220	Dolna Mesta	0.5
	BG0001028	Sreden Pirin - Alibotush	158
	GR1260005	Koryfes Orous Orvilos	49
Special Protection Areas (SPA) under the Birds Directive	BG0002072	Melnishki Piramidi	5
	BG0002078	Slavyanka	112

Table 4. *Nationally designated areas in Slavyanka/Orvilos and Stargach/Perivlepto (EEA 2014)*

Name	IUCN Category	Type	Year	Area (km2)
Ali Botush	Ia	Strict Nature Reserve	1951	16
Pavliova Padina	VI	Protected Site	1981	1
Achladochoriou sti thesi Kokkala Koinotitas Achladochoriou	IV	Wildlife Refuge	2001	6

The NATURA 2000 network is the fundamental spatial structure in the European Union for environmental conservation and aims to assure the long-term survival of Europe's most valuable species and habitats. The part of Slavyanka and Stargach, located in Bulgaria, is covered by a total of 161km^2 of NATURA sites (88% of Bulgarian section), while the Greek part includes 49km^2 NATURA sites (19% of Greek section). Nationally designated areas cover 9% and 2% of sections, respectively. The largest one of these protected areas – the "Ali Botush" Reserve in the northern slopes of Slavyanka – also has the highest possible protection category, according to the scale of the International Union for Conservation of Nature (IUCN).

While Greece and Bulgaria are among the countries with biggest shares of national territory under NATURA2000 – 27% and 34% respectively (EC 2013), both governments must ensure continuity of trans-boundary NATURA sites, should work towards alignment of assessment criteria and common site maintenance and site control measures. In the Greek-Bulgarian case this is even more important, because the common country border is situated in a transitional climatic and biogeographical zone (EEA 2011).

Uncoordinated approach to NATURA2000 site designation leads to having sites, which end at the national border. Also illogically others only partially cover the same physicogeographical territory on side of the border, while on the other side it is covered in its entirety. Such is the case with Orvilos and Perivlepto. A. Assenov (Асенов 2013), who has worked on the discrepancies between NATURA sites along the Greek-Bulgarian border, recommends that the Bulgarian sites under NATURA in Stargach should be continued on Greek territory. He also underlines the importance of the actions that need to be taken (even potential sanctions for the countries) to revisit the trans-boundary NATURA sites extent in order to avoid limiting habitat types and species populations within administrative borders. Following this logic it should be added as a recommendation, that the GR1260005 "Koryfes Orous Orvilos" SCI site, as well as the BG00002078 "Slavyanka" SPA site should be extended into Greek territory, so that the "network" concept of NATURA2000 is adhered to. This way, following the natural connections, Orvilos' and Perivlepto's protected areas can get closer to or even reach the neighboring GR1260007 "Ori Vrontous – Lailias – Epimikes" SCI, GR1260008 "Koryfes Orous Menoikion – Oros" SCI and GR1260009 "Koilada Timiou Prodromou – Menoikion" SPA sites.

Further steps to increase the level of nature protection in line with, but not limited to above recommendations are reasonable and important considering the fact that the south slopes of Orvilos (near the Beli Preseki saddle, which connects Orvilos with Mavro Vuno) have seen one of the biggest forest losses in the region for the 2000-2012 period, according to data of the Global Forest Change Project (Hansen et al. 2013). Apparently a big forest fire in the year 2000 destroyed approx. 30% of the total 188ha forest cover in the Beli Preseki saddle area.

CONCLUSIONS

The Greek and Bulgarian sections of Slavyanka/Orvilos and Stargach/Perivlepto show relatively big differences in land cover type distribution, which is a result of differences in slope aspect, agricultural practices, population density.

In terms of degree of human impact both country sections show many common features, which is a good foundation for potential aligned approaches to land management and nature conservation. In terms of nature preservation differences are very big and steps must be taken from the authorities to designate new and extend the areas of existing NATURA2000 sites, as well as other nationally designated areas, as recommended in the above chapter.

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SUSTAINABLE DEVELOPMENT ON A SELECTED AREA OF LOW TATRAS NATIONAL PARK – LANDSCAPE VERSUS URBAN PLANNING

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ABSTRACT
The Low Tatras (Nízke Tatry Mts.) National Park is a national park in Central Slovakia, between the Váh River and the Hron River valleys. The area of the national park of 728 km^2 and its buffer zone of 1,102 km^2 makes it the largest national park in Slovakia. The park has excellent conditions for many sports activities, including ski resorts and natural tourist attractions like caves open to the public. The study aims to comprehensively assess and evaluate the impact of tourism development in a selected area - Jasná, a famous resort, on the environment and a proposal for sustainable development of this mountain resorts area to be prepared. Jasná - Low Tatras is the largest ski arena with great conditions for winter sports in Slovakia on the northern and southern side of Chopok. The study is based on an assessment of the current state of the environment and reflects the current conditions in the protected area, on the natural condition of the area, as well as on development plans in the area, which have already been approved or are in the process of being approved under the current legislation (e.g. spatial planning, land use decisions, projects assessed on EIA and SEA). The continued expansion of the resort and the requirements for new buildings create pressures on the environment and the protected areas, where the arena is located. Outcome of the assessment of the natural and anthropogenic risks in the study area is its zonation, the proposal for optimal land use of each zone and its management.

Keywords: *protected area and natural resources, landscape ecological regionalization, optimal land use*

DETERMINING THE LANDSCAPE SENSITIVITY IN A MOUNTAINOUS REGION: CASE STUDY ON FRUSKA GORA (SERBIA)

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Abstract: The Sensitivity of a landscape to an imposed environmental change mostly depends on climatic and topographic characteristics and soil properties. Although this concept of landscape sensitivity is known in the literature, attempts to quantify an index of sensitivity are still rare. Objective of this study is to identify the key factors for determining the landscape sensitivity in a mountainous region with different land management practices. For this purpose the Fruska Gora Mountain, located in northern Serbia and covering an area of approximately 500 km2, was chosen. This mountain has an elliptical shape in the east-west direction with a longer axis around 78 km, greatest width of around 15 km and the highest peak of 538 m. The forests on Fruska Gora used to cover an area of 113.000 ha until World War II, while now only 25.000 ha is a forested area. Over this period, the land use type has changed in many parts of this mountain and now besides forests, there are agricultural land, vineyards, pastures and urban areas. In order to determine the key factors influencing the landscape sensitivity under the same climatic conditions, hillslopes with a range of inclinations, developed on different geological material and with different vegetation cover were selected. On each hillslope the following characteristics were determined: slope length, inclination and aspect, soil depth, type of vegetation (Carpinion betuli illyrico-moesiacum and Tilio-Fagetum submontanum). Soil samples were collected from each hillslope from three positions: at the top of the hillslope, in the middle of the hillslope and at the bottom of the hillslope. On all samples the textural characteristics, particularly the percentage of the clay size fraction, the content of organic matter and C, the aggregate stability, the composition and richness of the ground flora were determined. The results obtained indicate that besides climate and topography, a key issue for determining the landscape sensitivity is also the geological setting and some physical, chemical and biological properties of the hillslope.

Keywords: *landscape sensitivity, mountains, land use change, geological setting, vegetation type*

THE RELATIONSHIP BETWEEN RAINFALLS AND LANDSLIDE ACTIVITY: A CASE STUDY OF GENERAL GESHEVO LANDSLIDE, EAST RHODOPE MTS., BULGARIA

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ABSTRACT

Bulgaria's territory is largely affected by dangerous slope processes that exposed to risks human lives, settlements, economic activities and the transport network. Therefore, the study of these phenomena is extremely important to determine their mechanism, velocities and triggering factors. In the Rhodope mountain region, some of the biggest and deep landslides are distributed. Most of them are not known at all or are not sufficiently investigated. Their periodic activations often lead to interruption of roads and communications, isolation of towns, damages to buildings, and other effects. Cyclical activation of landslide processes has posed the question on the relationship between rainfall and landslide activity. To solve the task we have used the data from the 3D monitoring with extensometers TM-71 and rainfall data from the meteorological stations located in the town of Kardzhali and in the village of General Geshevo. Movements in the periphery of landslides at the village of General Geshevo and in the neighborhood of Chakartsi show velocities in the range of 0.43 to 4.25 mm per year. Inside the landslide speeds are higher, but the values are difficult to be established due to the compensatory nature of the movements. Sharp displacements exceeding 90 mm are have been established.

Keywords: *landslides, precipitation, Eastern Rhodopes, monitoring*

INTRODUCTION

The Eastern Rhodope Mountain is one of the most affected areas in Bulgaria by landslides activity. The deepest landslides in our country have occurred there. Such is the case with the landslide at the village of General Geshevo. This landslide is one of the largest landslides for the last 25 years on the territory of Bulgaria. The engineering geological interest in the landslides in this area has greatly increased since 1995, when the vast deep-seated landslide triggered between the villages of Zhaladovo and General Geshevo along the road Djebel-Zlatograd. The increasing of the landslide movements in the spring of 1997 and winter of 2001 caused a collapse of a 1.5 km road length.

A key influence on the landslide activity is the impact of the changing conditions of the groundwater as a result of rainfall patterns (Bromhead at al., 1998). Cyclical activation of landslide processes poses the question about the relationship with precipitation.

The present study summarises the results of the 3D monitoring and the meteorological station model Matrix WS-2300 installed in the town hall of General Geshevo for the period from 2010 through 2013. The results are important for clarifying the role of groundwater for landslide processes activation.

LOCATION AND GEOMORPHOLOGY

The study area is located in Southern Bulgaria (Figure 1), 10 km southwest of the town of Djebel and 11.5 km northeast of the town of Zlatograd.

Figure1. *Situation of the research area*

From a geomorphological point of view, the studied area is situated in the western parts of the East morphostructural area. The contemporary morphological appearance of the area is a result of complex interactions of horizontal and vertical

movements, dominated in the recent neotectonic stage and directly related erosive denudation processes. The relief in the area is low mountainous (at an altitude from 600 to 1000 m). The area affected by landslides is located in the south-eastern slopes of a local hill with gradients of slopes from 5 to 20°. In it several flows mapping the river Ereklideresi are formed.

GEOLOGICAL AND TECTONIC CONDITIONS

Geology in the area is represented by Precambrian metamorphic complexes and Paleogene sedimentary and effusive rocks. Metamorphic complexes are represented mainly by amphibolites, gneisses, schists, quartzites and marbles. A Precambrian rock complex is slit and covered by volcanic and terrigenous materials in the Paleogenic (Oligocene) age (Goranov, 1960; Goranov al., 1960; Kozhuharov, Boyanov, 1995, Boyanov et al., 1960; Yanev, 1992; and others.). Paleogene materials are divided into several formations, represented by terrigenous and pyroclastic materials. Sediments are represented by conglomerates, sandstones, clays and limestone. As a result of active volcanic activity, lava flow layers, domes of rhyolite, andesite, latites and their tuffs are formed.

In a more detailed plan the researched site is located within the so-called Dzhebel area, covering mainly the so-called Dzhebel depression built by tuff-sedimentary rocks. On the metamorphics there are big coarse conglomerates, which cut off in small granular materials and laminated tuffs with layers of tuff organogenic limestones. The series of laminated tuffs is widespread and in the north continues outside the limits of the depression. Between the great dislocation between the villages of Preseka and Plazishte there is a series of so called "Dzhebel sandstones". The latter are various gritty and poorly cemented with clay and tuffs classes. The total maximum thickness of the series is about 170 m. In the southern part of the region they are located on sandstone and limestone tuffs. The West Dzhebel sandstones are torn and covered by rhyolite (the height Ustra), and in the east - from andesite basalt. Quaternary deposits are less prevalent. In river valleys gravels and sands are represented. On some of the slopes sandy loam delluvial material is met. By tectonic perspective, the studied area is situated on the border between the Rila-Rhodope Mountains in the Moravian-Rhodope area. According to Sarov and others (2002), the studied area is located on the border between the eastern parts of the Central Rhodope extensional structure and the Central Rhodope metamorphic core complex (by Ivanov et al., 2000).

WEATHER CONDITIONS

The studied area is imposed by impact from the Mediterranean climatic zone, which is particularly developed in the river valleys due to the invasion of warm air masses from the south. The differences in height of the terrain and the air currents determine the differences in the precipitation and the temperatures of the different regions (Tishkov, 1967). The low mountainous relief determines temperature inversions in the studied area.

To clarify the climatic conditions in the surveyed area in June 2010 in the mayoralty of General Geshevo a weather station model Matrix WS-2300, a product of TFA Dostmann GmbH & Co. KG - Germany was installed. In order to determine the amount of precipitation the weather station is programmed to take twice daily reports, in the morning and in the evening, in the time range 9:00-11:00 a.m. and 9:00-11:00 p.m.. The maximum amount of precipitation was established in June 2010 and the minimum in November 2011 (Figure 2).

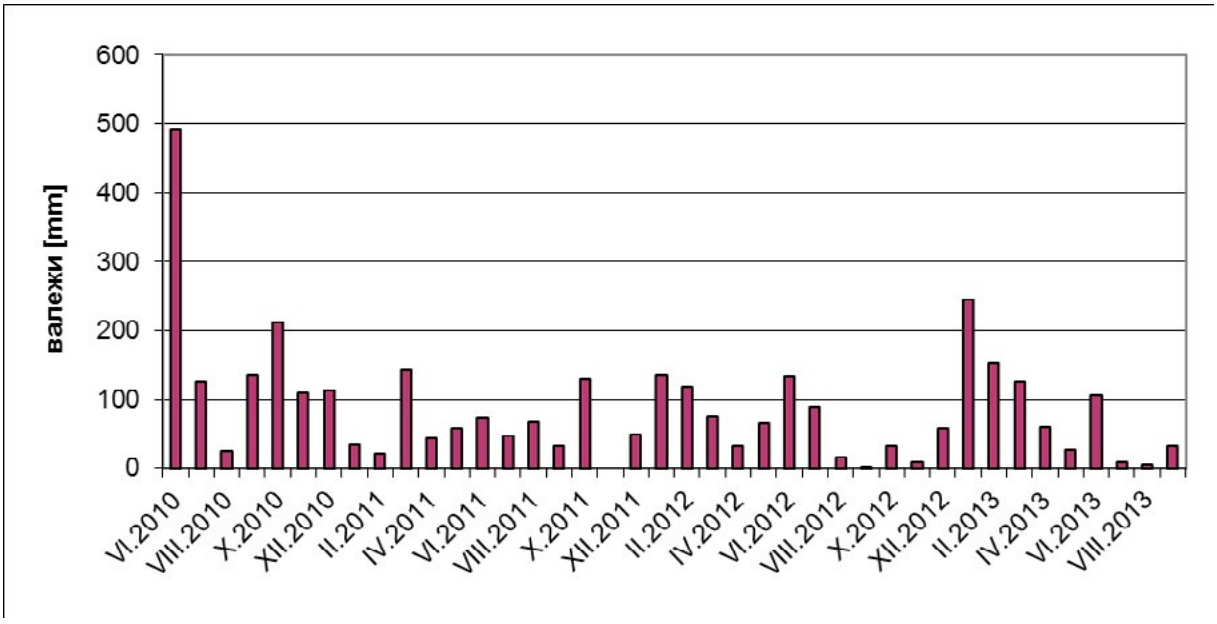

Figure2. *Graph of the average monthly amount of precipitation in the period 06.2010 - 09.2013*

The average monthly temperatures for the period from June 2010 to September 2013 are shown in Figure 3. Average minimum temperature measurement periods are recorded in January and February. Maximum temperatures occur in July and August (Figure 3).

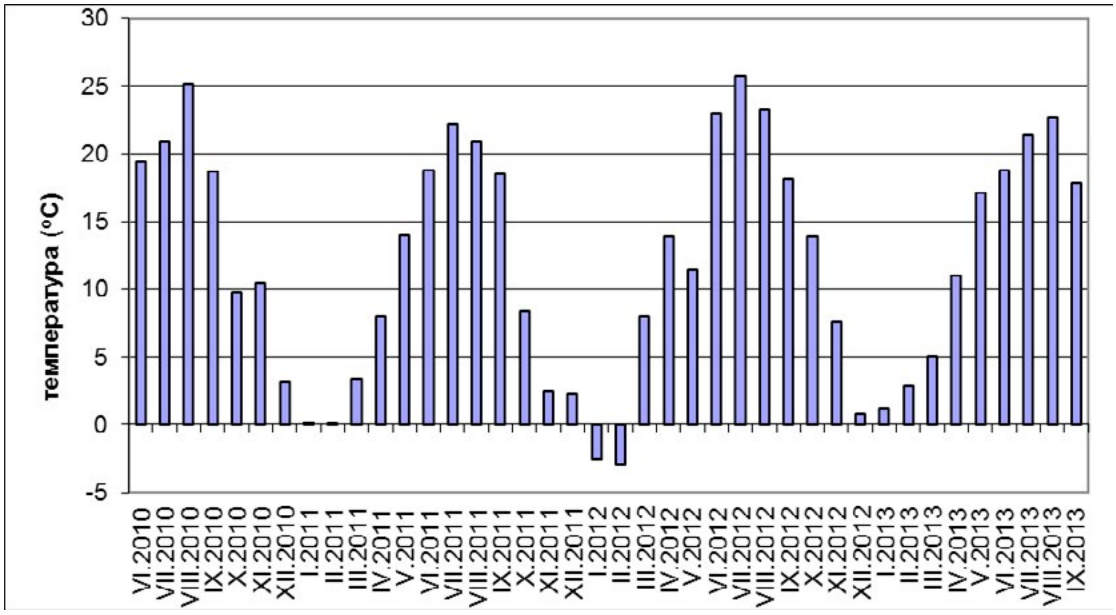

Figure 3. *Graph of the average monthly air temperature in the period 06.2010-09.2013*

3D MONITORING

Sometimes decades of continuous measurements are necessary in order the accumulated information the permissible error of reporting to be exceeded. For this reason a monitoring mechanic-optical extensometer TM71 (Czech production - patent of prof. Kostak) was chosen, in which this risk is reduced to a minimum (Kostak, 1991).

The device enables direct (in situ) reporting of movements in the three spatial axes X, Y and Z. The measuring range is 25 mm. The device works on the principle of mechanic-optical interference and the related Moire. Detailed description of the apparatus and its operation is made by Kostak (1991). Movements in the three axes are calculated by trigonometric formulas. The device allows periodically resetting after the accumulation of large amounts of displacements. The registration of movements is carried out at regular intervals depending on the dynamics of the observed process.

TM-71 is effectively applicable to the measurement of movements in dam-break violations and cracks of different origin (landslide, tectonic, in buildings and civil engineering structures, etc.), not wider than 4 m. The accuracy of the device ranges from 0.001 to 0.01 mm depending on the width of the crack (area), the length of the installation brackets and exposure of the device to direct weathering as sunshine, rainfall and others. (Kostak, 1991). Daily and seasonal temperature fluctuations affect the readings of the device especially when the axes coincide with the directions of the consoles. For this reason, the mathematical treatment of the results is temperature correction of the measured displacements.

In July 2003, an extensometer GG11 was installed in the fracture zone, disclosed during the biggest landslide in 2001. The monitoring point is located about 20 m behind the main landslide slope (Krustanov al., 2010). In May 2010, a second extensometer J13 was installed at 500 m northeast of the locality of Chakartsi. The data obtained from the extensometers is shown in Figures 4 and 5.

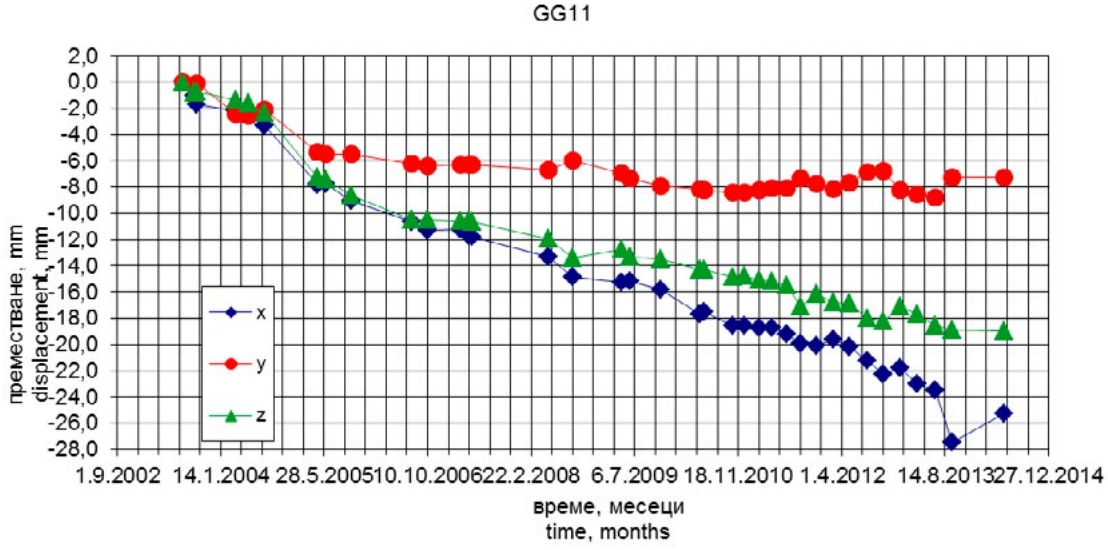

Figure 4. *Graph of movement established in the post TM-71 (GG11) for the period from 2003 to 2014: + X - extension of the crack; + Y - landslide foot towards SE; + Z - subsidence landslide foot.*

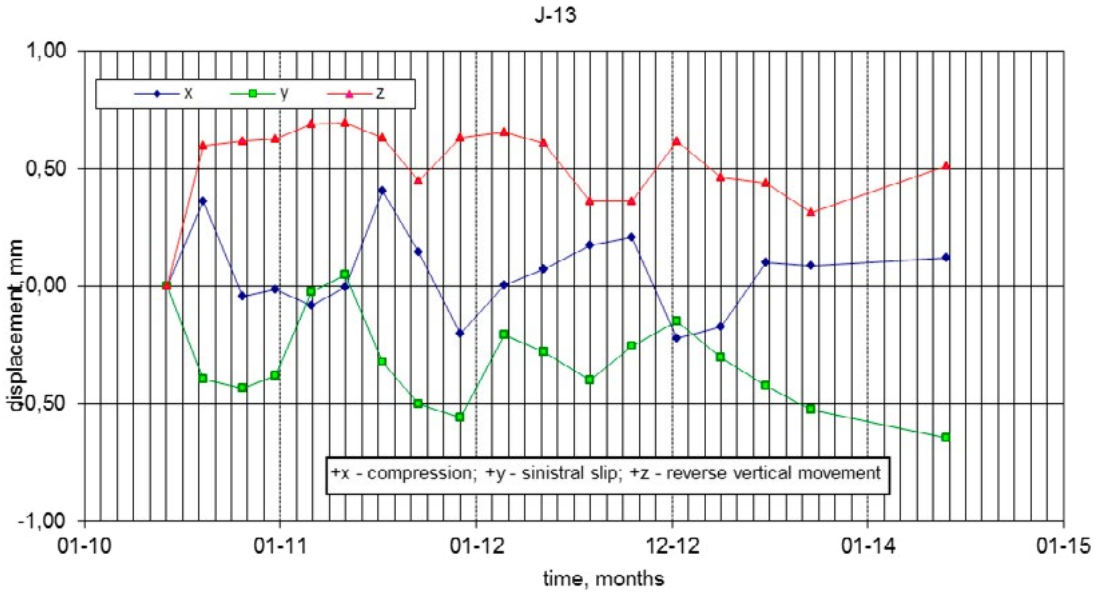

Figure 5. *Graph of the movement established in the post-71 TM (GG 11) 2010-2014: +X – compression; +Y – sinistral slip; +Z – reverse vertical movement.*

RESULTS

Clarifying the relationship between the precipitation and the movement of earth and rock in the landslide area makes possible to do a comparison of the data provided from the extensometer and the weather station. Rainfall and traffic are given in the table below (Table 1).

Table 1. *Average data from precipitation and recorded displacements*

Age		2010	2011	2012	2013
Precipitation	mm	1211.5	697.8	761.4	760.5
GG11	X, mm	-2.695	-1.592	-1.661	-3.478
	Y, mm	-0.426	0.607	-0.456	0.924
	Z, mm	-1.327	-1.325	-0.979	-1.894
J13	X, mm	-0.015	-0.188	-0.017	0.341
	Y, mm	-0.380	-0.179	0.410	-0.499
	Z, mm	0.624	0.006	-0.012	-0.105

The table shows that the largest displacement was found by the extensometer GG 11 along the "X" in 2013, and the least one moving along the axis "Z" in 2011 - by the extensometer J 13. With regard to precipitation the rainiest year was 2010, and the least amount of precipitation fell in 2011.

CONCLUSION

On the basis of the monitoring carried out and the analysis of the data, the following conclusions can be drawn: From the data obtained it is not possible a direct link between rainfall and the movement on the individual axes to be made. Although the minimum recorded movements took place in the least rainy year, the reported maximum displacement did not occur in the rainiest year.

We believe that the reason for this ambiguous link between the different movements and precipitation on one hand is the duration period of the landslides which has lasted for more than 20 years and the good drain of the pitch on the other, as the infiltrated precipitation accumulates in the formed landslide lakes or is discharged in deep river gullies.

To establish a definite link between landslide movements and precipitation in the study area a regime of long series of observations is required.

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II. MOUNTAIN ECOLOGY AND PROTECTED AREAS

ECOLOGICAL AND GEOCHEMICAL MONITORING OF THE CATCHEMENT AREA OF THE BELAYA RIVER IN THE CAUCASUS STATE NATURE BIOSPHERE RESERVE

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ABSTRACT

The chemistry of natural waters is one of the dynamic indicators in the ecological-geochemical monitoring in the context of climate change and the increase of anthropogenic influence. Water River Belaya is the main source of water supply for the population living in this part of the Republic of Adygea. The River Belaya originates in the Caucasian reserve. Long-time geochemical observations of the river water in the Belaya basin determine their stability. However, the high activity of the exogenous processes in the mountain landscapes of the Caucasus Nature Reserve causes changes in the composition of river waters (landslides, 2012).

Keywords: environmental and geochemical monitoring, the Belaya River, the catastrophic landslides, the salt content, the analysis of the trace elements composition.

INTRODUCTION

The catchment area of the Belaya River is an important natural object of socio-economic development of the Republic of Adygeya. The Belaya River is the second longest and the water-bearing left tributary of the Kuban River. It originates on the slopes of the Fisht–Oshten Mountains in the Caucasus State Nature Biosphere Reserve. The catchment area of the Belaya River in the Caucasus State Nature Biosphere Reserve occupies a large area and includes a core area, a buffer zone, and a transition (cooperation) zone. Reserve areas contribute to the conservation of the resources of clean water. The Belaya River catchment area includes 29 glaciers, totalling up to 7.6 km^2 (The website of…). They are potential reserves of fresh water of drinking quality.

The Belaya River feeding sources are precipitation, including rain and snow, groundwater, and mountain snow and glaciers. Spring-summer floods are typical of the Belaya River and are caused by intensive snow and glacier melting. However, sharp rises of the water level sometimes occur in the autumn and even in winter. It is usually related to abundant rainfall in the catchment area. The peak flow usually occurs in late May or early June. Minimum water levels are observed in the winter.

The Belaya River runs through all the altitudinal landscape zones. Sourcing in the Alpine meadows, it runs through the mountain forest zone, which is a large part of its upper and middle watercourses. The Belaya River has created a canyon-like deep valley with steep slopes in hard rocks, while the river valley becomes wide and forms terraces in loose clay sediments.

The valley of the Belaya River is quite densely populated. The major inhabited areas are the city of Maykop, the capital of the Republic of Adygeya, the city of Belorechensk, the towns of Kamennomostsky and Tulsky. The water use of the Belaya River as a source of drinking and industrial water requires constant monitoring of its water quality (Tah, 2007). The quality of surface water can be used as a dynamic indicator for environmental and geochemical monitoring.

RESEARCH FINDINGS

Long-term geochemical studies of the main course of the Belaya River and its major tributaries within the Reserve and in the inhabited area have shown stability of the natural surface water (Table 1). Water samples have been taken from the source of the river to its outlet to the plain and in the outlets of the major tributaries.

Table 1. *PH and the water salt content of the Belaya River and its major tributaries*

Date of sampling	Place of sampling	pH	Mineralization of the water, mg/l
2004, April	r. Belaya, v. Guzeripl	7,6	26
	r. Belaya, below tr.Zhelobnaya	7,5	46
	r. Belaya, below tr. Kisha	7,8	29
	tr. Bziha	7,5	30
	tr. Sjuk	7,7	53
	tr. Dah	7,9	67
	r. Belaya, Maykop	7,9	66
2004, May	tr.Zhelobnaya	8,0	50
2004, August	glacier Fisht	6,3	15

	r. Belaya, the source of the river	6,5	35
	tr. Kurdjips, the source of the river	6,9	86
2008, August	r. Belaya, below v. Guzeripl	7,0	51
	tr.Zhelobnaya	7,4	143
2012, May	r. Belaya, v. Guzeripl	8,1	65
2012, September	r. Belaya, Maykop	7,8	75
2013, October	r. Belaya, Maykop	7,8	160
2014, September	r. Belaya, Maykop	7,5	160

In general, the salt content of the Belaya River varies from hydrocarbonate magnesium-calcium to hydrocarbonate calcium on the way from the source to the outlet to the foothill plain. PH is characterized by neutral to slightly alkaline reaction. The salt content increases usually from the source to the mouth. The left tributaries of the Belaya River make the salt content higher by draining loose sediments and carbonate deposits of the lowlands.

In the winter of 2011–2012, a great catastrophic landslide occurred in the area of the upper Belaya River, which originates on the snow slopes of Mount Fisht (2867 m) and Mount Oshten (2804 m). It enriched the river water with fine particles. The survey of the Oshten foot made by the Research Department of the Reserve and the Institute of Geography of the Russian Academy of Sciences in the fall of 2012 showed that main soil movements had occurred on the eastern slope of the upper part of Mount Guzeripl (Figure1), southeast of Mount Oshten, at the altitudes of 2000–2100 m above sea level.

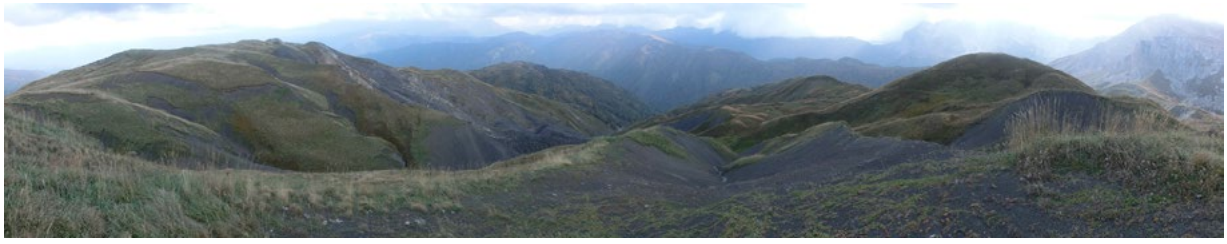

Figure 1. *Mount Guzeripl, 2012*

Mount Guzeripl is composed of metamorphic schist, strongly weathered where exposed, and covered with Jurassic clay and limestone deposits.

The upper slopes of the mount are step-like that is the cause of numerous movements and landslides (Figure 2).

Figure 2. *Numerous cracks along the slopes of the mount Guzeripl, 2012*

The crests of crystalline rocks have longitudinal location, while the present-day cracks of landslides are transverse to the extension of shale, exposing sliding surfaces almost from the top to the foot of slopes, which reach 70°. It was found during the survey that this landslide-debris process is virtually continuous. It was confirmed by new landslide masses discovered as well.

Groundwater discharges and rainfall in the Fisht-Oshten Mountain Massif make the landslide process stronger. Helicopter photography revealed a crash that had apparently happened several times and resulted in the complete block of the Belaya River tributaries Mutny Teplyak and Armyanka.

The catastrophic landslides of 2012 at Mount Guzeripl caused by earthquake and subsequent heavy rainfall has changed the physical properties (sharp increase of turbidity, darker water colour due to washing out carbonaceous black

shale rocks) and the chemical composition of the water to hydrocarbonate–calcium with a high content of silicates, iron and, lithogenic elements.

The water composition of the Belaya River has become worse for several years. The leaching regime of soil and loose sediments contributed to the removal of suspended sediments (Figure 3).

Figure 3. *The valley of the Belaya River after the catastrophic landslides, 2012*

The content of silicates and lithogenic elements was very high at the time of the disaster but the settling process quickly ended. The removal of organic matter is still going on. There are changes in the ionic composition of the water with an overall increase downstream.

Currently, the chemical composition of the water (ICP MS Method, device Elan6100) of the lower Belaya River is again hydrocarbonate magnesium-calcium but the concentration of the elements is up to 5–8 times greater (Table 2).

Table 2. *The content of chemical elements in the Belaya River, ppb*

		C	Al	Si	Na	Mg	K	Ca	Sr
	Clark river water		50	6500	6300	4100	2300	15000	70
2004	r. Belaya, Guzeripl, h=665, 4 m		0	1920	2740	5110	800	9060	19
2004	r. Belaya, Maykop, h=220 m		30	3150	1390	2000	320	14440	32
2008	r. Belaya, h= 430 m	12118	2	710	1968	3068	670	14854	49
2012	r. Belaya, Guzeripl, h=665, 4 m	84331	**9715***	5529	**8155**	**9506**	**3358**	**18159**	**87**
2012	r. Belaya, h= 430 m	89693	**2163**	2483	5521	**11524**	1821	**22806**	**113**
2013	r. Belaya, Maykop, h=220 m	140317	30	1724	**8825**	**17944**	**16563**	**37369**	**216**
2014	r. Belaya, Maykop, h=220 m	92968	31	1474	**7517**	**16687**	1474	**42683**	**242**

** Red font is selected exceedance, black - values above the average content in the rivers of the world.*

The analysis of the trace elements composition of the Belaya River during the catastrophic landslides also showed significant changes in the content of some elements (Figure 4).

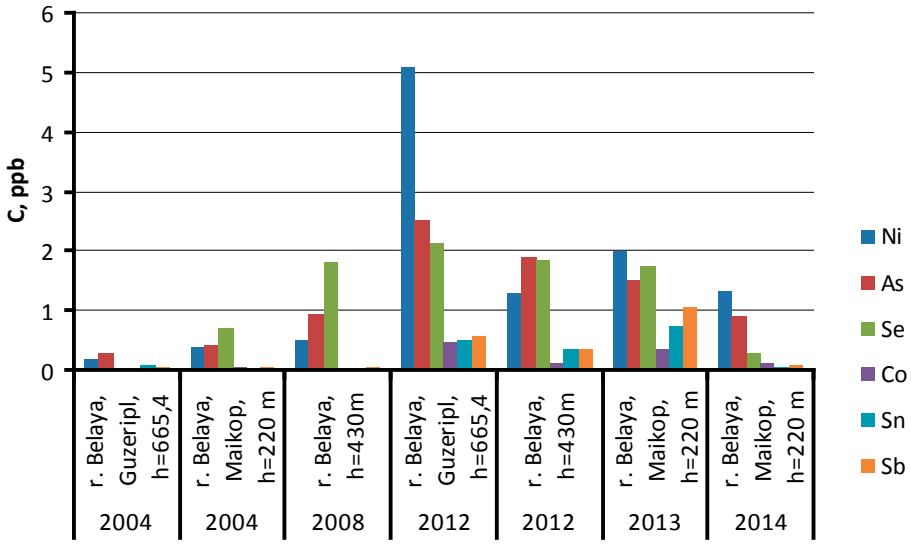

Figure 4. *The dynamics of change in the elemental composition of the Belaya river*

The contents of Fe, Co, Ni, V, Ti, Se, Br, Sn by increased as much as one to two orders. The environmental and geochemical monitoring of the Belaya River showed that the content of many trace elements in the water significantly decreased (Table 3). This indicates that the water gradually becomes cleaner.

Table 3. *The content of trace elements in the Belaya River, ppb*

		Ti	V	Fe	Co	Ni	As	Se	Br	Sn	Sb
	Clark river water	**3**	**0.9**	**40**	**0.1**	**0.3**	**2**	**0.06**	**20**	**0.04**	**0.07**
2004	r. Belaya, Guzeripl, h=665, 4 m	1.31	0.54	20	0.02	0.20	0.3			0.11	0.06
2004	r. Belaya, Maykop, h=220 m	1.59	0.69	10	0.05	0.40	0.44	0.7			0.06
2008	r. Belaya, h= 430 m	20.37*	0.85	95.19	0.03	0.52	0.94	1.82	31.70	0.01	0.08
2012	r. Belaya, Guzeripl, h=665, 4 m	66.42	10.48	1076.43	0.49	5.10	2.51	2.15	623.72	0.53	0.59
2012	r. Belaya, h= 430 m	40.53	3.68	334.17	0.14	1.30	1.91	1.84	713.76	0.36	0.34
2013	r. Belaya, Maykop, h=220 m	31.28	1.72	1884.96	0.36	2.02	1.52	1.76	198.30	0.75	1.07
2014	r. Belaya, Maykop, h=220 m	51.53	0.22	335.09	0.11	1.34	0.90	0.29	59.13	0.05	0.11

**Bold values above MAC*

The dosimetry of soil, exposed bedrock, landslide material, present-day river sediments, and silt does not reveal any excess in the background values.

Thus, very active exogenous processes affecting the geochemical condition of the landscape are characteristic of mountain landscapes of the Caucasus Nature Reserve. The chemical composition of natural water is an important indicator of the dynamics of processes in landscapes at changing climate and increasing human impact. The survey of the environmental and geochemical state of mountain landscapes is particularly relevant in densely populated areas. This knowledge is necessary because it determines the quality of the human environment.

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PLAN FOR PROTECTION PART OF THE DINARIDES IN BOSNIA AND HERZEGOVINA – KARST PHENOMENON IN FUNCTION OF SUSTAINABLE DEVELOPMENT

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ABSTRACT

In this study, we will give a plan of potential protection some of the most important natural values of mountain and high mountain areas in the Dinarides of Bosnia and Herzegovina. Dinaric karst of the investigated area is an integral part of the classical Dinarides karst, which extends from Italy (Trieste karst) to Albania (Prokletije) including significant parts of Slovenia, Croatia, Bosnia and Herzegovina, Montenegro and a smaller part of Serbia.

Most of the territory of Bosnia and Herzegovina belongs to the Dinaric mountain range as an integral part of the Mediterranean area of younger range mountains. The Dinarides of Bosnia and Herzegovina are divided into the External, Central and Internal Dinarides. As a region, the External Dinarides are closest to the Adriatic, being presented by thick-layered carbonates, and having the most intense karstification process with all its karst formations, both with endokarst and exokarst ones. The Central Dinarides are the highest in hypsometric terms, and they are separated from the Central Dinarides by an ophiolitic belt predominantly built of igneous and metamorphic rocks. Basically, the External Dinarides are representing holo karst and the other ones the combination of holo karst and mero karst in different variations.

The karst phenomenon in this area (particularly refers to the External Dinarides of the researched area) represents the greatest natural value and significant protection of certain locations in this area is planned. This plan and the potential protection of certain localities have a direct function in sustainable development of this area especially if we know that this has always been a scarcely inhabited and inhospitable area. Especially rejoices the fact that the serial nomination of the Dinaric Karst on the World Heritage List of UNESCO with making Tentative lists and nomination file in a joint project of all states that participate in this study area is planned.

Keywords: *Bosnia and Herzegovina, Dinarides, mountainous areas, karst phenomenon, plan of protection, sustainable development*

INTRODUCTION

The Dinarides mountain range is one of the most significant mountain morphostructures in Europe, especially in the region of Southern Europe. The Dinarides mountain system covers most of the western zone of a young mountain chain of Alpine orogen. The Dinarides are stretching from the pediments of the Julijan Alps (Slovenia) to the lower course of the river Sava (Serbia), the Skadarsko Lake (Montenegro-Albania), Metohija and Kosovo where the border to Prokletije (Albania) and the Šar mountain system (Macedonia) runs. The length of the Dinarides is about 700 km with significant variations in morphology and morphometry.

The first known researches in the world of karst, karst landform and karst hydrography were started at the area of the Dinarides (region Kras). Today that is an area which cover parts of Italy (the Trieste karst area), significant parts of Slovenia, about 50 % (ground) area of Croatia, over 50 % area of Bosnia and Herzegovina, most parts of Montenegro and smaller parts of Serbia (SW part) and Albania (furthermost north) known in the world by the name "classic karst" and on it a karst landform of moderate climate areas reached its maximum in shaping and development. The area of dinaric karst can be divided in two big morphological units: south zone of deep karst (holokarst), or the External Dinarides (with thick layered carbonate rocks) and northern shallow zone (merokarst), or the Internal Dinarides.

Today the tendencies of increasing space under protection (all levels of protection) in the European Union and in the world have implication on this space. This is a unique area on the territory of several countries in which the karst phenomenon has reached its maximum and because of that there is a need for a systematic plan for protection. Exactly that plan of serial nomination of the Dinarides karst to the UNESCO World heritage list is one of the best ways of protection and valorisation of individual areas in the Dinarides. This project is implemented by the authorities and experts of countries that have parts of the Dinaric mountain area with the help of experts from UNESCO. It should be emphasized that this project is explicitly thought about protection of unique karst area of the Dinarides which covers the area of several countries (by the order from NW to SE) - Italy, Slovenia, Bosnia and Herzegovina, Serbia, Montenegro and Albania.

DATA AND METHODS

Expert teams from the countries that are included in this project of Serial nomination of the Dinarides karst to the UNESCO World heritage list and the tentative list making, have made valorisation of the Dinarides karst, based on their previous researches and the available data. The same applies to the authors of this paper, who have selected the most valuable and representative places under protection, based on different methods, according to the law in Bosnia &

Herzegovina. These specified areas represent foundations for future forms of protecting objects and areas in the sphere of the research. With the help of geographic analysis and synthesis, areas that are more representative than others have been selected, which is presented by cartographic methods. A compilation geographic method is used for coordination with the plans for protection in other countries. Other important things that we must not forget are terrain researches and the GIS method that is used in the cartographic method.

RESEARCH FINDINGS AND DISCUSSION

The Dinarides

The Dinarides mountain system covers most of the western zone of a younger chain mountain of the Alpean orogen which is the widest in the area of Bosnia and Herzegovina. The Dinarides spread from the pediment area of the Julian Alps (Slovenia), to the lower course of the river Sava (Serbia), the Skadarsko lake (Montenegro – Albania), Metohija and Kosovo, where the border to Prokletije (Albania) and the Šar mountain system (Macedonia) runs. The Dinarides border towards the Alps is presented by the fault on the line Jesenice-Velenje-Varaždin, while the south-west border is presented by the Adriatic islands and the coastline (Petrović and Petrović, 1997). The Dinarides spreading course (NW-SE) is referred to as the Dinarides and this name is used in the scientific literature of the region, spreading from the Karavanki (Slovenia) to Prokletija (Albania), from Adria to the Peć dislocation zone (Ahmetbegović, 2012). The length of the Dinarides is approximately 700 km with significant variations in morphology and morphometry. In the North West the Dinarides are most narrow along the line Novi Vinodolski-Ogulin (around 35 km), while in the South East they widen and spread on approximately 300 km (on the line Dubrovnik – the lower valley of the River Sava). In this area, the Dinarides are 2650 meters high, which is the maximum height in the whole system. Morphologically, the research area is lowering towards the Adriatic sea whereas the lowering towards the Panonic basin is gradual, and formed like natural stairs (morphologically expressed piedmont area stairs). Because of that, the Dinarides have an asymmetric profile with a morphologic divide towards the Adriatic pool, which conditions bigger terrain movement towards the Black sea (the River Sava) than towards the Adriatic. The Dinarides mountain system has an explicit chain character with long mountain chains which spread in a parallel way to the Adriatic coastline.

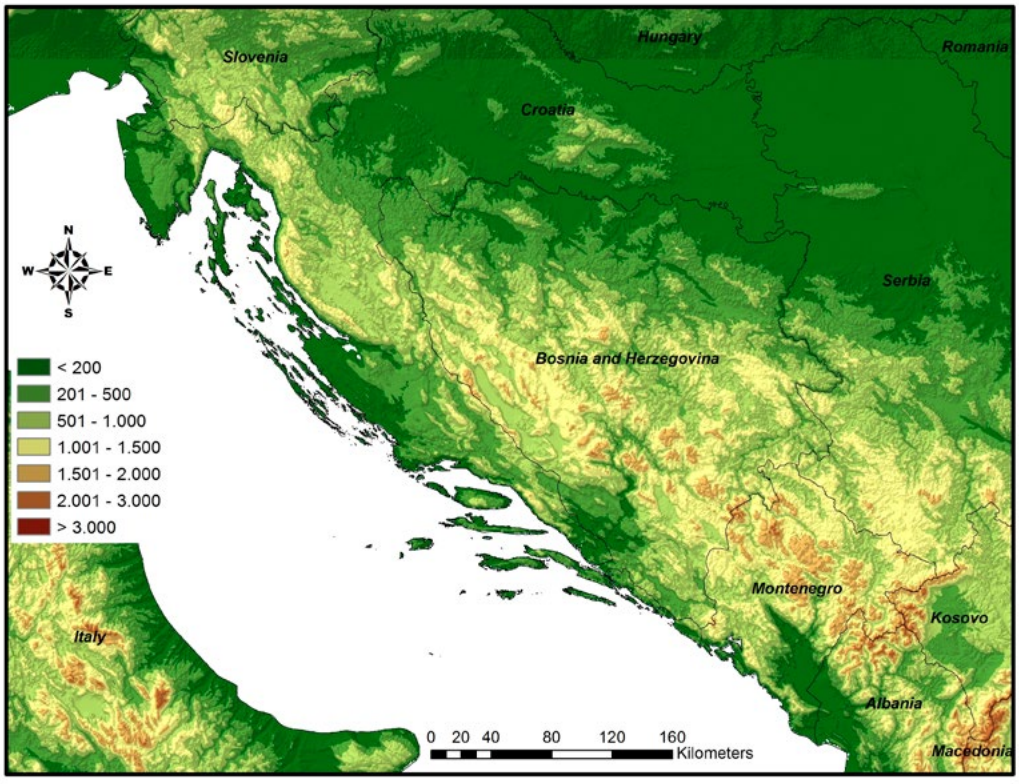

Figure 1. *Dinarides*

The mountains contain sharp reefs with massive structure, curved chains, widespread surfaces, the piedmont areas, and deeply faulted valleys with occasional spreading. The Dinarides are divided into the External, Central and Internal Dinarides. As a region, the External Dinarides are closest to the Adriatic, being presented by thick-layered carbonates, and having the most intense karstification process with all its karst formations, both with endokarst and exokarst ones. The Central Dinarides are the highest in hipsometric terms, and they are separated from the Central Dinarides by an ophiolitic belt predominantly built of igneous and metamorphic rocks. Basically, the External Dinarides are representing holo karst and the other ones the combination of holo karst and mero karst in different variations. The border between extremely passable limestone terrain in the southwest, and geologically heterogene and less passable terrain in the northeast part

of the Dinarides is spreading on the line Karlovac – the Grmeč mountain – the middle course of the river Sana and Vrbas – the Ivan mountain south of Sarajevo – the middle course of the river Drina – the Tara mountain and Zlatibor (Petrović and Petrović, 1997). The Dinaride mountain system can be divided into: northwestern, middle and southeastern part, and as a part of them, smaller and larger mountain areas can be: ore mountains, coastal mountains, flysh mountains etc.

The Dinaric karst area

The first researches of the karst, karst areas and karst hydrography began in the area of the Dinarides (Kras region). That's the area that covers parts of Italy (the Trieste krast area), significant parts of Slovenia, around 50 % of Croatia, over 50 % of Bosnia and Herzegovina's territory, the biggest part of Montenegro and smaller parts of Serbia (the south-western part) and Albania (north) - known in the world by the name of "classical karst" and, as a part of it, karst landform of mild climate areas reaching maximum in development and shaping. The area of the Dinaride karst can be divided into two big morphological parts: southern zone of the deep karts (holokarst), aka Outer Dinarides (with deep layered carbonate rocks) and north shallow zone (merokarst) Inner Dinarides. The Dinaride karst represents the landform of the biggest part of the Dinarides, developed on the big carbonate platform that is from Mesozoic era. In fact, that is the biggest uninterrupted karst area in Europe (Kranjc, 2003). Landscape bareness is connected with the part that has natural conditions (Mediterranean climate with dry and hot summers), partly with too much pasture and deforestation. (Lučić, 2009). Besides the highly developed karst forms, the Dinarides karst is important because it contains first karst landform forms that have been described, some of them with native names: polje, dolina, kamenica, ponor, uvala, hum… There are more than 20000 caving objects in this area which is known as the biggest cave system Postojna – Planina (around 21 km) in Slovenia, and the deepest system is Lukina jama – Trojama (1.392 m) in Croatia. Fields in the karst have big significance and they are a factor of development of the Dinarides karst. The biggest fields are in south-western Bosnia and Herzegovina (Livanjsko, Duvanjsko, Glamočko i Kupreško polje) and in eastern Herzegovina (Popovo, Gatačko, Nevesinjsko and Dabarsko polje). The Dinarides karst is a geographic term based on a geostructural complex of carbonate rocks, which spreads from the Slovenian-Italian towards the Montenegro-Albanian border and from the Adriatic islands towards Podrinje (Lučić, 2009). It has been developed throughout millions of years on a carbonate platform in the Tetis Sea from the Triassic until the end of Cretaceous. However, beyond the karstologic circles, that term is unknown. Some parts have significant culturological meanings, the region Kras, with the surroundings of individual topos like the Postojna or Škocjan caves, or morphological complexes of some mountains (Velebit, Biokovo, Dinara Čvrsnica, Durmitor, Lovćen), poljes (Cerkniško polje, Livanjsko polje, Popovo polje), etc. That category is limited to karst of the middle Dinaride space together with the Mediterranean and sub- Mediterranean regions of Croatia, Bosnia and Herzegovina and Montenegro. The area is apx.80000 km^2.

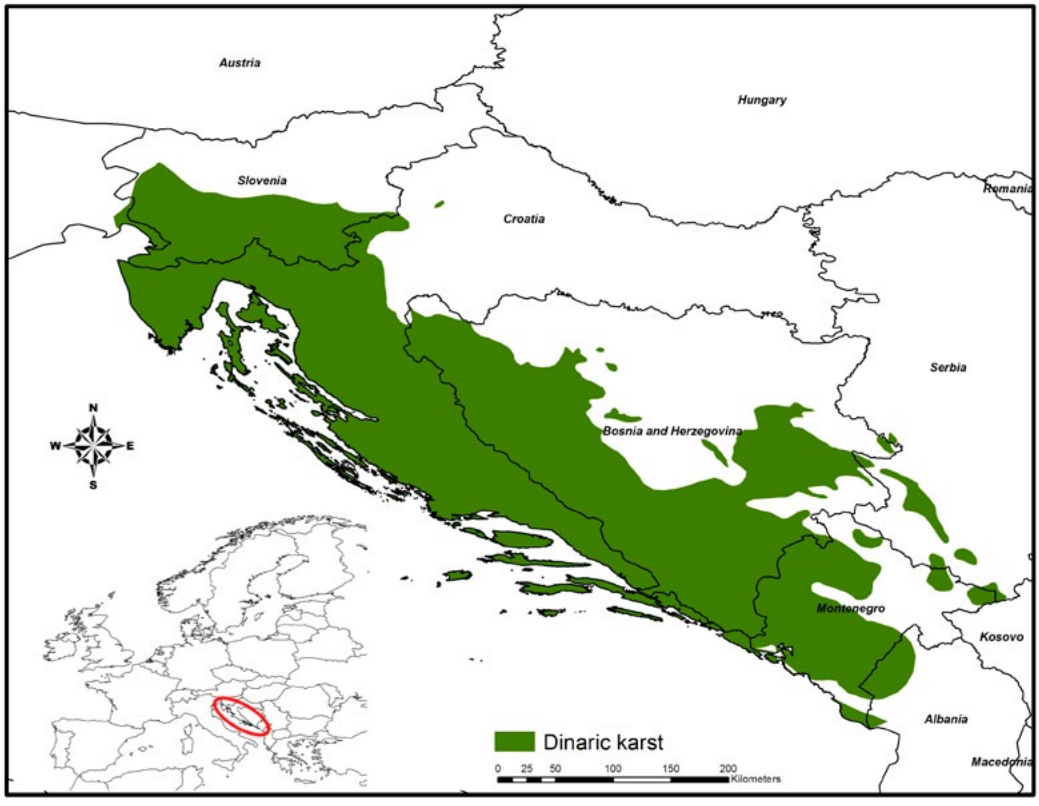

Figure 2. *Dinaric karst area*

Because of that, the socio geographic term "Dinaride karst" has no justification. It is better to use the term "the Dinaride culturological area" (Perica, 2008). The Dinaride karst has multiple natural and culturological values, and some of those

values are under protection. Natural heritage objects: the Škocijan cave and the Postojna-Planina system in Slovenia, the Plitvička lakes in Croatia, the Vjetrenica cave in Bosnia and Herzegovina, and the Durmitor Mountain in Montenegro. Culturological heritage: the city of Kotor in Montenegro, Stari most in Mostar (Bosnia and Herzegovina) and the old cores of the cities Dubrovnik, Split and Trogir (Croatia). In the Dinaride karst, National parks have been created. Most of them are in Croatia: Brijuni, Risnjak, Sjeverni Velebit, Paklenica, the Plitvička lakes, Krka, Kornati and Mljet. In Bosnia and Herzegovina the National park is Sutjeska, and in Montenegro there are three more: Durmitor, Lovćen and the Skadarsko Lake. In the Dinaride languages there are multiple karstology related native callings: polje, dolina, udolina, hum, ponor, jama, kamenica and such, which are used today as scientific terms in global terms. The Slovenian geographic term Kras (Region) has become a universal calling for a genetic type of landform, and the Dinaride mountains by the world literature is considered as an example of karst (Lučić, 2008).

Basic features of the karst landform in Bosnia and Herzegovina

Holokarst is developed, in the Outer Dinarides part, on the territory of Bosnia and Herzegovina. That is a perfect karst, with deep layered limestone with big thickness, and it's often called the naked karst because of the lack of vegetation. This area contains all karst forms, there are no swallets (rivers are exception, if there are any, they are alogogenic type) on the topographic area, but there is plenty of water underground. The North border of the Bosnia and Herzegovina holokarst runs along the line Bihać – the upper course of the river Sana – Kupres – the upper course of the river Vrbas and Rama – south of Sarajevo – the upper course of the river Neretva. North of this line, there is an area of merokarst, which is defined as unfinished green karst. That is unfinished karst in which the karst area forms are not fully developed like in holokarst. The most common are: sinkhole, cave system and swallets, but kamenice, škrape, and poljes in karst are missing. River valleys in this area are most commonly developed like in water-sustainable terrains, because the limestone mass is not thick, and the rivers are cutting to the water-sustainable place. Karst poljes, as the biggest egzokarst area forms, are numerous in Bosnia and Herzegovina, and they cover large spaces. Livanjsko polje is the largest in the Dinaride karst and it's often used as a representative example in research works. Based on geological observation, we can see that the longitudinal axis for the most of polje is parallel with the spreading line of layers. The Livanjsko polje are most commonly tectonically conditioned, and their spreading way is the Dinaride (NW-SI), border between the mountains, so they can be considered as an inter-mountain basin. The poljes are on different sea levels, and their main attribute is that the poljes are lowering as stairs towards the Adriatic which follows the hydrography. These cascade lowerings are more expressive in the area of south-western Bosnia (Kupreško polje, the valley of Cetina in Croatia) and in east Herzegovina (Gatačko polje - Popovo polje - and the Dubrovnik coastline in Croatia). So, the biggest poljes in the karst of Bosnia and Herzegovina lie in south-western Bosnia and in the west and east parts of Herzegovina. Throughout the Dinaride line of spreading in the Outer Dinaride belt and in the contact with the Middle Dinaride there are: Lušci polje, Petrovačko, Bravsko, Podrašničko, Grahovsko, Kupreško, Glamočko, Duvanjsko, Livanjsko, Vukovsko, Dugo, Imotsko-bekijsko, Mostarsko, Gatačko, Nevesinjsko, Dabarsko, Fatničko, Bilećko, Ljubinsko and Popovo polje (only the biggest fields are mentioned). By its size, the biggest is Livanjsko polje (405 km^2, 65 km), and the field with the highest absolute altitude is Vukovsko (1170 meters). Through the Popovo polje runs the river Trebišnjica. Earlier it was the biggest swallet in the Dinaride karst, but today its course has been reorganized and its trough is anthropogenic.

Protection plan for parts of the karst areas in the Dinarides of Bosnia and Herzegovina

Bosnia and Herzegovina so far has three National parks distributed in all areas of Bosnia and Herzegovina's Dinarides. The national parks Kozara and Sutjeska are in smaller BH entities. The first one is in the area of the Internal Dinarides (horst Kozara and historical area from the Second World War), and the second one is in the area of the Central Dinarides and partly in an area of karst characteristics. The youngest national park is in the Federation of Bosnia and Herzegovina in the External Dinarides zone. That is the National park Una, formed in the upper part of the drainage basin of the Una river with extreme karst and high mountain characteristics (mountains, valleys, canyons, gorges, springs, tuff and tufa barriers which form a cascade on the river). Except the National parks in karst areas of Bosnia and Herzegovina's Dinarides there are few more localities (Nature parks, Natural monuments, protected landscapes and so on) under lower form of protection. However, the percentage of protected areas in karst and generally in Bosnia and Herzegovina is significantly under the European average, so in the future it will be necessary to place as many regions and localities under various forms of protection. One of the best ways to protect and valorise individual areas in the Dinarides is exactly the plan of serial nomination of the Dinaric Karst on UNESCO World Heritage List. This is a project implemented by governments and experts of countries that participate in the mountain area of the Dinarides with the help of experts from UNESCO. It should be emphasized that this project explicitly refers to the protection of the unique karst area of the Dinarides, which includes the territories of the following countries (by order from NW to SE): Italy, Slovenia, Bosnia and Herzegovina, Serbia, Montenegro and Albania. This project linked to a great extent to another International project which also includes the Dinaric area, and it is on a higher level of implementation. That is the project of gravestones protection (gravestones from the medieval period) which is being realized by Bosnia and Herzegovina, Croatia, Serbia and Montenegro. Stećci are gravestones that are connected to the Bogumil population that inhabited this area in the Early Middle Ages. It is interesting that the majority of localities (necropolis) with preserved stećci are in the area of the Dinarides and mostly in Bosnia and Herzegovina's Dinarides. The plan for serial nomination of the Dinaric Karst on UNESCO World Heritage List in the initial part has an aim a Tentative List of the individual countries included to be made. The currently protected parts in these countries would be the base for the future protection of the whole Karst area in the Dinarides. That has already been done and now the efforts are focused on unification of the individual proposals for registration on the unique Tentative List. After that a working plan of the Nominal file proposal for the registration of the Dinarides Karst on the World Heritage List has to be prepared with particular remark

that all items registered on the list must be subject to adequate legislative protection and a management system should be worked out including a clearly defined framework for the items and their protection zones. While making the Tentative List for Bosnia and Herzegovina, currently protected areas in karst areas are taken as base for future protection and a plan of sustainable development of that area. One of the authors of this paper is also an expert in the team for the serial nomination of the Dinarides karst in Bosnia and Herzegovina which has been formed by initiative of the Ministry of Civil Affairs of Bosnia and Herzegovina. He is also project leader of this project for Bosnia and Herzegovina. In the Tentative List for Bosnia and Herzegovina the following areas are included: the National Parks Una and Sutjeska, the Nature Parks Blidinje and Hutovo blato, the Natural Monument Tajan and the area of Livanjsko polje. We have to say that the largest cave system in Bosnia and Herzegovina called cave Vjetrenica is not on this list. Currently it is under protection of the country. Including it on the UNESCO World Heritage List is going through a special project. In extension is given a brief overview of selected areas under current protection, which are in Bosnia and Herzegovina's Tentative List for registering on the World Heritage List as part of an international project.

The Una National Park is the youngest National park in Bosnia and Herzegovina which includes an area of canyon parts in the upper stream of the river Una, an area of canyons of the lower part of the river Unac and the area between the river Una and the river Unac. The entire area of the National park is on the territory of the municipality of Bihać in Una-Sana canton (FB&H). It is spread on a surface of 19.800 ha. The greatest nature values of this protected area are waters, tuff and diverse wildlife. The river Una is the greatest nature value of this area including tufa barriers that have blocked the river channel and formed spectacular cascades (Štrbački buk is the best known one). The Una National Park is one of the most representative protected areas in the Dinarides karst of Bosnia and Herzegovina.

The National park Sutjeska (17.350,00 ha) was declared as protected in 1962, which makes it the oldest National park in Bosnia and Herzegovina. This park is in the high mountain area of Bosnia and Herzegovina – Zelengora (2015 m), Maglić (2386 m) and Volujak (2297 m). Inside this protected area there is a nature reserve – the virgin forest Perućica. The National park Sutjeska is an area of extreme landform differences and a lot of water. It has significant biogeographic values and monument of significant battles from World War II. Administratively it belongs to the municipalities Foča and Kalinovik (RS). The National park Sutjeska is an exceptionally valuable area, so in the future rebranding should be done to counteract the initial factor of proclaiming that this Park has lost its importance (Spahić et al., 2014).

The Nature Park Hutovo blato (7411 ha) is a sub-Mediterranean swamp listed by the Ramsar conference. Hydrographically it belongs to the river basin and system of the downstream of the river Neretva. Administratively the Nature Park Hutovo blato belongs to the municipalities of Čapljina and Stolac (FBIH). Part of Hutovo blato, partly crypto depression, is topographically situated on the left valley slope of the river Neretva, about 5 km SE from the settlement Čapljina. Hutovo blato was declared as a Nature park in 1995 mainly because of the diversity of flora and fauna (especially birds) and the specific regime of the karst waters. A large fire in 2013 raised huge problems for this area. The Nature Park Hutovo blato deserves nomination on the Tentative List, but it should be mentioned that this area is under the most pronounced anthropogenic/artificial influence. This park was declared as protected in 1995 (the last year of war in Bosnia and Herzegovina) although in 1960 and 1970 significant regulation of surface water flows and concreting were done in this area. However, today there is significant possibility of returning to its original natural state and that would be the way for proper revitalization of this protected area (Spahić et al., 2013).

Nature Park Blidinje has a surface of 358 km^2 and belongs to the zone Visoki krš in the External Dinarides. It covers an area that includes the karst polje Dugopolje, Vran and Čvrsnica slopes facing the field as well as the NW part of mountain Čabulja. This is an extremely highland karst area containing Bosnia and Herzegovina's largest natural mountain lake called Blidinje jezero (2,8 km^2). This area was declared as a Nature Park in 1995. Administratively it belongs to the municipalities of Jablanica, Posušje and Tomislavgrad (FBIH). The Nature Park Blidinje is one of the most valuable highland karst areas in Bosnia and Herzegovina. It is in danger of possible devastation, because of the proximity of the village building excursion due to incompetent and corrupt administration at local and cantonal level.

The Natural monument Tajan has a surface of 4948 ha and hydrographically belongs to the drainage basin of the river Gostović (river Bosnia). The first natural monument in the zone of the Internal Dinarides of Bosnia and Herzegovina includes many natural, archaeological and speleological localities as well as paleontological findings, endemic plants and uncountable fauna. The most significant natural values are the canyons of Mašica, Suha and Duboka Tajašnica as well as some caving objects like Atom, Javor and Omladinska. Administratively it belongs to the municipality of Zavidovići and Kakanj (FB&H). The Natural monument Tajan deserves to be nominated for the Tentative List because for the first time an area of merokarst in the zone of the Internal Dinarides is being protected. Till lately this zone of the Dinarides and generally the merokarst were neglected in regards to the zone of the External Dinarides (Visoki krš, zone of holokarst).

Livanjsko polje is the largest polje in the karst of Bosnia and Herzegovina, as well as the largest egzogenetic form of karst landform in the Dinarides karst. Livanjsko polje is tectonically predisposed, has a maximum length of 65 km, a maximum width about 12 km and total surface of about 405 km^2. For now, only parts of the polje are protected (the ornithological reserve Ždralovac in the NW part of polje is also on the list of protected areas of the Ramsar's conference), but the plan is the whole polje to be protected. Buško jezero, the largest artificial lake in Bosnia and Herzegovina, is located in the SE part of the polje. Administratively it belongs to the municipality of Livno (FBIH). The town Livno is one of the largest urban settlements in the Dinaric karst. The only possibility for sustainable development and planned protection of

this regional karst phenomenon in the future is proclamation of the unique area of Livanjsko polje as protected area. The current partial protection has not given the expected results and this area definitely deserves protection as the largest egzo-karst landform in the Dinaric karst.

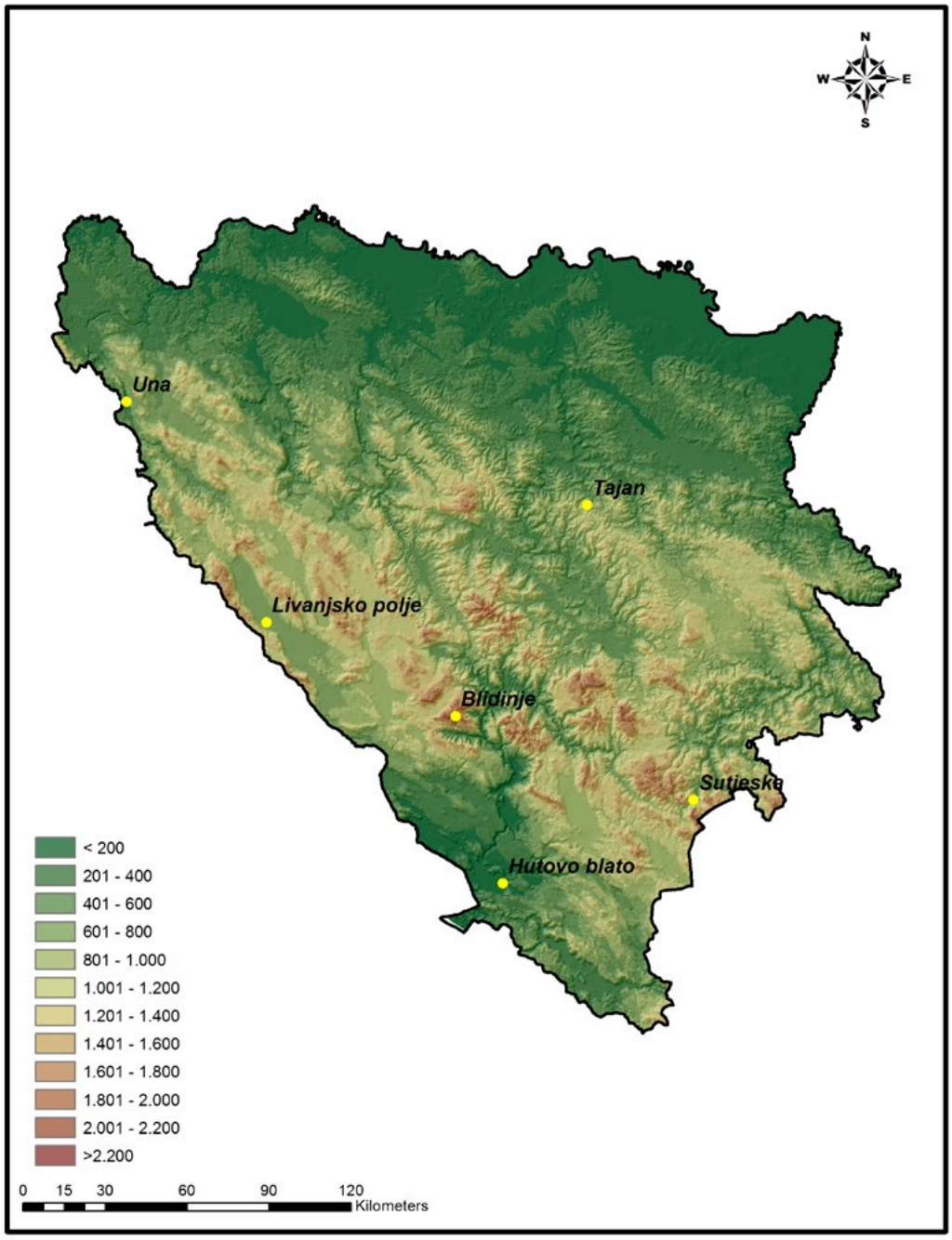

Figure 3. *Geographical position of protected areas listed on the Tentative list for Bosnia and Herzegovina*

Besides the areas that are listed and described in the Tentative List, in Bosnia and Herzegovina's Dinarides there are few smaller areas under lower form of protection that are not listed, but represent areas of exceptional nature value. Most important of them are: the Protected landscape Bijambare, Konjuh, Bembaša and Trebević, the Natural monuments Skakavac and Vrelo Bosne (FB&H), the Natural monuments Cave Orlovača and Cave Ljubačevo, the Special nature reserves

Gromiželj and Lisina as well as the virgin forest reserves Lom and Janj (all in RS).

Strategic aim of protection and plan of sustainable development of karst areas in Bosnia and Herzegovina

Strategic aim of protection and plan of sustainable development of the karst area in Bosnia and Herzegovina and the

Dinarides karst as a whole definitely includes preservation of the existing value of biological and landscape differences of the karst zones as areas of global value level as well as insurance of harmonized management of all natural goods on this area (Maleković et al. 2009). Considering all natural characteristics (landscape, geological, hydrogeological, geomorphological, hydrographical, vegetation, floristic and faunistic) the area of the Dinarides karst combines the highest number of natural values in Bosnia and Herzegovina and beyond. But, the area of the Dinarides karst is a featured zone of pronounced geo hazards, which especially refers to the system of karst hydrography where surface ecological incident can be far away because of the cracked carbonate base that makes the specific area of the karst underground (Parise, 2009). Because of that it is needed to plan right and pronounce sustainable development of this extremely depopulated area, which refers that strategically the guidelines of sustainable development plan must include, as follows:

- To inventure and evaluate speleological objects in the whole area of the Dinarides karst, with suggestions for their protection and valorisation.
- To bring up public awareness about the Dinarides karst as a specific phenomenon significant on European and world scale, as well as to encourage public involvement in the process of landscape protection and biological diversities on the surface and in the karst underground.
- To establish general protection of the Dinarides karst by law and protection of individual localities and objects (for example representative and unique phenomena in the karst-landforms, hydrograph, flora and fauna).
- To increase the proportion of the protected areas (all levels of protection) on cca 20% of the total surface of the Dinarides karst.
- To make and establish research programmes and monitoring, especially on endangered sites and objects of the karst.
- To educate the local population and include/involve people in the sustainable development plan in the whole area of the Dinarides karst.

Making platforms of protected areas in the Dinarides karst represents one of the main/prime tasks of this project. The Dinarides with their natural and cultural values are not behind other mountain systems in Europe and the world. Making the Dinarides a touristic brand would definitely rank them as one of the most important tourist destinations on an international tourism scale. One of the aims certainly is to maintain and strengthen the diplomatic/politic will for dialogue and cooperation among the countries participating in this project which is especially significant in the current turmoil in the world.

CONCLUSIONS

The Dinarides are one of the significant mountains in Europe, especially in south Europe. The Dinarides morphologic difference requires fast a plan for protection, in which all countries positioned on this mountain system have to participate. The Dinarides karst, defined as area of „classic" karst, is the most attractive and most important part in the Dinarides that extends through 7 countries, starting from Italy on the northeast to Albania in the southeast. This karst area through holokarst and merokarst parts represents an area of totally developed karstification both on the surface and underground. Karst is expressed by fascinating surface landforms as well as hydrographic forms/shapes and specific natural and cultural landscapes. That's the area of uncountable natural and cultural values from which many are under some kind of protection, but the time has shown that it's required to think about protection of the whole Dinarides karst. One of the best ways to protect and valorise the Dinarides is exactly the plan of serial nomination of the Dinarides karst in UNESCO's World Heritage List. Real sustainable development of this area is only possible by including: all countries, many experts and the governments of the countries included. When it comes to Bosnia and Herzegovina and the part of the Dinarides karst in Bosnia and Herzegovina, the list of areas under protection that are on the Tentative List definitely represent significant base for proclamation the Dinarides karst area as one of outstanding natural and cultural values.

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HIGH-MOUNTAIN AIR MONITORING AT THE BASIC ENVIRONMENTAL OBSERVATORY MOUSSALA

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ABSTRACT

Monitoring and studies of global climate changes, natural hazards and technological risks are the main areas of research performed in regional Global Atmospheric Watch (GAW) at station BEO Moussala (2925 m a.s.l., 42°17′ N, 23°58″ E). Real time measurements and observations are performed in the field of atmospheric chemistry and physics. Gas concentration measurements of CO, CO_2, O_3, NO, NO_2 and NO_x are performed with an automatic atmosphere monitoring system "Environment S.A". Complex information about aerosol is obtained by using a three-wavelength integrating nephelometer for measuring the scattering and backscattering coefficients, continuous light absorption photometer and by the scanning mobile particle sizer. The system for radioactivity and heavy metals in aerosols measurement gives the opportunity to control a large scale radioactive aerosol transport. Gamma background measurements and the spectrum of gamma-rays in the air near Moussala peak are carried out in real time. A HYSPLIT back trajectory model is used to determine the origin of the data registered by the apparatus. The obtained information combined with a full set of corresponding meteorological parameters is transmitted via a high frequency radio telecommunication system to the Internet.

Keywords: *atmospheric physics, atmospheric chemistry, atmospheric composition*

INTRODUCTION

Moussala Peak in the Rila Mountain National Park, Bulgaria, being the highest peak on the Balkan Peninsula, is an important reference point for assessing the anthropogenic influence in the large South-East European region.

For the above purpose, a unique facility was established and is operated by the Institute for Nuclear Research and Nuclear Energy of the Bulgarian Academy of Sciences, namely, the Moussala Basic Ecological Observatory (BEO).

BEO Moussala possesses modern infrastructure and equipment for scientific investigations. The station has a long tradition as a high-mountain scientific facility (as a cosmic rays observatory since the late 1950s, and, later on, as a complex ecological observatory). Its future, however, depends mostly on the process of scientific collaboration and integration within the global research area. The study of the high-mountain environmental parameters (meteorology, atmospheric physics and chemistry, background radiation, and cosmic rays), as measured at BEO Moussala, gives the possibility of a comprehensive evaluation of the anthropogenic and biogenic impacts on the climate.

The observed climate variations and the effects described in the four Intergovernmental Panel on Climate Change (IPCC) reports point to the fact that these have been the result of human activities and, consequently, of the increase of greenhouse gasses emissions and the global warming. On the other hand, the meteorological conditions are the main factor in the propagation, diffusion or deposition of polluting gasses in the environment. The assessment of the present-day variations and changes in the atmospheric composition has been performed via an analysis of the various indicators, thus assisting in determining the trends and in the possible parametrizations of the processes leading to the formation of the planetary boundary layer (PBL).

Besides the monitoring related to the global climate changes, Moussala BEO's unique location offers opportunities of conducting the traditional cosmic rays studies, i.e. investigating the relationship between the cosmic rays intensity variation and the atmospheric parameters. Moreover, the meteorological conditions of BEO Moussala operation are extreme, as are the phenomena and processes studied, namely, extraordinarily quickly changing air, space and environmental parameters under high-mountain conditions.

BEO MOUSSALA AS A REGIONAL GLOBAL ATMOSPHERIC WATCH (GAW) STATION

The BEO Moussala has now been operating for 15 years. At first, studies were carried out of the weather parameters; these were followed by measurements of greenhouse and reactive gasses. Subsequently, gamma radiation spectrum measurements began, while a muon telescope was designed and built as a continuation of the traditional cosmic rays studies, followed by the installation of a neutron monitor. In the next few years, new modern equipment was installed (a Nephelometer, SEVAN, SMPS), leading to the most recent experiment – capturing the so-called persistent organic pollutants. Thus, being equipped with modern devices for following atmospheric processes, Moussala BEO fulfilled the technical requirements for a Regional Global Atmosphere Watch (GAW) Station and joined the World Meteorological Organization's Program for Global Atmospheric Studies. The latter has established a global network of collaborating ecological observatories and facilitates for the exchange of data, equipment and specialists among them. The data registered are uploaded to the BEO Moussala's website (http://beo-db.inrne.bas.bg/moussala) and are being sent to worldwide data bases (WDCGG, Kyoto, Japan; NILU, Norway; NOAA, USA; JRC, Italy; RECETOX, Czech Republic). The gamma-probe data recorded are being sent automatically to the Bulgarian Nuclear Regulatory Agency.

The Observatory's location was chosen by a careful consideration. In the distant year 1959, at an altitude of about 3 000 meters above sea level, Bulgarian scientists assisted by their Hungarian colleagues built the Cosmic Station at Moussala Peak with the purpose of following variations in the cosmic rays intensity, as a part of the Earth's interaction with the open space. Later, the old Cosmic Rays Station having been destroyed by fire, the scientific and applied research activities of the restored observatory were also geared towards environmental problems: modelling the atmospheric composition and studying its impact on the ecosystems and the human health, as well as studying the correlations between processes of various scales in the air pollution formation.

The information is transferred to the Internet via a high-frequency radio-telecommunication system and is saved for analysis in the data bases of the international programs GAW, EURDEP, UNBSS and the projects ACTRIS and MONET.

Moussala BEO's main fields of activities are monitoring the atmospheric conditions and the long-range transfer of persistent organic pollutants (POPs), greenhouse gasses and aerosols. Thanks to the existing natural conditions and to the infrastructure established, Moussala BEO's mission is to be a long-term source of data and analyses in the service of science and society. By the middle of the last century, the intensive use of pesticides turned into an ecological threat leading to the signing of the Stockholm Convention (1979) [1] on monitoring the POPs concentration in the environment. The changes in the atmosphere's thermal balance due to the emission of greenhouse gasses drew the attention of the scientists and the world community as a whole in the 1980s. Thus, the United Nations Convention on Climate Change and the Kyoto Protocol [2] defined the year 1990 as a basic one for greenhouse gasses monitoring. More recently, the interest in aerosols as a factor in the climate changes increased due to the improved technological means for measurements and the scientific knowledge accumulated.

Moussala BEO's team continued its research work in the framework of the FP7 project ACTRIS (Aerosols, Clouds, Trace Gasses Infrastructure, 2011-2015). Data for aerosol measurements were regularly sent to the Norwegian Institute for Air Research (NILU), Norway, and The National Oceanic and Atmospheric Administration (NOAA), USA. Under a Letter of Intent with RECETOX, Masaryk University, Brno, Czech Republic, a set of filters for a five-year project for investigating POPs distribution over Europe were prepared at the BEO. Gamma background and meteorological data are being sent in real time to the European Commission through the Joint Research Centre (JRC, Ispra), Italy. The automatic weather station "Vaisala" is equipped with sensors for air temperature, relative humidity, atmospheric pressure, wind speed, wind direction and precipitations. Greenhouse and trace gases measurements are performed by an atmospheric gas analysing system. Having been a Regional Station in the Global Atmosphere Watch (GAW) program since February 1, 2010, BEO "Moussala" sends data from gas analysers, as well meteorological data, to WDCGG (http://gaw.kishou.go.jp/wdcgg/).

In 2014, Moussala BEO was recertified by IQNET for compliance with the ISO 9001:2008 and ISO 14001:2004 standards.

High Mountain Air Monitoring at BEO Moussala

- Monitoring of aerosols

SMPS

The measurements at the BEO Moussala station showed that the site lies above the PBL for about a half of the year: from autumn to early spring (September to February). Changes in the situation occur in March, when the station is found to be below the PBL, and in August, when it is above it. The months from May to August are typical when the daily variations are influenced by local convection processes of air masses with a high concentration of particles, especially in the period from noon until evening, with a maximum in July and August. During the spring and summer months, when a strong influence of convection processes is present, a time window exists from midnight to morning which enables one to perform measurements under the conditions of the lower free troposphere (Figure1 and Figure2).

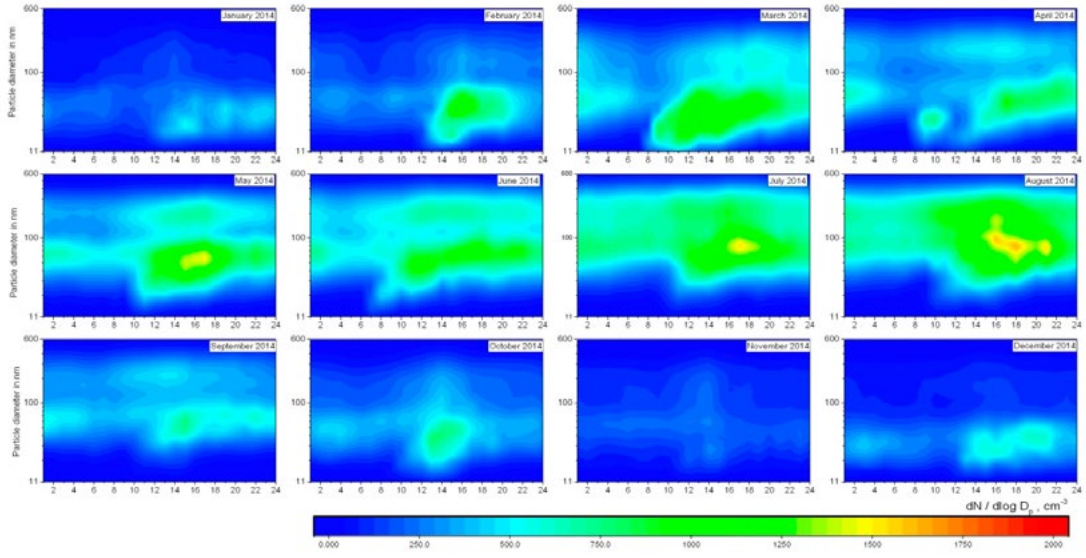


Figure1. *Monthly mean daily variation of particle number concentration in the size range from 11 to 600 nm at Moussala site for the period January 2014 to December 2014, represented by a colour code in the range from 0 to 2000 dN/dlogDpcm-3 particles per size class from blue to red.*

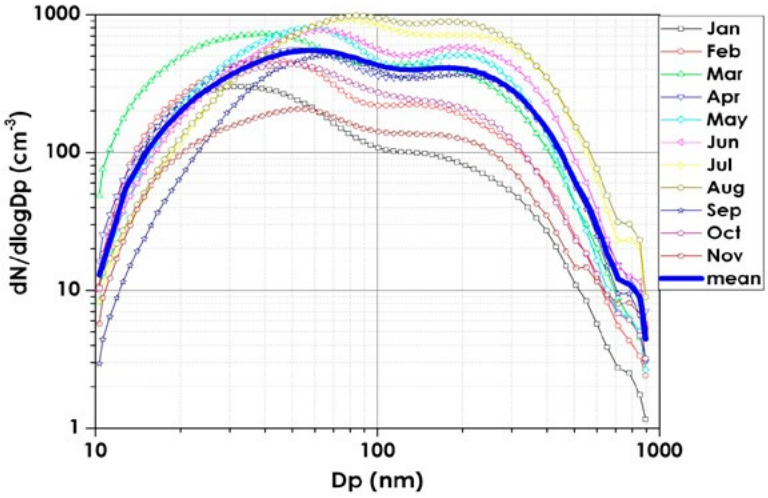


Figure 2. *Mean monthly distribution of aerosols, dN/dlogDp (cm^{-3})*

These detailed data yields information about the aerosol dynamics and the related meteorological processes throughout the year. Similar results for ultrafine aerosol particles variations have been obtained at the high-mountain station Zugspitze (2650 m.a.s.l.), Germany [3].

Nephelometer

Additional aerosol measurements at Moussala BEO are being performed using a TSI Integrating Nephelometer model 3563 and an SMPS particle sizer. Both of them have been performing continuous measurements since 2007 and 2008, respectively. The measurements of the aerosol properties during the whole period have showed permanent seasonal trends [4], [5], which have been confirmed by the data from the past two years, 2013 and 2014.

In the latter period, the observations showed predominantly clean air from the troposphere at Moussala with periods of relatively polluted air masses, mainly during the daytime in summer [5], as it is clearly seen in the SMPS presented in Figure1 and Figure 2. These results are also confirmed by the scattering and absorption data obtained by the nephelometer. The peak in the aerosol loading is clearly in the summer, in August for both years. Moussala BEO is located at such a distance from Sahara that arrival of Sahara dust takes place several times every year. This contributed to lower than usual values of the Ångstrom exponent (AE) [6] during spring and late autumn. The Ångstrom exponent is a parameter representing the wavelength dependence of the optical depth and is inversely related to the size of the particles. The mean monthly AE was lower than 1.5, it even could reach values below 1 because of a number of persistent strong Sahara dust events detected during a single month, as it occurred, e.g., in March and May 2013, (see Figure 3).

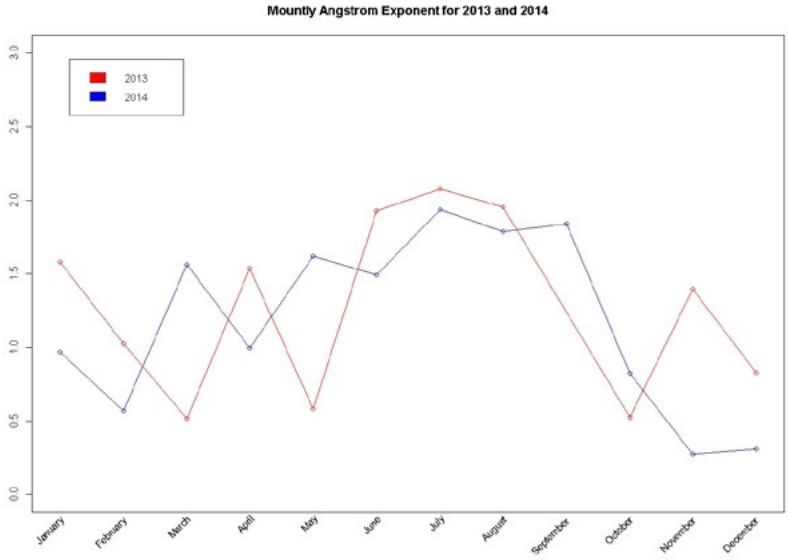


Figure 3. *Ångstrom exponent and backscatter fraction measured by a TSI integrating nephelometer during a two-year long period from 2013 to the end of 2014.*

The process of obtaining monthly averaged data has not been interrupted, except for a period of five weeks from the late August 2013 to the beginning of October 2013, when the Nephelometer was subjected to inter-calibration tests.

CLAP

Atmospheric aerosols are fine solid or liquid particles "floating" (suspended) in the atmosphere. Long term measurements of aerosols have been carried out at many research centres, including at Moussala BEO since 2006 under the framework of the EU projects EUSAAR and ACTRIS. Moussala BEO data are relevant in detecting possible anthropogenic influence and monitoring natural sources. The Saharan dust events are natural phenomena estimated as "the world's most powerful dust source'. Strong surface winds uplift dust to high altitudes and the convection transports it typically westwards but also to our latitudes. After such transports several times each winter, the snow surface becomes coloured while the TSI 3563 nephelometer registers increased scattering from the fraction closer to the coarse mode that makes it visible. The aerosol influences the radiation balance of the Earth through scattering and absorption of solar radiation. In June 2012, thanks to the ACTRIS project and an agreement signed for a long-term loan from the NOAA GMD division, a continuous light absorption photometer (CLAP) for real-time measurements was installed at Moussala BEO. The CLAP is a filter-based instrument for photometric measurements. Using the scattering and absorption coefficients measured for the 700/450 nm range of wavelengths, this exponent was calculated. Figure 4 illustrates the correlation between the DREAM model forecast and real measured data in the period when bigger particles were dominating in the atmosphere during one Saharan dust event (http://www.bsc.es/earth-sciences/mineral-dust-forecast-system/bsc-dream8b-forecast/)

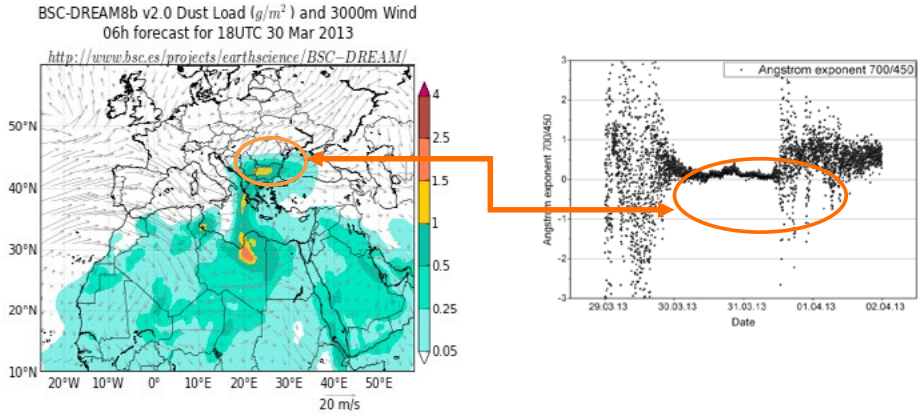


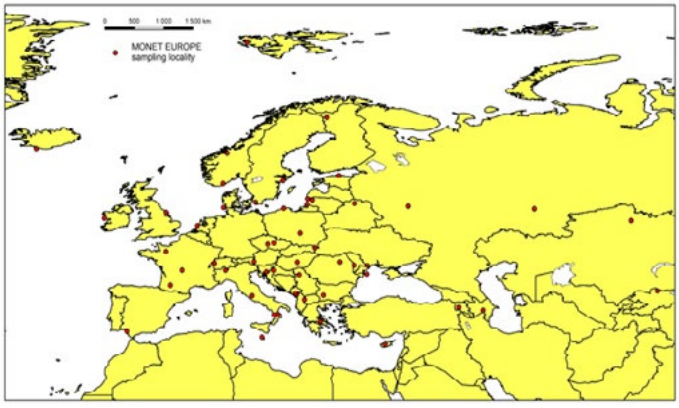
Figure 4. *Dust concentration (g/m³) forecast calculated by the DREAM model (left) and real data (right) on 30 March 2013 at 18 UTC*

- Monitoring of POPs

Passive samplers

As required by the Stockholm Convention, a need arose for POPs monitoring, especially in key matrices as ambient air. Moussala BEO was included as a member of MONET EU project in 2009. No data on POPs in the atmosphere had before been gathered in Bulgaria. Now, besides at the Moussala BEO, POPs monitoring is being performed at six more locations, mainly in the Sofia region. Being a unique high-mountain infrastructure the Moussala BEO issues reports on the situation in the Balkans peninsula region. The alpine areas are interesting and important background locations from a scientific point of view.

Passive air sampling started in 2009 in 37 European countries (Pic.1). Our long-term sampling campaign began in the spring of 2009. The samples were treated and analysed for the presence of PCBs, DDT and hexachlorobenzene, pentachlorobenzene, HCHs, and polycyclic aromatic hydrocarbons.



Pic. 1. *Map of monitoring stations of the project MONET EU*

Passive samplers provide information about long-term contamination of selected sites and can be used as a screening method for semi-quantitative comparison of different sites. A major advantage is the possibility to use these samplers in remote and inaccessible areas such as mountain areas.

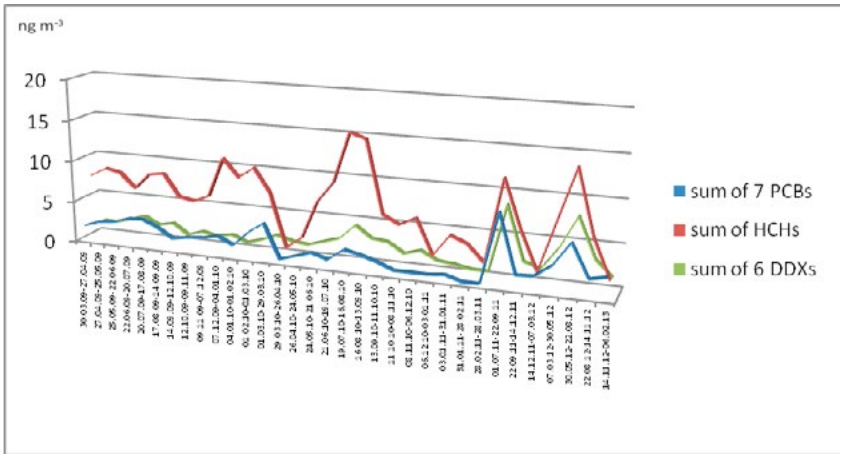


Figure 5. *Spatio-temporal deposition of persistent organic pollutants (PCBs, HCHs, DDXs) at the Moussala BEO high-mountain EMEP station in the period March 2009 - March 2013, (ng m^{-3}).*

The necessity to monitor the levels of POPs arises from their toxicity and chemical activity that remain high for long periods of time. The passive air samplers using PUF filters are suitable for monitoring several types of POPs, in particular, most of the polycyclic aromatic hydrocarbons (PAHs, acenaphtylene-pyrene), polychlorinated biphenyls (PCBs), and organochlorinated pesticides (OCPs). The concentrations of 29 PAHs, 7 PCBs, and 12 pesticides and biphenyls were measured at Moussala BEO (Figure5 and Figure6) during the campaigns (2009-2013).

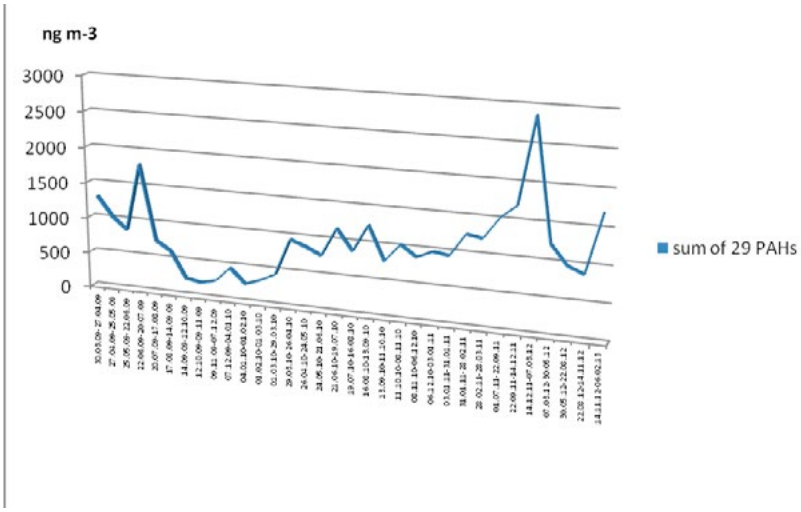


Figure 6. *Spatio-temporal deposition of persistent organic pollutants (PAHs) at the BEO Moussala high-mountain EMEP station in the period March 2009 - March 2013, (ng m^{-3})*

The analysis of the results obtained at the Moussala BEO EMEP station confirmed that passive monitoring is an inexpensive and powerful technique for gathering seasonal and spatial information on local pollution sources.

- Gamma background monitoring

IGS421B1 gamma probe

The ambient equivalent dose rate is being measured by the IGS421B1 gamma probe consisting of three Geiger-Muller counting tubes with a sensitivity range from 10 nSv/h to10 Sv/h. The data from the gamma background monitoring during the Fukushima accident are shown in Figure 7.

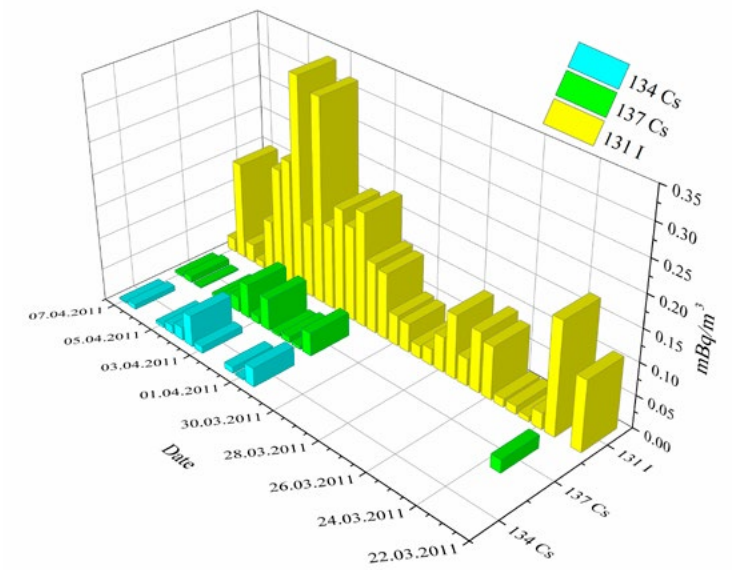


Figure 7. *^{134}Cs, ^{137}Cs and ^{131}I measured at BEO Moussala after the Fukushima accident 2011, mBq/m^3*

Na(I) spectrometer

In addition to the gamma background measurements (the IGS 421 gamma probe) [6], a Na(I) spectrometer was installed at Moussala BEO for on-line measurement of the gamma-rays spectrum in the air at the Moussala Peak. The energy interval of gamma-rays measurement is 100 – 6500 keV. In this energy interval, one can observe the main isotopes of natural and anthropogenic radioactivity, including such from nuclear accidents and the cosmic gamma-rays background (Figure8).

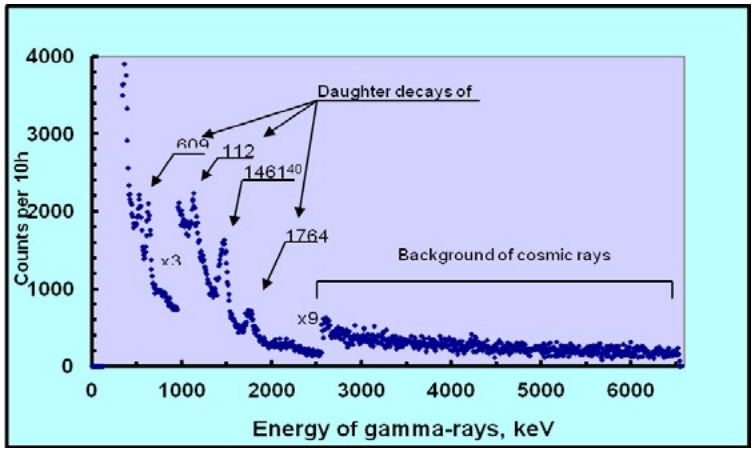


Figure 8. *Typical gamma-spectrum in the energy interval 150 – 6500 keV measured by the NaI detector at Moussala Peak*

The unique BEO location permits us to obtain fast preliminary information on local or transboundary radioactive pollution [7]. Using the gamma spectrometer, we are able to establish in real time which isotope is responsible for the increase of the gamma background (Figure 9).

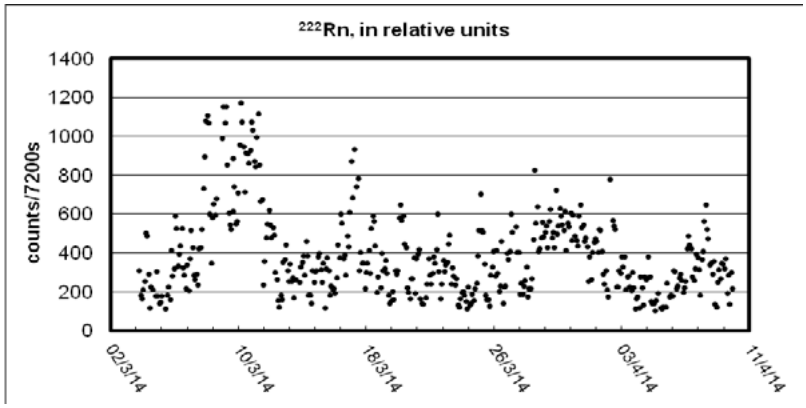


Figure 9. *Intensity of the 609 keV gamma line of ^{222}Rn measured in the period from 02.03.2014 to 11.04.2014*

Trans-border air pollution transport registered at Moussala BEO

By applying modern and widely used models (HYSPLIT NOAA Model, FLEXPART, etc.), large-scale computer simulations were carried out of the atmospheric composition in the Rila Mountain region (Pic.2)

Pic.2: *Air masses motion on 17.05.2013, when transport from Sahara desert was registered at the BEO, using the HYSPLIT4 (NOAA) model [8]*

The direct measurement of the atmospheric parameters is only possible for limited coordinates, which makes it necessary to apply models for the purposes of larger-scale analyses and forecasts and localization of the potential pollution sources. All information about the aerosol layers' origin and their altitude above ground, as measured by the Nephelometer device, confirmed the conclusion of observation of a long-distance Sahara dust transport beyond the Balkans and Moussala.

The data from the analyses provide up-to-date reliable information on the presence of pollutants in the air near Moussala Peak, thus allowing one to determine the trends in the variations of the concentration of harmful substances released in the environment, the causes and possible impact of these variations, and the location of the pollution sources.

CONCLUSIONS

The Moussala BEO location, namely, at a long distance away from any local pollution sources and at the lower troposphere boundary, favours the studies of the processes playing a key role in the climate formation. The high-mountain monitoring allows one to follow the transboundary transport of polluted air masses and to model the trends related to the climate changes that the world has witnessed in recent years. Moreover, the ground measurements conducted at Moussala BEO can be used as reference data for calibrating satellite measurements, the latter being of importance due to the fact that they provide information on the atmospheric condition over large regions where no ground stations are located. The satellite data must be calibrated and verified using comparisons with data obtained by ground stations possessing the necessary equipment, such as Moussala BEO.

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THE IMPORTANCE OF PROTECTED AREAS IN MOUNTAINOUS REGIONS FOR SUSTAINABLE DEVELOPMENT: CASE OF THE KAZ MOUNTAIN PROTECTED AREA

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ABSTRACT

Approximately one-third of protected areas in the world are located in mountainsides. As well as existence of many endemic and endangered species, availability of rich biodiversity in these areas is the main reason of this situation. Mountainous regions are also areas that require special management in terms of having water resources, energy, minerals, forests, agricultural lands and recreation areas. In the study, it will be touched on the importance of local, regional and national cooperation for provision of the sustainability of the natural resources in mountainous regions and the development of the human capital. Apart from that, it will be discussed the role of protected areas which are faced with natural and environmental disasters, had rich biodiversity and are a serious part of the global ecosystem in sustainable development. The case of the Kaz Mountain located in the Aegean Region of Turkey offers a possibility for researching the topic by field work and supporting by the views of local people.

Keywords: *Mountainous Regions, Sustainable Development, Protected Areas, Kaz Mountain.*

INTRODUCTION

Although many definitions are made in order to separate mountainsides from non-mountainous regions, there is not a single definition that everyone agrees on. Therefore, depending on the geographic structure of each country, different mountain and mountainous region concepts are emerging. The differences in the structure of the countries cause some problems in terms of applying a special common policy on mountainous regions in legal arrangements. In particular, sustainable development strategies are required in order to protect the mountain flora and fauna, also to improve the standards of life of the people living in these areas. For requiring these necessities and following a good management policy, protected areas will show us why we need sustainable development in mountainous regions. In the Kaz Mountain protected area, one of the best examples of it, due to the lack of any legal regulation for years tons of soil have been exposed to cyanide and forests and living creatures have been seriously damaged as a result of the mining excavation within the framework of the EIA exemption. However, the EIA exemption of mines was removed with a decision of the Constitutional Court in 2009, and it became a significant step in the protection of the natural environment. As mentioned above, because a large proportion of protected areas are in mountainsides, there should be policies considering the decisions of the Constitutional Court in sustainable developments of mountainous regions.

SUSTAINABLE DEVELOPMENT

Especially since the second half of the 20th century, on one side, depletion of natural resources has lead countries in the world to start looking for alternative sources, and, on the other side, for effective usage of the available resources in the process of seeking an alternative energy source. As part of the world's agenda this has provided the emergence of the "Sustainable Development" concept.

The concept at first was defined as "meeting today's human needs without jeopardizing the needs of future generations" according to the Brundtland Report named "common future (or our common future)" published by the World Commission for Environment and Development-WCED in 1987 (WCED, 1987). Another definition commonly used by UCN/UNEP/WWF is that "Sustainable development is a kind of development which raises life standards without carrying the capacity of the earth into trouble and damaging the earth (Price et al., 2004). Also in 1987, the World Bank mentioned the concept to associate it with economic growth, poverty reduction and environmental management discourse. Over time, the concept of sustainable development has spread quickly in many national and international platforms (Gurer, 2009).

Especially in the last century, the concept of sustainable development appeared concerning almost everything in the life cycle and as a necessity that change not to be ignored by society. Despite topics such as coastal sustainability, economic sustainability, sustainability of energy resources, sustainable tourism, sustainability of water resources, the mountainous regions which have natural resources form the key point of sustainability. That's why sustainability of the mountainous regions has a serious role in environment.

SUSTAINABLE DEVELOPMENT IN MOUNTAINOUS REGIONS

Basic ecosystems are complex and interrelated structures. Mountainous ecosystems which are a part of this are undergoing rapid and constant change - change not only in natural structure but also in social structure. Especially due to the low income and inadequate employment of the people living in these areas, there is migration of the young and active population. Apart from that, it causes lack of information. So, the fundamental policy should take into account use of the

natural resources in an effective way without damaging the biodiversity and prevent migrations of local inhabitants by developing economic, social and environmental development policies (Gurer, 2009).

Looking at the statistics, it is seen that mountains have a global significance. The first conference at which the significance of the mountainous regions was discussed was the United Nations Conference on Environment and Development in Rio, in 1992. At the conference the problems of the mountains were analysed, an international platform was developed and the plan was accepted by many governments. Thus, Chapter 13 of Agenda 21 in 1992 was defined as "Management of Sensitive Ecosystems: Sustainable Mountain Development" and two programs were presented. These are a) production and reinforcement of information for sustainable development of ecology and mountain systems, b) encouraging the development of water resources and creating alternative livelihoods (Price et al., 2004). In this perspective the intended actions were identified in three groups such as "topics related to management", "collection of data and information" and "national and international cooperation", also the financial, scientific and technical instruments have been determined as application tools (UNEP-WCMC, 2014).

In the years that followed the Rio Conference, national and international organizations related to sustainable developments of mountainous areas have been established and have worked for their mountainous regions. Especially, the European countries have introduced legal regulations by developing their own policies. Sub-national and international institutions and organizations have undertaken a variety of roles in execution of activities related to mountainous areas. The Food and Agricultural Organization (FAO), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the United Nations University (UNU) are main actors. In 1995, the Council of Europe prepared "Europe Mountainous Regions Charter" in the Congress of Local and Regional Authorities of Europe. (The Charter is currently in a draft form). Besides it, in 1995, the Global Environment Fund (GEF) defined mountain ecosystems as one of their ten active programmes (Walsh, 2002). Furthermore, the United Nations General Assembly proclaimed the year 2002 as "International Year of the Mountains" in 1998 (Price et al., 2004).

PROTECTED AREAS

Many mountains are significant areas for tourism and recreation, so they should be protected because they provide such facilities. However, plurality of the endemic species living in the respective area, whether these species are in danger or not, the status of the forests and the fresh water sources, the plant cover are important causes for proclaiming an area as a protected area. Protection is envisaged by the Natural Parks Law, the Forest Law and the Law on Protection of the Cultural Heritage, and so on. Apart from that, high cultural diversity in mountainous regions offers a good opportunity in administration of the protected areas and protection of the cultural and biological diversity (Mountain Agenda, 2002).

THE IMPORTANCE OF PROTECTED AREAS

The World Conservation Union (IUCN) has developed a global definition about "protected area". According to this;

IUCN Definition in 1994: "Terrestrial and marine areas which serve for sustainability and protection of the biological diversity, the natural and cultural resources". (Lise, 2014)

IUCN Definition in 2008 (Updated definition): "Legal areas which aim to protect nature for a long term containing related ecosystem services and cultural values." (UNEP-WCMC, 2014)

Approximately one-third of the world's protected areas are composed of national parks and nature conservation areas in the mountains. One of the reasons is that many endemic and endangered species live in this area (Price, 20014). Several examples can be given for protected areas of the world:

A significant portion of the protected areas in mountainous regions designated by UNESCO have natural and unnatural areas that are declared as World Heritage.

60% of Costa Rica which exceed altitudes of 1000 meters is composed of national parks, forests, indigenous and biological reserves and wildlife refuge or conservation areas considered as national monuments. 89% of this area is covered by forests.

In the Alps there are 300 protected areas covering more than 100 hectares and managed by more than 3000 workers. While these protected areas constituted 15% of the Alps until 2008, according to 2013 data these areas already constitute 25% of the Alps (Ariza et all., 2013).

Upon the creation of protected areas the loss of biological diversity should be reduced. However, despite the rise in the number of protected areas since the 1970s, the loss of biological diversity has been rapidly rising. This inconsistency and the reduction in the biodiversity over the last 40 years can be attributed to two main facts: (IUCN, 2014).

1) To what extent do protected areas lead to the results of biological diversity?
2) How much is the notable biological diversity represented in the protected areas?

In the past decade, almost all the world has noticed that mountain ecosystems should be protected in various protected areas. This awareness has created an opportunity. The world's fairly well-developed systems, Mountain Protected Areas, are the ideal areas to create ecological networks. Mountain protected areas give opportunity to create protection strategies in landscapes in order to protect the biological diversity model and process. On the other hand, mountain ecosystems are vulnerable to global changes such as climate change. Therefore, a clear understanding is required how the cultural and spiritual values are to be fully recognized and protected. In this sense, participation of regional and international communities is required concerning the establishment and management of protected areas (IUCN, 2014).

KAZ MOUNTAIN PROTECTED AREA

Kaz Mountain which is situated between Aegean and Marmara is the highest mountain on the Biga peninsula. The deep valleys and canyons on the mountain have a rich variety in terms of flora and fauna. In 1993, the Kaz Mountain National Park with an area of 21.450 hectares was recognized as "national park" by a decision of the Council of Ministers. Besides many kinds of plants, in this national park there are also lots of endemic species such as bears, wild cats, pigs, jackals, wild rabbits and so on (Kaz Dağı Milli Parkı, 2014).

The most important reason for protection of the Kaz Mountain National Park is that it has a great ecological structure. The Kaz Mountain has natural wealth because it has not been affected by the last ice age. There are different climatic conditions and a qualified ecosystem. Thus, Aegean, Mediterranean, Black Sea and Tundra climate systems can be seen in the Kaz Mountains. As a result of it, 800 different plant species which have 32 endemic have emerged (Kaz Dağı Milli Parkı, 2014).

In interviews with the local people in the Kaz Mountains, it was analyzed that the basic source of living in the area is forestry, small ruminants, dry wood collection and olive production. However, since 2001, there has been a drop in these activities except in olive cultivation due to the prohibitions enforced by the natioanal park and olive cultivation has become the only livelihood of the local people (Arı and Soykan, 2006). The negative effect of this prohibition concerning the peasants has been analysed as a result of the interviews with local people (Arı and Soykan, 2006). Pınarbaşı village headman expressed this reaction as follows:

"Our peasants used to provide their livelihood from the prohibited area but now they are surrounded from all sides. People are surprised about where they should go and what they shoul do. The authorised bodies should have considered this result".

Because the peasants had difficulties with finding another livelihood, they turned to migration over time. Therefore, it should be researched on local people, alternative livelihoods should be provided and the state should give financial support when protected areas are determined.

Since 2000 some companies have received licences for extraction from mines such as gold, copper, lead and zinc and excavations have been made in various regions. However, the muddy flow of drinking water in the villages had led to an understanding of the dangerous situation. To romove these materials, the land should be mined and investigated with the help of cyanide. For instance, half ton of water and 175 grams cyanide are required to decompound 1 gram of gold. In the village of Ovacık in Bergama, nearly 10 gr gold is produced from 1 ton of soil. Totally, if an avarage of 17 tons of gold is to be extracted, thousands of tons of soil have to be excavated and seperated with cyanide. It means the emergence of poisened soil, destroyed forests, extinct animals and plant species, and large opened pits. In terms of legislation, an exploration license can be taken with an application to the General Diractorate of Mining Affairs of the Ministery of Energy and Natural Resources. However, before any new arrangements are made, drilling and excavations could be made in related coordinates without EIA (Environmental Impact Assessment) report (Ilgar, 2014).

According to the decision of the Constitutional Court dated 08.07.2009 published in the Official Gazette No.27282 E:2006/99, K:2009/9; Act 2872 as amended in the third paragraph of Article 10 "Oil, geothermal resources and mineral exploration activities are outside the scope of the Environmental Impact Assessment". In the first and second paragraph of Article 56: "Everyone has the right to live in a healthy and balanced environment. Improving the environment, protecting the health of environment and preventing the pollution are the duty of the state and the citizens". In Article 56 is reasoned that the state should have responsibility for survival of the physical and mental health. The environmental effect evaluation in Article 10 refers to controlling and following of projects, analysing the chosen place and technological alternatives, preventing situations that could harm the environment.

Because it is very cumbersome after pollution to turn the environment into its former state, it should be searched for ways to prevent the negative affects instead of cleaning or restoring the environment. EIA is one of the ways for making economic investments and activities without destroying nature and polluting the environment. The basic element aimed by EIA is the environment and the creatures in the environment. Research activities excluded from the scope of EIA can bring changes in the biological diversity and nature, so it has risks for the environment. In order to eliminate existing risks, EIA is a necessity of responsibility of the state according to Article 56 of the Constitution. By this rule, excluding petroleum, geothermal and mineral exploration activities from EIA is contrary to Article 56. Thus, the provision in the third paragraph of Article 10, No. 2872, "Petroleum, geothermal resources and mineral exploration activities are outside the scope of the Environmental Impact Assessment" was founded as unconstitutional.

CONCLUSION

In conclusion, it is aimed to ensure with these arrangements that each kind of materials will be removed according to environmentally-friendly criteria. So, each mine when power plants and business begin to grow and be developed, equality and justice shall be provided and the natural resources shall be protected. Harms from for-profit organizations shall be prevented, our natural and cultural heritage shall be protected, also the flora and fauna will not be damaged. The decision taken by the Constitutional Court is so vital not only for us but also for our future generations. It is the only way to prevent harms from the rapidly-expanding cities to be done to the forests and the living creatures, also to protect the naturalness of the mountainous regions and keeping on sustainable development can be ensured with this understanding.

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INFLUENCE OF NEGATIVE CLIMATE CHANGES ON THE PHYSICAL DEVELOPMENT OF URBAN AND RURAL AREAS IN BOSNIA AND HERZEGOVINA

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ABSTRACT

The influence of negative climate changes on the physical development of urban and rural areas of Bosnia and Herzegovina has been analysed in the paper. So, economy and society in urban and rural areas of Bosnia and Herzegovina are susceptible to environmental consequences of climate changes. In practice, this means that poorer countries in development of economic activities will suffer most due to climate changes, while some developed countries can be in a position to use new commercial possibilities. Presently, there is a significant scientific consensus that human activity has affected the increase of atmospheric concentration of greenhouse gases, respectively of carbon dioxide, methane, nitrous oxide, ozone and chlorofluorocarbon, as a result of global changes of the climate that will probably change dramatically during the next centuries in Bosnia and Herzegovina.

Keywords: *climate, development, urbanisation, rural areas, population, Bosnia and Herzegovina*

INTRODUCTION

More and more intensive industrialisation and urbanisation, as well as tourism, a growing phenomenon of the 21st century, have numerous negative direct, indirect and multiplicative effects on the flora and fauna habitats of Bosnia and Herzegovina. For all mentioned above, this paper tries to indicate to a need for more significant investing into tourism development, which is presently at a very low level of development in Bosnia and Herzegovina. In the past ten years a dynamic development of tertiary activities in urban and rural areas has been distinguished; among which shopping centres take a significant position. (Nurković, R., 2012)

However, no matter how inviting the advantages of economic growth may be, they cannot be achieved without paying attention to natural and human resources on which development is based Balling, (R.C. and S.W. Brazel, 1987). It is necessary to find a better method of measuring the negative effects and influences of economic activities on the living environment and culture of Bosnia and Herzegovina. The original method of dealing with agricultural production was in service of nature protection. However, modern agriculture in the world, which is technically well equipped, specialised and market-oriented, disturbs increasingly the ecological balance (Bornstein, R. and M. LeRoy 1990). Traditional growing of agricultural crops has always been dependable on nature and limited by type of land, climate and topography, therefore, it is fully exposed to weather, vermin and various diseases. With an objective of achieving more intensive production and an increase of quantity of cultivable surfaces, natural vegetation and forests along the river courses have begun to disappear increasingly. The rest of natural vegetation with specific flora and fauna world is destroyed, and a uniform and ecologically very unstable cultural landscape in Bosnia and Herzegovina has been created.

METHODS OF WORK AND DATA SOURCES

The methodological approach is imperatively adapted to the purpose of work, and the impact of adverse climate change on the physical development of urban and rural areas in Bosnia and Herzegovina. The survey covers the urban and rural development of areas in Bosnia and Herzegovina. For negative climate change in urban and rural areas of Bosnia and Herzegovina, data from all available data sources, reports and records conducted by institutions at all levels of government and relevant professional bodies have been used, as well as information from other available sources, including the maps of affected areas, archival materials and media reports. (Nurković, R. 2006)

Analytical methods were used in the study of the impact of a negative climate change in the urban and rural areas in Bosnia and Herzegovina. A standard desk research method was used with the help of secondary data, including also the data of the population of economic activities dealing with climate change in Bosnia and Herzegovina. Historical and normative methods common to urban and rural researches were also used as a basic method of collecting primary data sources obtained from the Hydrometeorological Institute of the Serbian Republic and the Federation of Bosnia and Herzegovina. The analysis used data from 22 weather stations that had a homogeneous series of observations or made adequate research possible.

THE IMPACT OF CLIMATE CHANGE ON URBAN AREAS

Cities in Bosnia and Herzegovina play a multidimensional role in climate change on urban development of urban functions, especially on urban centres. As areas of high population density and the development of economic activities,

cities can be responsible for the temperatures in Bosnia and Herzegovina. (Đurđević V and Rajković B., 2010) As centres of economic growth, information and technological innovation, cities in Bosnia and Herzegovina have a significant role in climate change. The population in Bosnia and Herzegovina has recently surpassed the total urban population limit of 50% in 2014. It is anticipated that the urban population rate in the cities will grow even faster. Some of the urban places in Bosnia and Herzegovina show a unique vulnerability to extreme climate changes. Different geographical locations allow testing the impact of climate change in the higher climatic zones of Bosnia and Herzegovina.

This section contains information on four interrelated components of urban climate: (I) the urban heat island effect and climate pollution, (II) the current climate and climate of historical trends, (III) the role of natural climate variability, and (IV) climate projections due to the increase of greenhouse gases in the world of changes. Figure 1 provides a schematic representation of the key interactions within the urban climate systems. Coping with the relative influence of these components on the urban climate is a challenge. Natural variability can occur on multidecadal timescales, compared with the time frame for historical analysis and greenhouse gases. (Bernier, P. & Schoene, D. 2009) Another challenge is that the different climate factors cannot be independent. For example, climate change may affect the amplitude and periodicity of natural variabilities, such as the intensity and frequency of the El Niño-Southern Oscillation (ENSO). Rating of the observed climate changes is carried out based on analysis of the available data obtained from the Hydrometeorological Institute of the Serbian Republic and the Federation of Bosnia and Herzegovina. The analysis used data from 22 weather stations that had a homogeneous series of observations or it was possible to do adequate approximation. The determination of climate change is done based on the analysis of changes in air temperature and precipitation. There were detailed analyses of: differences in the average annual air temperature and precipitation for the period 1961-1990 and 1981-2010, trends of changes in air temperature and rainfall, and their extremes to Banja Luka, Sarajevo and Mostar for the period 1960-2010. Research of temperature changes for the period 1961-2010 indicate the presence of an increase in temperature in all parts of the country.

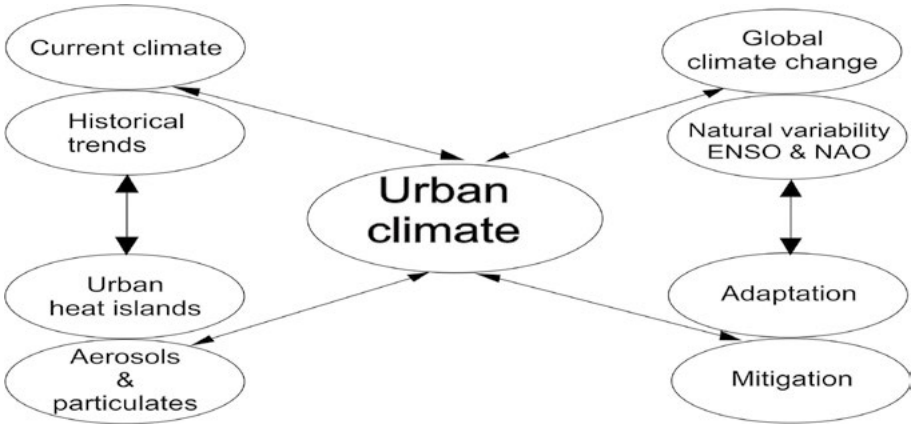

Figure 1: *Schematic representation of key interactions within the urban climate systems*

Based on a comparative analysis for the period 1981-2010, in relation to the period 1981-2010, it was found that the greatest average increase in temperature during the summer months was observed in the southern part, on the territory of Herzegovina (Mostar 1.2°C) and in the central parts (Sarajevo 0.8°C), while the largest increase in spring and winter was recorded in the north central part of the country (Banja Luka 0.7°C). The least increase was during the autumn in the interval of 0.1 to 0.3°C (Figure 2). Increase in air temperatures annually is ranged from 0.4 to 1.0°C, while the temperature rise in the vegetation period goes up to 1.0°C. However, increase in temperature over the last decade is even more pronounced (Table 1 and Figure 2). It should be noted that the increase in temperature, in addition to increasing GHG emissions, is caused by the increased insolation and increase in the urban heat island effect.

Table 1. *Changes in air temperature (°C) in Banja Luka, Sarajevo and Mostar, 1961-2010*

		Years	Vegetation period	Spring	Summer	Autumn	Winter
Banja Luka	1961-1990	10,6	16,9	10,9	19,7	10.9	0,8
	1981-2010	11,4	17,9	11,6	21,0	11,5	1,5
	2001-2010	11,9	18,4	12,3	21,7	11,8	2,2
Sarajevo	1961-1990	9,7	15,7	9,7	18,3	10,4	0,4
	1981-2010	10,1	16,2	10,0	19,1	10,5	0,7
	2001-2010	10,4	16,5	10,5	19,6	10,6	1,1
Mostar	1961-1990	14,6	20,3	13,6	23,5	15,3	5,9
	1981-2010	15,2	21,2	14,3	24,7	15,5	6,2
	2001-2010	15,5	21,8	14,9	25,3	15,5	6,5

Source: Hydrometeorological Institute of the Serbian Republic and the Federation of Bosnia and Herzegovina, 2010

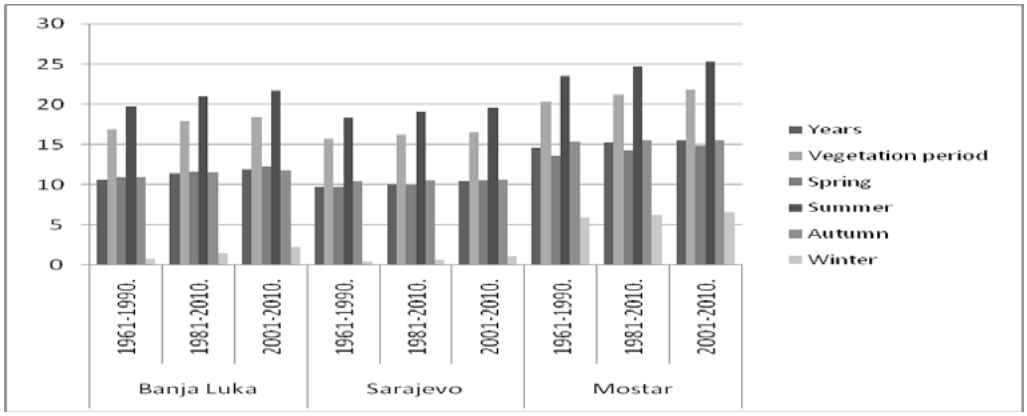

Figure 2: *Changes in air temperature (°C) in Banja Luka, Sarajevo and Mostar, 1961-2010*

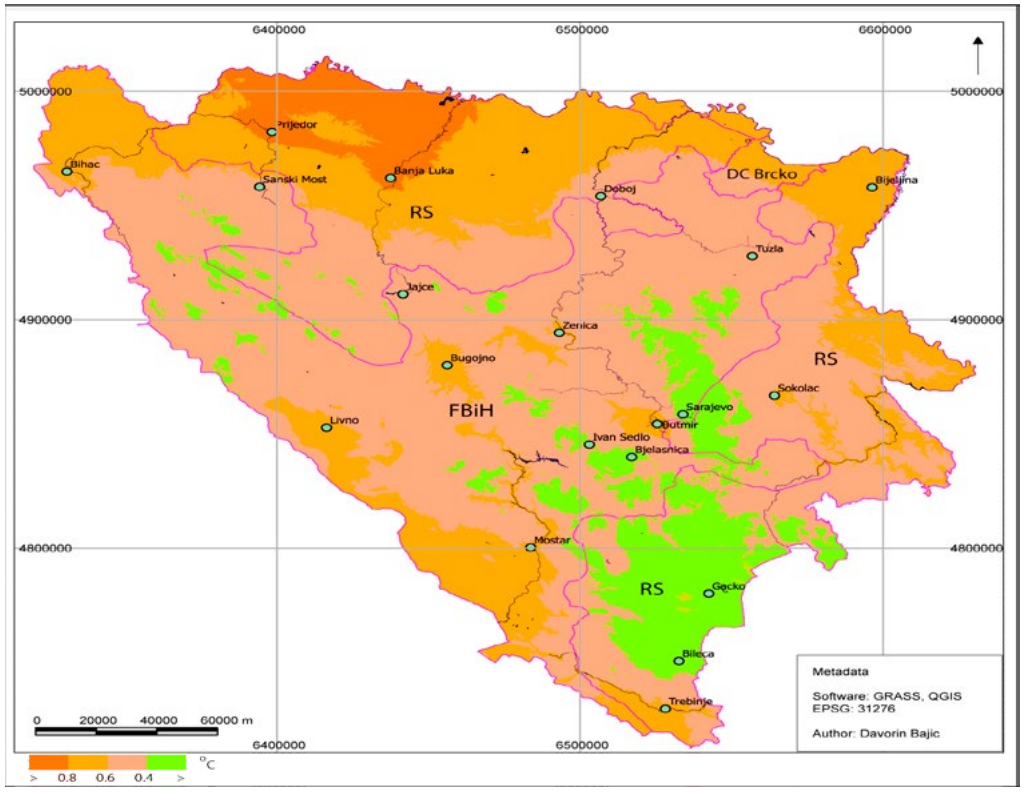

Figure 3: *Climate change in Bosnia and Herzegovina in 2010*

CHANGES IN PRECIPITATION IN THE URBAN AREAS

In the period of 1961-2010, most of the territory of Bosnia and Herzegovina is characterized by a slight increase in rainfall annually. The biggest positive change in annual precipitation is a characteristic of the central mountainous areas (Bjelašnica, Sokolac) and the surrounding areas of Doboj, while the largest deficit was recorded in the south of the country (Mostar, Bileća). The largest decrease of rainfall is during spring and summer. It is especially noticeable in Herzegovina (up to 20%). In autumn, the largest increase of rainfall per season was recorded and the biggest surplus was in the northern and central parts of Bosnia and Herzegovina. Although there were not any significant changes recorded in the amount of rainfall, there is greatly disturbed pluviometric regime, i.e. annual distributions. (Đurđević V and Rajković B.,2010) (Figure 3)

The number of days with precipitation exceeding 1 mm has decreased on almost the entire territory, while the percentage of annual precipitation, due to the occurrence of rainfall greater than 95% calculated for the period 1961-2010, was on the rise. In other words, although annually there were no significant changes in precipitation, reducing the number of precipitation days larger than 1.0 mm and increasing the number of days with intense precipitation has greatly disturbed the pluviometric regime. (Trbic G et all. 2010) The estimated change in the annual distribution of rainfall with increasing temperature are one of the key factors which cause frequent and intense droughts and flooding phenomena on the territory of Bosnia and Herzegovina. For the study, three urban settlements in Sarajevo, Mostar and Banja Luka were taken, which are shared by a number of characteristics, but differ in key respects (Spasova D., Trbic G., Trkulja V., Majstorovic Z). 2007 They are all big concerning the population and they have a dynamic economic development of activities in Bosnia and Herzegovina. (Table 2 and Figure 4)

Table 2. *Changes in the amount of precipitation (mm) in Banja Luka, Sarajevo and Mostar, 1961-2010*

		Years	Vegetation period	Spring	Summer	Autumn	Winter
Banja Luka	1961-1990.	1027	562	262	298	246	221
	1981-2010.	1034	540	258	270	278	227
	2001-2010.	1078	546	263	271	280	221
Sarajevo	1961-1990.	932	468	226	242	241	223
	1981-2010.	936	472	221	236	266	213
	2001-2010.	1014	514	226	252	304	226
Mostar	1961-1990.	1523	522	379	196	450	497
	1981-2010.	1405	502	335	173	458	439
	2001-2010.	1514	534	339	188	472	506

Source: Hydrometeorological Institute of the Serbian Republic and the Federation of Bosnia and Herzegovina, 2010.

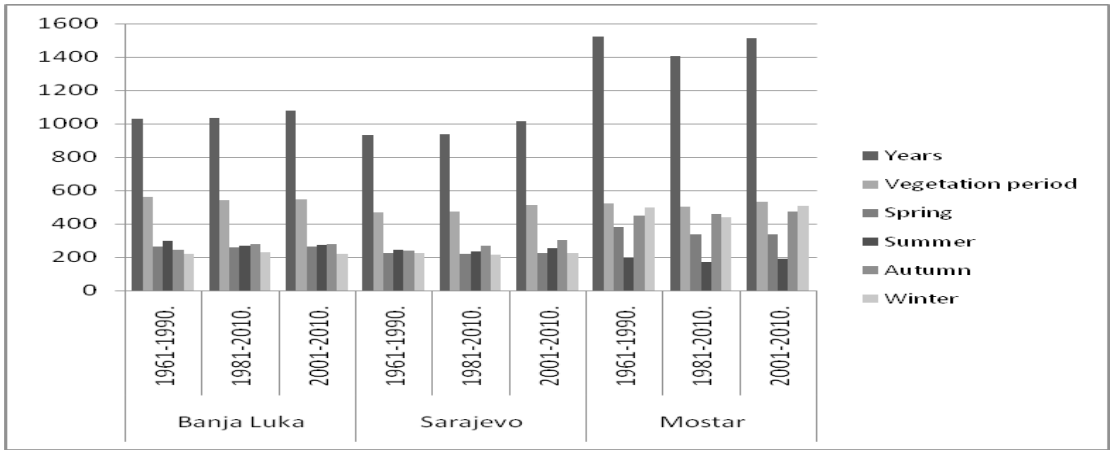

Figure 4: *Changes in the amount of rainfall (mm) in Banja Luka, Sarajevo and Mostar, 1961-2010*

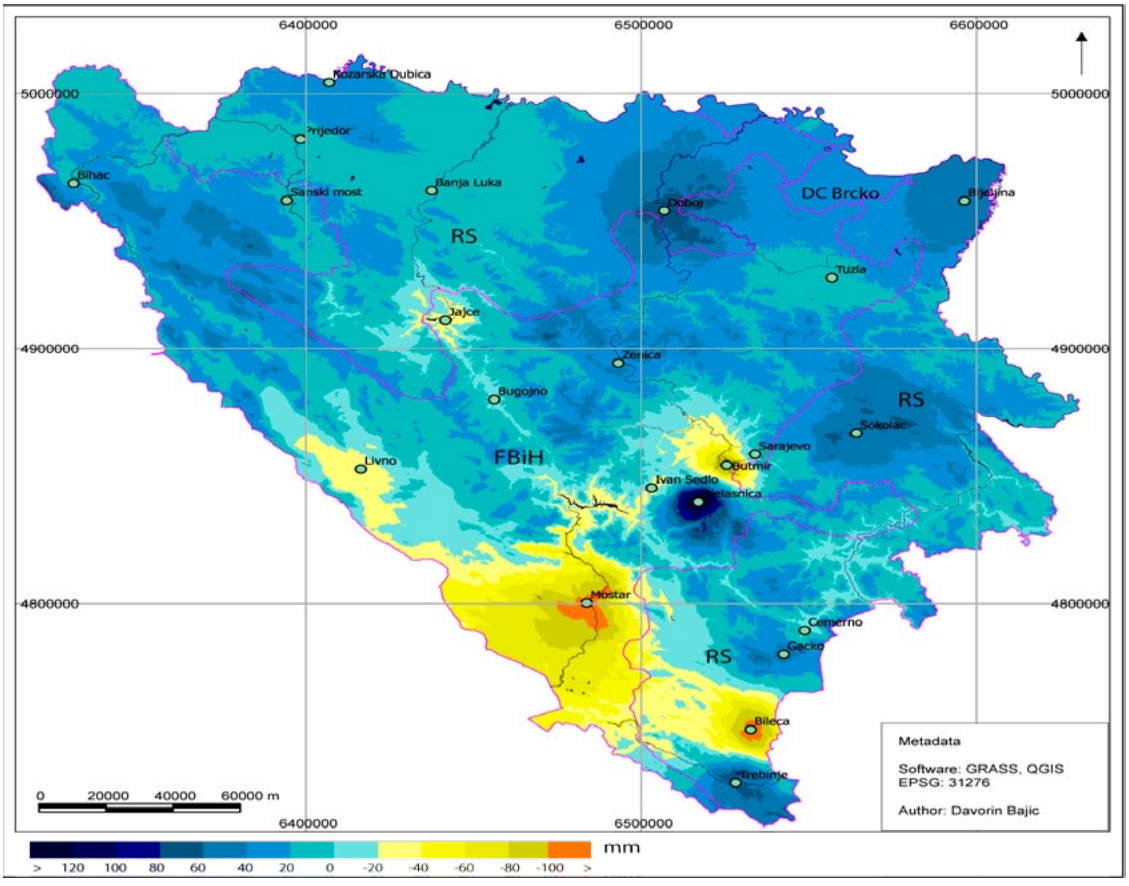

Figure 5: *Changes in the annual precipitation in Bosnia and Herzegovina (comparison period 1981-2010).*

CLIMATE CHANGE AND RURAL DEVELOPMENT

Climate changes in the rural areas of Bosnia and Herzegovina are caused by the accumulation of greenhouse gases such as carbon dioxide, methane, sulfur dioxide, chlorine, carbon, etc. in the lower atmosphere.(Nurković, R., 2013) The supply of agricultural commodities is influenced by factors such as droughts, floods, extreme weather and other natural disasters. A good example of this are the heavy floods in rural and urban areas of Bosnia and Herzegovina in 2014. Rural areas in modern development are the holders of the agri-production function, the function of industrial production, trade and service functions, infrastructure functions in the service of the surrounding urban areas, cultural and political functions, leisure activities and residential functions that by changing the socio-economic structure of the population become more complex. This is a ripe area for potential future research of the climate in the rural areas of Bosnia and Herzegovina.

Agricultural production has traditionally remained the predominant activity in the rural areas of Bosnia and Herzegovina. (Čustović, H. 2005) A large population of returnees managed to build their own farms with the aim of producing and selling products, not having any other economically acceptable option. Many of these people are former employees of industrial and tertiary sector, so they return to farms owned by their families. Their abilities are limited, as well as experience in farming. (Ngigi, S.N. 2009) On the farms, there are usually a few animals and a large number of small plants, most of which are consumed and exchanged locally with getting a very small income. (Wajih, S.A. 2008) At the beginning of the 21st century, according to the *Agency for Statistics of Bosnia and Herzegovina*, Bosnia and Herzegovina had 2.450.000 hectares of agricultural land which was 48% of the total area, of which the arable land accounted for one million acres, 36,000 acres of orchards, vineyards on 4000 hectares, while the remaining 470,000 hectares comprised meadows and pastures on 935,000 hectares. This means that agricultural land is a scarce resource, and it should be handled very carefully in order to create more added value (available per capita 0.26 ha of arable land, or 0.51 ha of agricultural land). Despite this, more than 40% of the agricultural land is still unused. (Figure 5)

Figure 3: *Mini-plantation of vines near Srebrenik, 2013*

More than half of the households in rural areas in 2010 had an area of less than 2 hectares. It is very important to point out the extremely unfavourable structure of agricultural holdings in terms of their size. The average size of an agricultural holding is 3.1 ha, and they are, on average, divided into 7-9 parcels, which is the basic element that inhibits the rapid modernization of the sector. The development of chemical and metal industrialization in Bosnia and Herzegovina in the period of 1953-2011 caused deep structural changes that resulted in a complex socio-economic transformation, with the corresponding consequences in the settlement structure, functional and physiognomic characteristics and environment of the rural areas. Widely launched, urban based, the industrialization was accompanied by intense social restructuring of farmers, deruralisation, and associated with that, also the rural exodus. During the period of 50 years, in the inter-census period of 1953-2011, the number of farmers decreased by approximately 79.5% or 2.4539.271. (*Agency for Statistics of Bosnia and Herzegovina, 2010*)

In response to the increasingly demanding consumer demand, but also to the needs of the society, growing organic crops has grown into the main "alternative" in food production. Due to climate change, organic farming represents a collection of different production techniques that take into account the quality of the environment, adverse impacts are forbidden. That means we should provide organic products and products with additional quality, and place them on the market through a quality assurance system and voluntary labelling under the names of state and private brands. According to the *Agency for Statistics of Bosnia and Herzegovina, 2010*, in the period of 2003-2013 in Bosnia and Herzegovina, under organic production there was more than 100,000 ha of arable land and gardens, over 40,000 meadows and much less orchards and vineyards. (Nurković, R., 2013)

CONCLUSION

Climate change is a global and regional environmental problem facing humanity, with strong implications for the rural population. For developing countries such as Bosnia and Herzegovina, we have to face the impact of climate change in urban and rural areas, especially in agriculture, which can improve rural incomes and maintaining food safety. Also, it is our moral responsibility to give to our children and future generations a cleaner and safer life in Bosnia and Herzegovina. Now it is time to follow the values and lessons from our long traditions and teach the population in urban and rural areas of Bosnia and Herzegovina about environmentally sustainable development.

Experts from domestic institutions in Bosnia and Herzegovina at all levels, throughout the process, worked together with their counterparts in the international community regarding climate change. All participants were acquainted with the climatic problems in Bosnia and Herzegovina, based on the best international practices and standards during the seminar that preceded the evaluation. Sectoral teams visited all the affected areas in order to meet the representatives of the entity, cantonal and municipal authorities, as well as relevant representatives of local communities, non-governmental organizations, and field offices of the UN and the European Union. A total number of 26 municipalities were visited and a few had been visited several times by different sector teams.

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ARSENIC AND HEAVY METAL VERTICAL DISTRIBUTION IN SOIL OF THE OGOSTA RIVER LOW FLOODPLAIN, NW BULGARIA

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ABSTRACT

The vertical distribution of arsenic (As), zinc (Zn), cadmium (Cd), lead (Pb) and copper (Cu) in the floodplain soil along the mining affected Ogosta River, NW Bulgaria is studied in three profiles. Arsenic is the main pollutant exceeding more than 1600 times the European background level for floodplain soils (FOREGS) and 180 times over the Dutch Intervention value with concentrations from 257 mg/kg to more than 10 000 mg/kg. The rest of the trace elements were found to range within (mg/kg): Pb 183-2982, Cd 0.7 – 12.6, Zn 120 – 1165, Cu 56 – 373. Depending on the proximity to the mining area and the position of the floodplain sections above the river, variations of a common distribution pattern are determined. High contaminant levels from topsoil to deep layers are characteristic for the lowest floodplain levels in the Ogosta Valley upstream the homonymous dam lake. Heavy metal contents tend to increase in depth in the most frequently inundated floodplain sections due to deposition of less contaminated river sediments in the last three decades. The floodplain areas lower than 1.2 m seem to be the key secondary pollution source in the Ogosta River riparian zones posing environmental risk to the groundwater, river water and river channel sediment.

Keywords: *heavy metals, arsenic, floodplain soil, mining pollution, Ogosta River*

INTRODUCTION

River floodplains are landscapes of a high 'value' in regards to the role of wetlands for biodiversity maintenance. They also provide resource for development of intensive farming. Riparian lands are highly vulnerable to contamination due to accumulation of sediments and chemical substances transported by river waters from the drainage basins downstream thus functioning as cascade landscape-geochemical systems (Penin, 1993; Glazovskaya, 1988). As a result floodplain sediments often render as depots of hazardous substances, especially in the mountainous river basins, where ore-mining and metal processing take place. Extraction and dressing of metal ores generate fine grained refuse material containing residual heavy metals and metalloids stored in tailings impoundments. If discharged into local river systems, these fine particles can be transported dozens of kilometres downstream the river course and deposited in the riparian areas during high flood events (Brewer et al., 2003; Coulthard, Macklin, 2003; Klemm et al., 2005). Numerous studies show that sediment layers set during mining periods often comprise contaminated sections within the vertical floodplain profile (Leenaers et al., 1988; Middelkoop, 2000; Owens, Walling, 2003; Swennen, Van der Sluys, 2002). Therefore, the knowledge on contaminant presence along the sediment profile is quite important for groundwater contamination hazard assessment. The aim of the present study is to outline the general patterns of vertical distribution of heavy metals and metalloids in the contaminated floodplain soil of the Ogosta River valley in NW Bulgaria. It is focused on the low lying areas along the main river where the highest pollutant concentrations are documented (Spectroteh, 1994; Kotsev, 2003; Mandaliev et al., 2013) and the aquifer is expected to be more vulnerable to arsenic and heavy metal pollution.

DATA AND METHODS

The study area covers the Ogosta River valley located in the north-western part of the Stara Planina Mountains upstream the 'Ogosta' dam lake (Figure 1). Mining activities in the area are known since Roman times when gold was extracted from the fluvial sands along the river and its tributaries (Milanov, 1990). Saxons operated lead mines in the vicinity of the town of Chiprovtsi during the Middle Ages, but industrial mining activities started in 1951 and lasted until 1999.

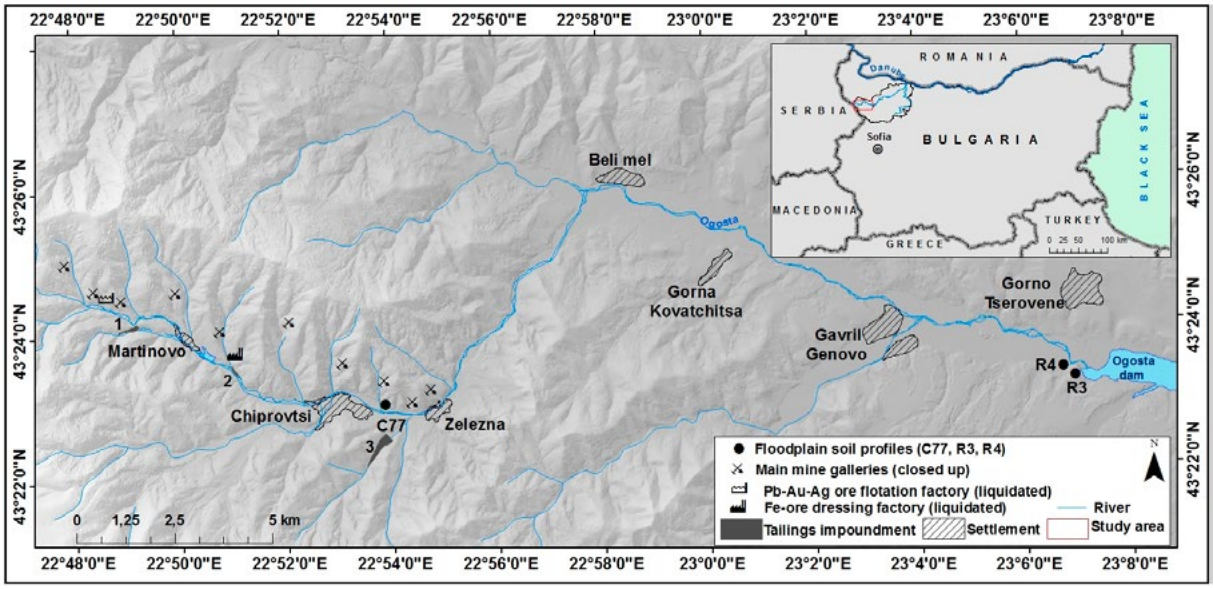


Figure 1. *Soil sampling sites designation in the Ogosta Valley*

The mine tailings generated by iron-ore dressing and by lead-ore flotation were stored in three tailings impoundments near the town of Chiprovtsi. Intensive rainfalls in the spring of 1964 resulted in tailings dam failure of the 'Mechi dol' tailings impoundment and release of 100,000 t of fine waste rich in arsenic and heavy metals (Chiprovets-EAD, 1995). Later on mine tailings from both ore-processing factories were discharged directly into the tributaries of the Ogosta River until 1979. The mineral and chemical composition of the river channel sediment have been strongly affected for many kilometres downstream the mining area. Several high flood events and irrigation practices in the Ogosta Valley during the period of industrial mining led to extensive soil contamination in the river floodplain. Detailed survey of heavy metal and arsenic levels in topsoil was conducted in 1994 (Spectroteh, 1994), but there is scarce information about contamination of deeper soil layers. Detailed description of the river terrace spectrum in the Ogosta Valley upstream the dam lake was accomplished by Stoilov (1966, 1970). According to his findings, the low floodplain can be found at 1-2.5 m above the river and the high floodplain - at 3.5-6.0 m. The low floodplain is partially presented in the mountainous part of the valley near Chiprovtsi town, but it is well developed downstream the river with span of up to several hundred meters in the area next to the dam lake.

Fluvisols in the study area are determined to be eutric (FLe, FAO) according to the soil map of Ninov (1997). The soils are base-rich with neutral to slightly alkaline pH. The soil profile is often shorter than 30 cm (Institute of Soil Sciences, 1963, 1975; Vodproekt-AD, 1992). The clay fraction (< 0.001 mm) varies between 15-25% while fraction < 0.01 mm is 30-45% in the valley between the village of Beli mel and the dam lake (Institute of Soil Sciences, 1980). Soil texture is heavier in the valley upstream Beli mel, where the clay fraction is 17.1-28.5% and the fraction < 0.01 mm is 29.6-61.6%.

The organic carbon content in the topsoil of local Fluvisols usually varies between 1.2% and 3.5 % and occasionally reaches 5-6 % in some locations. It ranges from 0.6% to 0.9% in the deeper layers.

Three soil profiles in the lower floodplain of the Ogosta Valley have been studied in 2007 (Figure 1; table 1). One of them (C77) is located in a floodplain section 1.2 m above the river in the mining area near the town of Chiprovtsi.

Table 1. *Location of the soil profiles*

Profile code	Latitude	Longitude	Altitude m	Vertical distance to the river level m
C77	43°22'55.4"	22°53'44.9"	447	1.2
R3	43°23'26.8"	23°06'50.4"	187	1.2
R4	43°23'21.2"	23°06'51.6"	186	0.9

The other two profiles R3 and R4 are nearly 25 km downstream of C77, close to the 'Ogosta' dam lake, where intensive accumulation of river sediment occurs. They are situated at 1.2 m and 0.9 m above the river, respectively. The soil samples are taken from refreshed cut banks of the river considering the boundaries between the sediment layers. The samples were air-dried and afterwards powdered in porcelain mortar. Soil samples (fraction < 0.063 mm) were digested with *aqua regia* at 95°C and analysed at the ACME ANALYTICAL LABORATORIES LTD (Canada). Concentrations of arsenic and heavy metals were determined by ICP-MS. Measurements of replicates, reference material STD DS7 and blank samples provided high quality of the obtained data. The detection limits for the studied chemical elements are as follows (mg/kg): zinc (Zn) 1 –

10 000; arsenic (As) 0.5 – 10 000; lead (Pb) and copper (Cu) 0.1 – 10 000; cadmium (Cd) 0.1 - 2000.

RESEARCH FINDINGS AND DISCUSSION

Concentrations of heavy metals (As, Pb, Cu, Cd, Zn) in the three soil profiles are assessed against the mean values for river flood sediment in Europe (FOREGS, 2005) and the Dutch intervention values (table 2) which are widely used for environmental quality assessment (Bird et al., 2003; Macklin et al., 2003). The first ones are in the role of background levels, while the Dutch intervention thresholds define serious soil pollution and a certain risk of negative consequences for the biota (Brewer et al., 2003).

Table 2. *Reference and threshold values for heavy metals in soil (mg/kg)*

	As	Pb	Cd	Zn	Cu
European background for floodplain soil[1]	6	16	0.30	56	16
Dutch intervention values[2]	55	530	12.0	720	190

Sources: [1]FOREGS (2005); [2]Macklin et al. (2003)

Arsenic content in soil is extremely high in all studied profiles. The highest concentrations exceed the upper detection limit of 10 000 ppm (table 3), which is 180 fold over the Dutch intervention value and 1600 times over the European background.

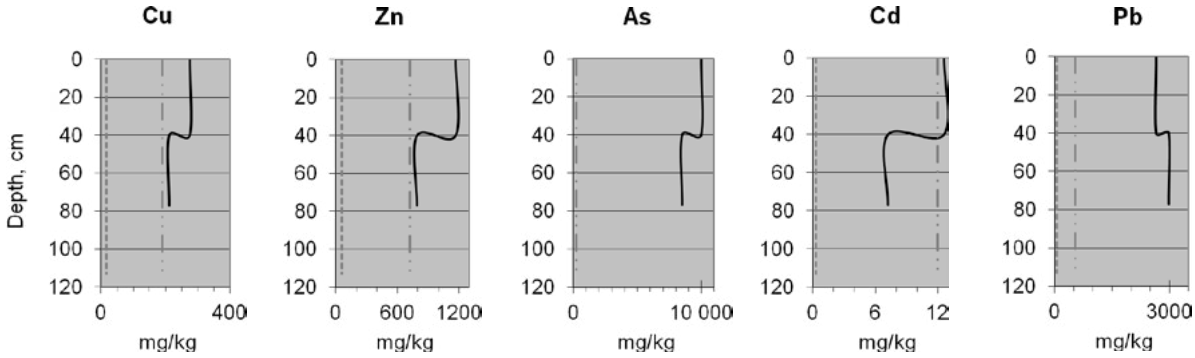
Table 3. *Concentrations of heavy metals in the soil profiles C77, R3 and R4*

Sample code	Depth cm	As mg/kg	Pb mg/kg	Cd mg/kg	Zn mg/kg	Cu mg/kg	Mn mg/kg	Fe %
C77-1	0-40	10000	2652	12.6	1165	275	8913	8.30
C77-2	40-70	8525	2982	7.2	791	212	>10000	7.98
R3-1	0-4	385	227	0.8	178	71	2245	3.87
R3-2	4-20	257	284	0.9	183	79	1859	3.75
R3-3	20-33	603	208	0.7	130	61	2974	3.93
R3-4	33-70	1717	342	1.2	173	95	6677	5.50
R3-5	70-90	1117	183	0.7	120	56	3377	4.49
R3-6	90-113	3792	399	2.0	247	172	6055	5.45
R4-1	0-13	696	214	1.1	175	74	2169	3.67
R4-2	13-30	683	318	1.4	194	62	1588	3.67
R4-3	30-70	8954	567	3.6	331	213	5330	7.58
R4-4	70-90	>10000	1067	8.2	507	373	5440	12.06
mean*	-	3894	787	3.4	350	145	4719	5.85
min	-	257	183	0.7	120	56	1588	3.67
max	-	>10000	2982	12.6	1165	373	>10000	12.06

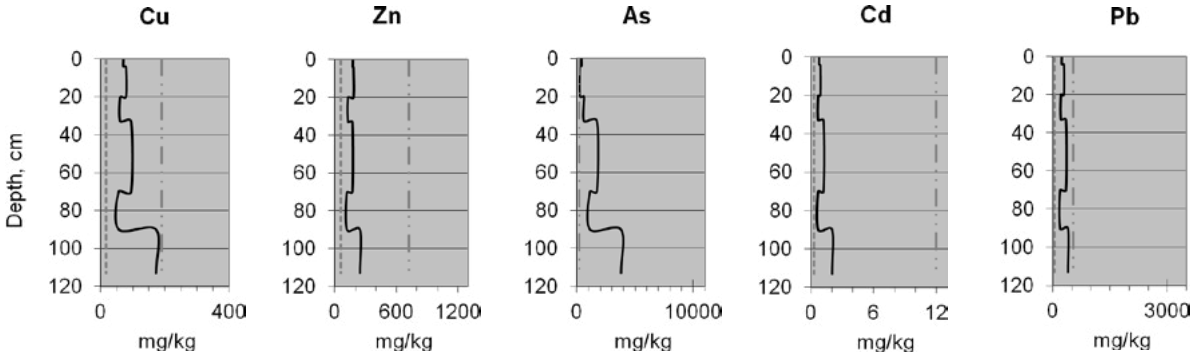
**Values over the upper detection limit are taken as equal to the limit.*

Considering the level of contamination, Pb is the second element of concern. Its maximum concentration of 2982 mg/kg is measured in profile C77 within the mining area. The excess over the intervention threshold is more than 5 times. Lower Pb levels are determined in the vicinity of the dam lake, where Pb mostly varies from 183 mg/kg to 399 mg/kg, between the background and intervention values. Lead concentrations over the intervention threshold are measured in the deeper sediment deposits of R4, where Pb is up to 1067 mg/kg. Similar to Pb, Cu exceeds the Dutch threshold in C77 and R4 and is measured below it in R3. Zinc and Cd can be found over the intervention value in C77, while in the profiles downstream the river both contaminants are detected between the two thresholds.

Profile C77 in the low floodplain (1.2 m) near the town of Chiprovtsi



Profile R3 in the low floodplain (1.2 m) next to the 'Ogosta' dam lake



Profile R4 in the low floodplain (0.9 m) next to the 'Ogosta' dam lake

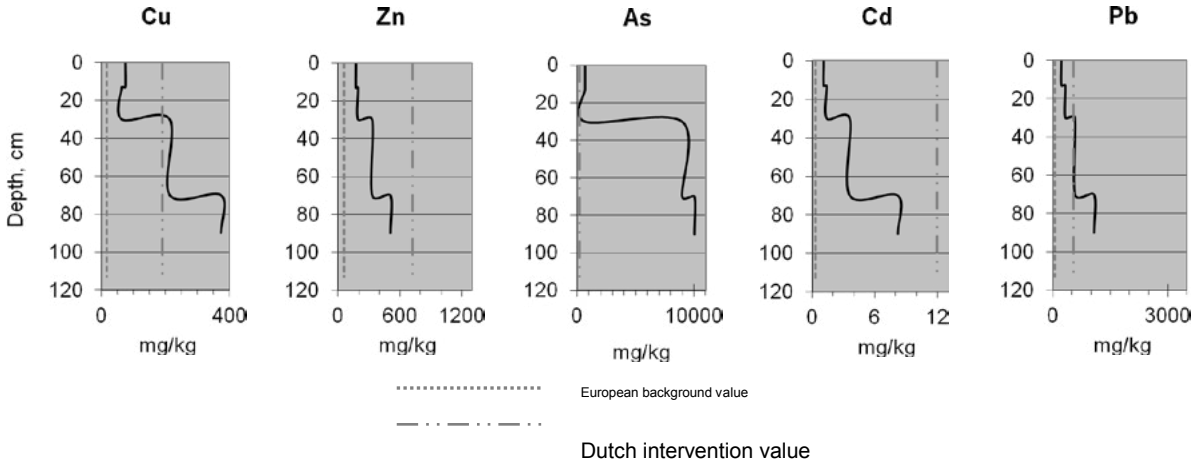


Figure 2. *Vertical distribution of heavy metals in the soil of the low floodplain*

The site C77 is more contaminated due to its proximity to the main pollutant emitters in the Ogosta Valley. Increased contents of heavy metals in the lower floodplain can be also expected dozens of kilometres downstream the course of the Ogosta River as it is documented in profiles R3 and R4.

Studied heavy metals show almost identical vertical distribution pattern in each profile (Figure 2). This fact suggests rather common source of pollution and similar impact ratio between the Fe-ore dressing factory and the Pb-ore flotation to the river sediment for a long period of time.

Profile C77 reveals a vertical distribution pattern of slight decrease of heavy metal contents from the topsoil to the deeper sediment layers. Unlike C77, R3 and R4 show an opposite trend with increasing pollutant contents in depth. The

difference between the vertical distribution pattern in the mining area and downstream the valley can be explained with more frequent inundation of the floodplain area next to the lake. Less contaminated sediments were accumulated probably in the 80-ies of the XX century and later when the intensity of mining activities significantly decreased and mine tailings material was pumped into 'Golyam Bukovets' impoundment instead of discharging into the river. The pattern of increasing concentrations from surface to deeper and older sediment layers of profiles R3 and R4 'recorded' the process of gradual improvement of the environmental quality of the Ogosta River sediment.

CONCLUSIONS

The three studied profiles represent versions of a common pattern of heavy metal vertical distribution in the sediment of the lowest floodplain sections in the Ogosta Valley. A particular feature is the presence of contaminants within the entire profile 1 m in depth. This pattern was identified also in other soil profiles located in the studied floodplain up to 1.2 m above the river (Mandaliev et al., 2013; Kotsev et al., 2006). Highly contaminated alluvial deposits are expected to be in contact with the groundwater in the low floodplain for certain periods during the year, especially at high river flow. This poses considerable risk of As release from sediment to groundwater, which may also affect the Ogosta River. The river bank erosion releases back the heavy metals bound in the floodplain soil into the river channel thus preserving the contamination level of the river channel sediment and particulate matter increased even after the cease of the mining activities. The highly contaminated and most frequently inundated part of the floodplain, including the sections up to 1.2 m above the river, can be regarded as significant diffuse source of groundwater and river pollution. A concept of Ogosta Valley remediation should consider intervention activities for this part of the floodplain as a task of the highest priority.

ACKNOWLEDGEMENTS

This study has been realized in the frame of the research project VU-NZ-04/05 "Geoecological assessment of the tailing impoundment waste as main pollutant for the environment (soil, water and vegetation) in the Chiprovtsi area, Northwestern Bulgaria", financially supported by the National Science Fund. The authors would like to thank Velimira Stoyanova from the National Institute of Geophysics, Geodesy and Geography for producing Figure 1.

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OROBIOME VEGETATION OF TURKEY

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ABSTRACT

Turkey covering an area of 780 000 km^2 and located in the Alpine-Himalayan orogenic belt is a mountainous country with mean elevation of 1132 m. 56 % of the total land of Turkey is above 1000 m. The mountains exceeding 1000 m in the coastal areas, 1100/1200 m in Inner Anatolia, 2000-2200 m in NE Anatolia and 500/600 m in SE Anatolia form distinct habitats called orobiomes and/or mountain ecosystems. The orobiomes of the Northern Anatolian Mountains contain Euro-Siberian plants mostly composed of coniferous trees and alpine grasses. The western and middle parts of Taurus Mountains have Oro-Mediterranean vegetation mostly *Cedrus libani, Abies cilicica* and *Pinus nigra* forests. The orobiomes of the SE Taurus is the main productive spreading areas of oak forests. Inner Anatolia orobiomes contain dry forest composed of *Pinus nigra, Quercus* and *Juniperus* species. In NE Anatolia, mountain steppe and alpine grass form orobiomes vegetation. Aspect, altitude and deep valley and karstic depressions in the mountain belts also form special habitat for the growth of different floristic region. Especially karstic depressions and high mountains are the main refuge areas of some endemic and relict plant species.

Keywords: *orobiome, vegetation, mountain ecology, Turkey*

INTRODUCTION

Mountain environments are also called mountain ecosystem and/or orobiomes cover the ecosystems of upland and/or mountain areas on which climatic properties are different than those of the lowlands. The decrease of the temperature contributes to the growth of cold resistant vegetation and the increase of the precipitation also supports the growth of cold-humid kinds of vegetation. In the Taurus Mountains, for example, appear cedar, fir and black pine forests that are called Oro-Mediterranean forests. Over the native timberline of these mountain ranges is the subalpine meadow region.

The deep valley forming rain shadow areas in the mountainous areas lead to the growth of semiarid vegetation. Some relict species belonging especially to the Last Glacial epoch are also seen in the upper part of the mountains in Anatolia (Atalay 1992, van Zeist and Bottema 1991).

On the other hand, micro and local climate variations are also important in the mountain regions of Turkey, with different aspects of steep slopes exhibiting contrasting conditions due to variations in precipitation and solar energy receipt.

Mountain soils are usually shallow because the soil has eroded and the pedogenic processes are slow due to the short vegetation or decaying period in the cold conditions. In the mountainous areas of Turkey the ordos of entisol and inceptisol are common especially on the steep slopes (Atalay 2011).

MATERIAL AND METHOD

Study materials depend mainly on field observation between 1970-2014, and literature mainly on the geomorphology of Turkey (Atalay 1987), the ecology and seed transfer regioning of the main forest trees of Turkey such as *Picea orientalis* (Atalay 1985), *Cedrus libani* (Atalay 1987), *Fagus orientalis* (Atalay 1992), *Pinus brutia* (Atalay, Sezer and Çukur 1999), *Pinus nigra* (Atalay and Efe 2010), *Pinus sylvestris* (Atalay and Efe 2012). Ecosystems of NE Anatolia (Atalay et al 1985), Ecoregions of Turkey (Atalay 2014), Vegetation geography of Turkey (Atalay 2015), and Applied Climatology (Atalay 2012) and other cited references are considered in the determining of the mountain ecosystems.

As to methods, firstly the altitudinal boundaries of the orobiomes are established according to the different climatic regions of Turkey. This boundary reflects the vegetation differences according to the altitude. Firstly the climatic type prevailing on the lower belt and its vegetation is introduced and then the changes of climatic data and vegetation in the upper area are defined, thus the orobiomes that differ from the lowland are established. The specific orobiome properties of the main climatic region are introduced. In order to show orobiomes, many topographic and vegetation profiles are drawn and many photos are added to show some important properties of the orobiomes.

FINDINGS

FORMATION OF THE MOUNTAINS IN TURKEY

Turkey which is in the Alpine-Himalayan orogenic belt has very high and rugged topography. Its mean elevation in Thrace is 1132 m, and 1162 m only in Anatolia. The altitude of Anatolia increases from the west to the east, and from the coastal belt toward the orogenic range extending both in the north and south of Anatolia.

According to the altitudinal belts, the belt higher than 1000 m accounts for 56 % of the total land of Turkey (Tanoglu, 1947, Table 1).

Table 1: *Altitudinal belts of Turkey (Tanoglu 1947).*

Altitudinal belt (m)	Area (km²)	Rate of total land (%)
0-250	79 254	10.4
250-500	53 912	7.1
500 -1000	201 999	26.6
1000 - 1500	230 775	30.4
1500 - 2000	118 284	15.5
More than 2000	75 754	10.0
Total	759 987	100.0

Turkey's mountains can be classified into three groups in terms of their formations.

Orogenic Mountains: There are two main orogenic belts called the **Northern Anatolian Mountains** in the northern part of Anatolia and the **Taurus Mountains** in the southern part of Anatolia. These mountains have been formed with the folding and uplifting of the sediments in the Tethys Sea during the alpine orogenic movements which occurred in the Lower Tertiary especially during the Oligocene period. After this period these mountains have undergone vertical tectonic movements. So these mountains, as a whole, are uplifted (Atalay 1987a).

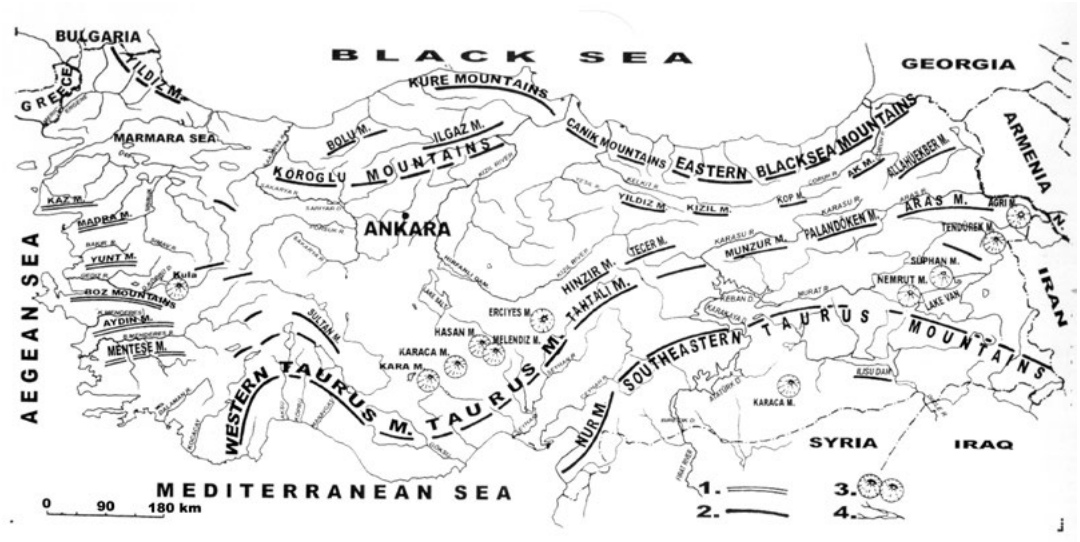

Figure 1. *Main mountains of Turkey. Explanatation: 1. Horst mountains, 2. Orogenic range or mountains, 3. Volcanic mountains, 4. Rivers*

Block and/or Horst Mountains: Vertical faulting movements are responsible for the formation of the Block Mountains. The rigid Palaeozoic metamorphic masse of Western Anatolia was subjected to vertical tectonic movements which occurred during the Upper Tertiary and Early Holocene. Thus, a horst and graben system was formed with dissecting of this masse along the fault line. Edremit, Bakircay, Gediz, Small Meander and Big Meander are the main grabens and the horsts fitting mountains are the Mountains of Kaz, Yunt, Boz, Aydin and Mentese. The mountains such as Dumlu, Kagapazari, and the Aras Mountains encircling tectonic depressions of NE Anatolia can be considered as horst blocks. The relative altitude between the bottom of such grabens and mountains is at least over 1000 metres.

Volcanic mountains. The central volcanic eruptions occurring between the Neogene and Quaternary periods formed volcanic cones such as Erciyes, Karadag, Karacadag, Melendiz in Central Anatolia, Agri (Mont Ararat), Suphan, Tendürek, Kisir, Aladag, Nemrut in Eastern Anatolia, and Karacadag in SE Anatolia (Figure 1).

VEGETATION OF OROBIOMES

The orobiomes of Turkey contain montane forest vegetation composed of coniferous forest and alpine and subalpine herbaceous vegetation growing under the cold humid and sub-humid climatic conditions. The altitude and aspect factors determine these vegetation compositions according to the climatic regions of Turkey (Figure 2, 3; Atalay 1982, 1984, 2001, Atalay et al 1985, 2012, Mayer et al 1986)).

These mountains rising mostly abruptly along the Black Sea coast start in the Thrace and go on as a parallel to the coast of the Black Sea. The Northern Anatolian Mountains have been deeply cut by the rivers of Coruh, Harsit, Kizil and Filyos flowing into the Black Sea. Grabens and/or depressions separate two main branches of the Northern Anatolian Mountains: the Coastal Mountains and the Backward Mountains of Northern Anatolia. The main Coastal mountains and their high elevations are Yıldız M. (1031 m), Kure (2019 m), Canik M. (1194 m), and Giresun M. (3038 m), the Eastern Black Sea Mountain (Kackar Hill 3932 m). The second range lying the southern part of the Northern Anatolian Mountains are Koroglu M. (2499 m), and Ilgaz M. (2546 m), Camlibel, Cimen, Mescit-Ala Mountains (2329 m) and Yalnizcam M. (3202 m).

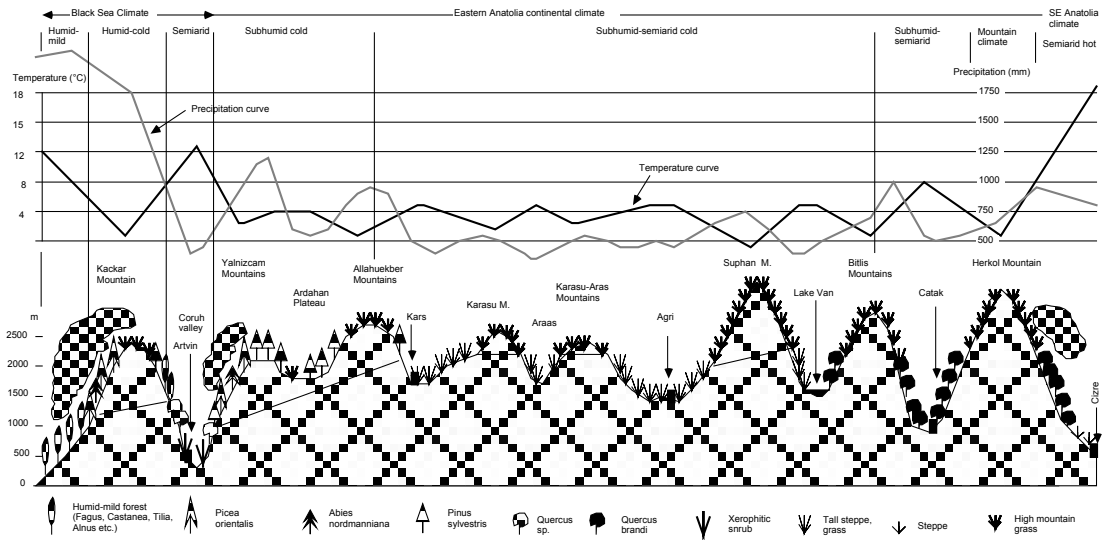

Figure 2. *The N-S profile showing the distribution of precipitation, temperature and vegetation in East Anatolia*

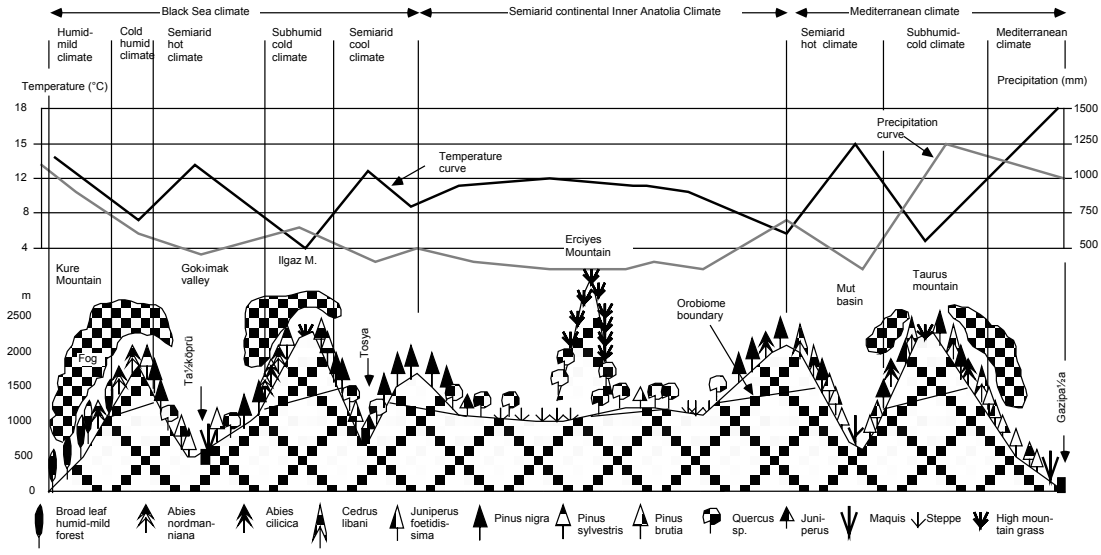

Figure 3. *The N-S profile showing the distribution of precipitation, temperature and vegetation in Central Anatolia*

The Northern Anatolian Mountains extending in the Black Sea geographical region of Turkey are under the influence of the Black Sea climate characterized by mild-humid conditions on the coastal belt between 0 m and 1000-1200 m, and cold-humid covering the upland mountain areas. The mean annual temperature which is 12ºC-14ºC on the coastal belt of the Black Sea decreases to nearly 8-9ºC at an elevation of 1000 m, to 5-6ºC at an elevation of 2000 m, and it is below freezing point over 3000 m. July temperatures to be recorded are 22-23ºC on the coastal area and under 18ºC above 1000 m. January temperatures which are nearly 6-7ºC on the coastal belt fall below the freezing point above 1000 m. Conspicuous property of the Black Sea Region is that it is the rainiest region of Turkey. Rainy conditions prevail through all seasons in the coastal belt of the Black Sea Region. The mean annual precipitation is above 1000 m in general. The rainiest place with 2200 mm precipitation is the eastern Black Sea Coast. Cloudiness and relative humidity are high especially during the vegetation periods. The environmental laps rate is very low with the rate of 2-3ºC/ per 1000 m on the northern slopes of the northern Anatolian Mountains due to foggy conditions (Atalay 1984, 2012, 2014; Figure 2-6).

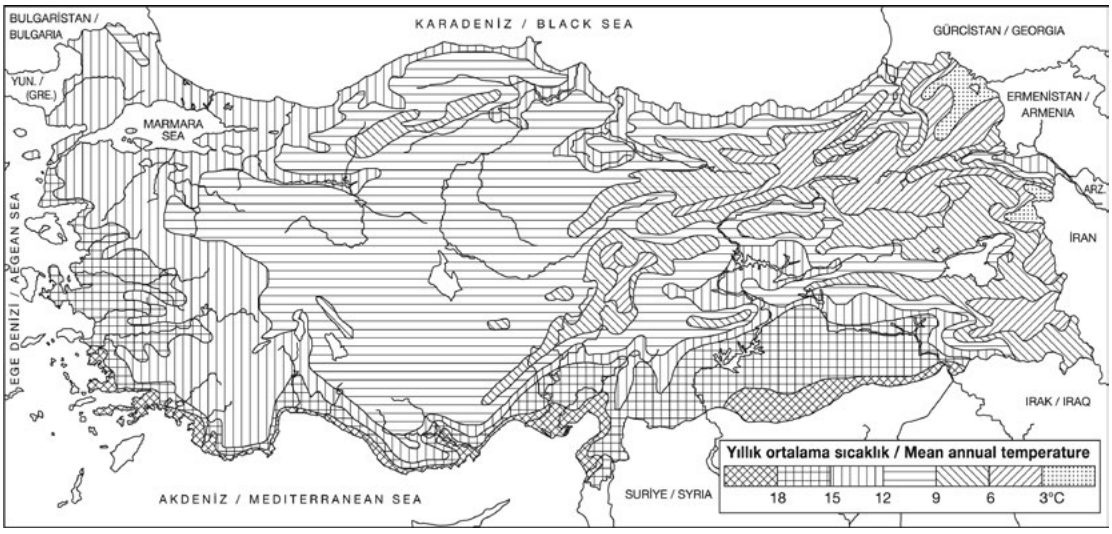

Figure 4. *Distribution of the mean annual temperature of Turkey (Atalay 2012)*

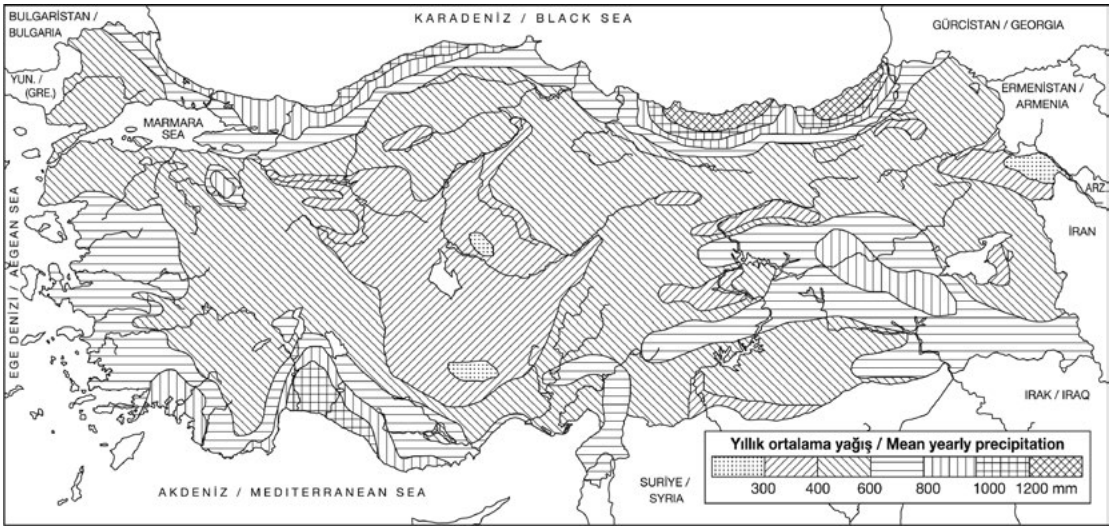

Figure 5. *Distribution of the mean yearly precipitation (Atalay 2012)*

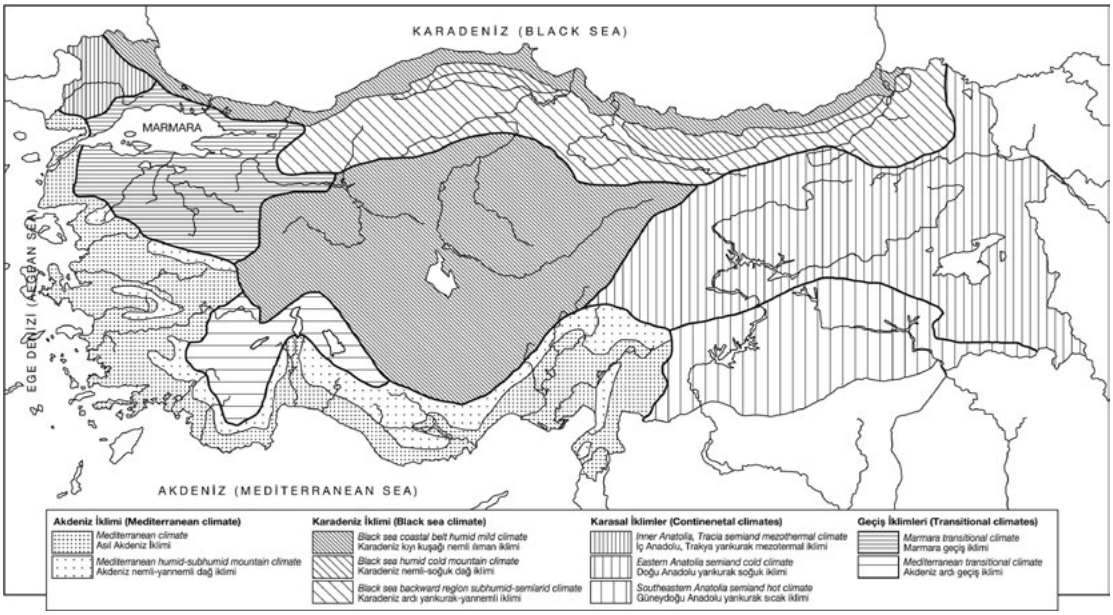

Figure 6. *Climatic types of Turkey (Atalay 2012).*

An obvious factor in the Northern Anatolian Mountains is that they are subject to fog formation depending on the humid air mass coming from the Black Sea (Figure 7-10). In fact, there is a general air circulation from north to south because of the fact that during the summer period locally the Black Sea is under high pressure and the inland hot part of Anatolia is under low pressure. The air mass rising on the north facing slopes of the Northern Anatolian mountains lead to the fog formation in response of cooling the humid air mass (Atalay et al 1985, Atalay 2012). So, diffuse radiation in the foggy area and orographic precipitation contributes to the growth of *Fagus orientalis* Lipsky, *Picea orientalis* L., *Abies bornmulleriana* (Mattf) Coode and Collen, *A. nordmanniana* (Stev.) Spach and other hydrophytes.

As a general rule, there is a considerable difference between the coastal area and the backward part of the Northern Anatolian Mountains. As such, the humid mild and humid cold forests of the coastal mountain vegetation turn into the native occurrence areas in Scots pine forests growing under direct solar radiation on the high plateau and south facing slopes of the mountains; while the lowlands and the valley bottoms are the main spreading areas of black pine, oaks forests and dry shrubs. The high plateau of the NE Anatolia and Koroglu Mountains are the main native occurrence areas of pure productive Scots pine forests. Seldom foggy and humid areas support the growth of mixed forests composed of Scots pine, fir and spruce on the north facing slopes of the Yalnizcam Mountains. For that reason, it can be clearly stated that the orobiomes and/or mountain ecosystem of the Northern Anatolian Mountains in the main growth areas consists of coniferous forests.

VEGETATION OF THE NORTHERN ANATOLIAN MOUNTAINS

The altitude of the Northern Anatolian Mountains includes three altitudinal vegetation belts.

Coastal Belt Vegetation: The coastal belt of the Black Sea region extending between 0 and 1000/1200 m is the main spreading area of broad leaf deciduous forests mainly composed of *Fagus orientalis* Lipsk, *Castanea sativa* Mill., *Tilia rubra* subsp caucasica (Rupr), *T. tomentosa*, *Alnus barbata* subsp. *glutinosa* CA Mey. (Yalt), A. (L.) Gaertn, *Quercus* sp., *Acer* sp, *Fraxinus* sp. and many shrubs mostly *Rhododendron* sp., *Ilex colchica* L, *Prunus laurocerasus* L., *Buxus sempervirens* L., *Corylus avellana* L, *Cornus mass* L. etc..

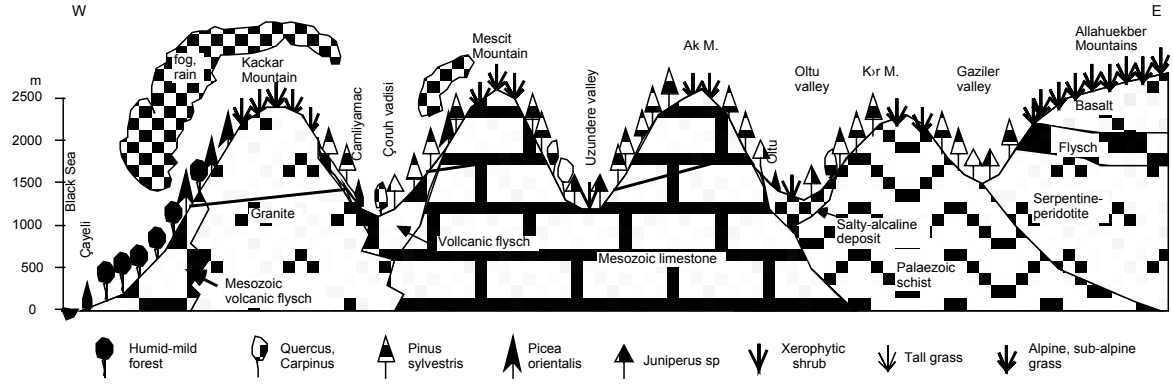

Figure7. *Geological cross-section and vegetation/forest distribution in the eastern part of Northern Anatolian Mountains*
Note: The black line represents the orobiome boundary in all profiles.

Orobiome Vegetation: The Orobiomes of the Northern Anatolian Mountains are divided into two groups: Coniferous forests and Alpine grassland.

Coniferous forests which are associated with *Picea orientalis* L. (Link), *Abies nordmanniana* and *A. bornmulleriana* begin above 1000 m and rise up to 2000-2200 m on the slopes facing north in the coastal mountains of Northern Anatolian Mountains, but this line attains 2400-2600 m in the southern part of NE Anatolian Mountains. Alpine grass vegetation begins above the natural timberline and is to be found on the upper part of mountain submits.

The aspect factor is very important in the northern Anatolian Mountains in terms of vegetation composition and its distribution. Namely, the north facing slopes of the mountains considerably prevent the forwarding of the fronts coming from the north. On the other hand, the rising of humid air masses coming from the Black Sea along the north facing slopes of the coastal mountains leads to fog formation and orographic rain. The foggy conditions on the north slopes contributing diffuse radiation are responsible for the growth of humid-cold forests. Indeed the heavy foggy places of the Eastern Black Sea region are the main native occurrence areas of oriental spruce (*Picea orientalis*). In other words, the existence of Picea orientalis is related to the heavy foggy formation in the Eastern Black Sea Mountains. The middle and western part of the coastal highland of the Northern Anatolian mountains are the natural occurrence areas of the fir (*Abies bornmulleriana* and *Abies nordmanniana*), (Figure 7-10).

The direct solar radiation areas of the south facing slopes of the mountains and plateau surfaces and mountains of the backward region of the Black Sea Region support the growth of Scots pine (*Pinus sylvestris* L. var. *sylvestris* and black pine (*Pinus nigra*) (Atalay and Efe 2010, 2012; Cepel et al 1977; Tetik 1986).

Climatic factors changing according to the sub-region of the Northern Anatolian Mountain Region mostly determines the vegetation composition.

Eastern Black Sea Region. When comparing the profiles of the Black Sea coast and the NE Anatolian plateau, one

can see broad leaved deciduous forests on the Black Sea coast, after that *Picea orientalis, Abies nordmanniana* mixed forests containing rarely Scots pine forests are dominant on the north facing slopes of the Eastern Sea Mountains and the Yalnizcam Mountains due to the diffuse of the solar radiation. The direct solar radiation areas of the NE Anatolia plateau such as the Sarikamis and the Ardahan plateaus extending in the 1800-2700 m belt are the natural pure and productive Scots pine forests due to the cold sub-humid and direct solar radiation (Fig 7-8).

When comparing the profiles of the Black Sea coast and the Zara-Hafik depression, after the broad leaved deciduous forest in the coastal belt of Black Sea, Scots pine forests become dominant on the upland area receiving direct solar radiation. Toward the Kelkit depression black pine, dry shrubs and Mediterranean vegetation containing Pinus brutia and maquis are to be seen. Fagus orientalis forests are seen on the lowland part of the north facing slopes of the Kelkit and the Vezirkopru depressions, and toward the upper part of the mountainous areas Scots pine again to be seen.

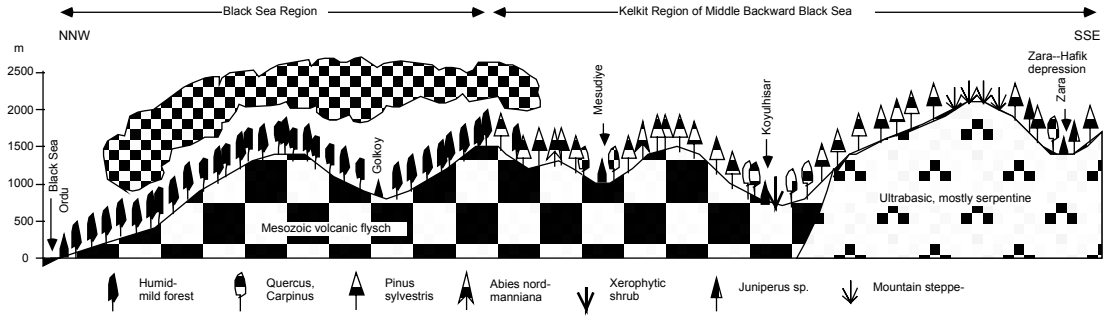

Figure 8. *Vegetation profile comparing the Ordu and the Zara-Hafik depression showing a transition from humid-mild broad leaf forests under the foggy environment to Scots pine forests growing under the direct solar radiation*

Middle section of the Northern Anatolian Mountains: Here the north facing slopes of the Kure Mountains are mainly covered with broad leaved deciduous forests and Pinus nigra clusters termed as a secondary succession are common on abandoned agricultural fields. Up slopes of the foggy area is mainly the occurrence area of the *Abies bornmulleriana* forests and rarely broad leaf tress notably *Fagus orientalis*. Further southwards Scots pine forests begins to be dominant below the sub-humid sunny area.

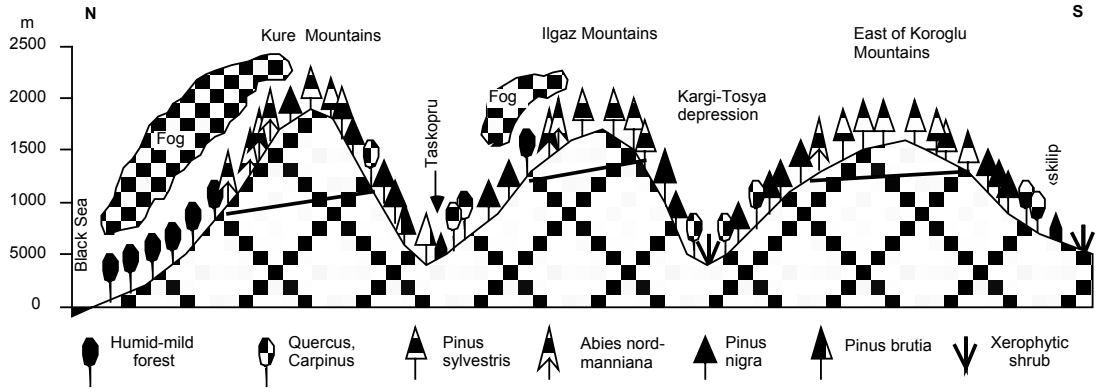

Figure 9. Vegetation profile in the Middle part of the Northern Anatolian Mountains; the foggy areas here are the place of growth of *Fagus* and *Abies* stands

Western part of the Northern Anatolian Mountain: After the broad leaved deciduous forest of the coastal belt of the Black Sea we reach the mixed forests with *Abies bornmulleriana* and *Fagus* forest and pure *Abies nordmanniana* in the foggy areas like the Kure and the Ilgaz Mountains. The Kastamonu plateaus where sub-humid and sunny conditions prevail are the main occurrence areas of black pine and oak, while the lowlands or the tectonic corridor support Mediterranean vegetation. Humid Scots pine forests beginning to be dominant on the north slopes of the highlands in the Northern Anatolian Mountains produce fir regeneration on the lower story of the Scots pine forest. Thus with the growing of fir plants the mixed forests is composed of *Pinus sylvestris* and *Abies nordmanniana* form. Here, if *Pinus sylvestris* trees are cut down excessively, pure *Abies* forests tend to turn into dominant forests. Best example can be given with the localities of Ulu Ova, near Ulus district; the Keltepe and Egriova localities, the southern part of the Karabuk depression and Kartalkaya S of Bolu. The south slopes and the undulation areas of all southern highlands are productive Scots pine forest habitats (Figure 10).

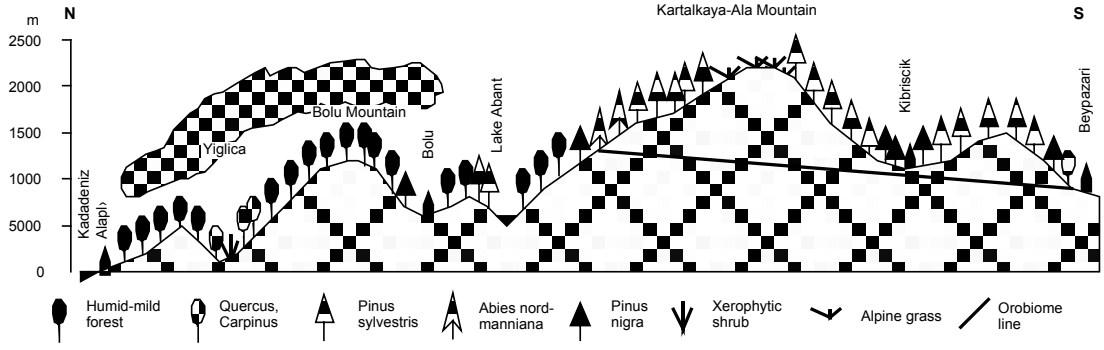

Figure10. *Vegetation profile of the western part of the Northern Anatolian Mountains; here direct solar radiation areas of the south and high part of the mountains fit the pure Scots pine forest stands.*

ORO-VEGETATION OF THE MARMARA TRANSITIONAL REGION

The Marmara transitional region which is located mainly in the southern and eastern part of the Marmara Sea area is the transitional region between the Black Sea and the Mediterranean climates. For this reason, the northern slopes of the Marmara Region Mountains contain Black Sea vegetation like broad leaved deciduous forests with *Fagus orientalis* and *Abies bornmulleriana* spread on the upslope, while the south facing slopes of the mountains support the growth of Mediterranean dry forests composed of *Pinus brutia* and *Pinus nigra*. The Ulu-Domanic Mountain which is located in the Marmara Region is the best example to the show that the altitude and aspect factors influence the vegetation distribution (Figure 11). Indeed, on the southern slopes of the Ulu Mountain from the foothills to the top *Pinus brutia, Quercus, P. nigra* and *Pinus sylvestris* forests exist. On the northern slopes of these mountains the altitudinal belt contains, as follow: *Castanea, Quercus* and *Abies bornmulleriana*. Endemic fir (*Abies equi-trojani*) grows only on the northern high slopes of the Kaz (Ida) Mountain orobiomes.

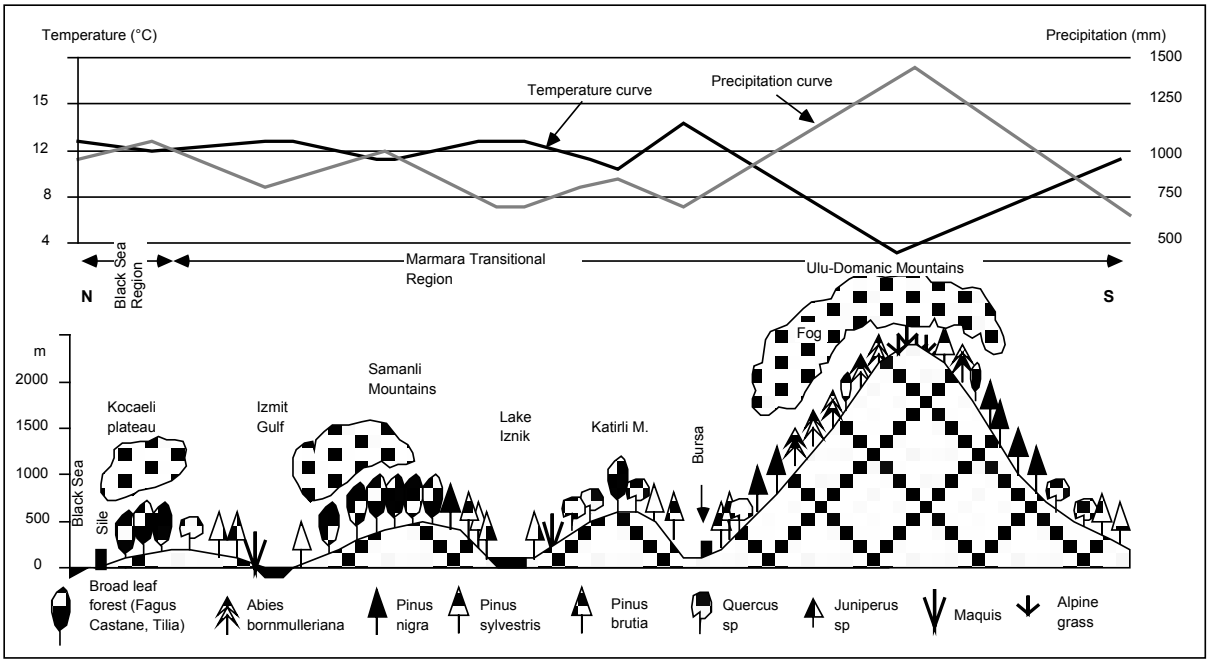

Figure11. *A profile showing the mean annual temperature, precipitation and vegetation distribution typical for the Marmara transitional region*

VEGETATION IN THE AEGEAN REGION MOUNTAINS

The formation of most of the Aegean mountains is related to the vertical tectonic movements occurred after the Alpine orogeny. In other words, especially some parts of metamorphic rigid masses were uplifted and some of them were depressed along the fault lines, so the horst-graben system or the topography formed as mentioned before.

In the Western Anatolia, the main horst mountains in the direction of N-S are the mountains of Kaz (1767 m), Manisa (1075 m), Boz (2157 m), Aydin (1646 m) and Mentese (Baba M 2308 m, Ak 2198 m). The main grabens in which alluvial plains and rivers are found are Edremit, Bakircay, Gediz, Small Meander and Big Meander. There is a great elevation difference between the graben and the horsts. For example, the elevation in the Gediz graben is about 100-200 m, but it is over 2500 m in the Boz Mountains.

Climatically, the Aegean Region is under the influence of the Mediterranean climate characterized with mild and rainy

winters, hot and rainless summers. The amount of precipitation and temperature considerably changes depending on altitude aspect factors. The mean annual temperature changing from 18°C in the south to 15°C in the north of the coastal belt drops to 9-10°C on the south facing slopes and to 8-9°C on the north facing slopes at an elevation of 1000 m. This figure is about 6-7°C at an elevation of 2000 m in the Aegean Mountains. The July temperature rising to 25°C on the coastal belt of the Aegean Region drops to nearly 20°C at an elevation of 1000 m. The mean annual precipitation changing between 500-700 mm on the lowlands exceeds both 1000 mm on the north facing slopes of the mountains in the northern part of Izmir and on the south facing slopes of the mountains occurring in the southern section of Izmir. This is related to the frontal activities direction, namely the north facing slopes of the northern Aegean region is under the influence of the fronts coming from the northern sectors, but the southern slopes of the mountains occurring in the southern part of the Aegean Mountains get abundant rainfall from the fronts coming from the southern sectors (Figure 4-6).

The aspect and altitude factors affecting the distribution of vegetation in the Aegean Region are depicted below.

Thermo belt of the Aegean Region: This belt covers lowland areas of the mountains and grabens on which Mediterranean vegetation composed of Pinus brutia forests with maquis vegetation grow. Maquis and garrique vegetation is seen where Pinus brutia forests have been destroyed. Especially garrique vegetation is dominant on the abandoned agricultural and burnt areas, and clear cutting forest areas.

The Oro-Aegean Region: The Oro region begins at an elevation of 1200 m on the south facing slopes of the mountains in the south and this line descends as low as 400 m in the north. The orobiomes of the western Anatolian region are the main spreading areas of the Anatolian black pine (*Pinus nigra* Arnold subsp. *pallasiana* (Lamb.) Holmboe), because *Pinus nigra* grow in the transitional regions extending between the continental semiarid and humid mild, and humid hot climatic regions (Atalay and Efe 2010, 2012 and Efe 2005).

Murat Mountain located in the NE of Usak city, the Aegean Region, has special importance in terms of climate and vegetation distribution. On the upper part of this mountain pure *Pinus nigra*, mixed forest associated with *Pinus nigra, Pinus sylvestris* and *Juniperus communis* L. var *saxatilis* (dwarf juniper) occur. On the north facing upper slopes forests composed of *Pinus nigra, P. sylvestris* and *Fagus orientalis* appear (Figure 12).

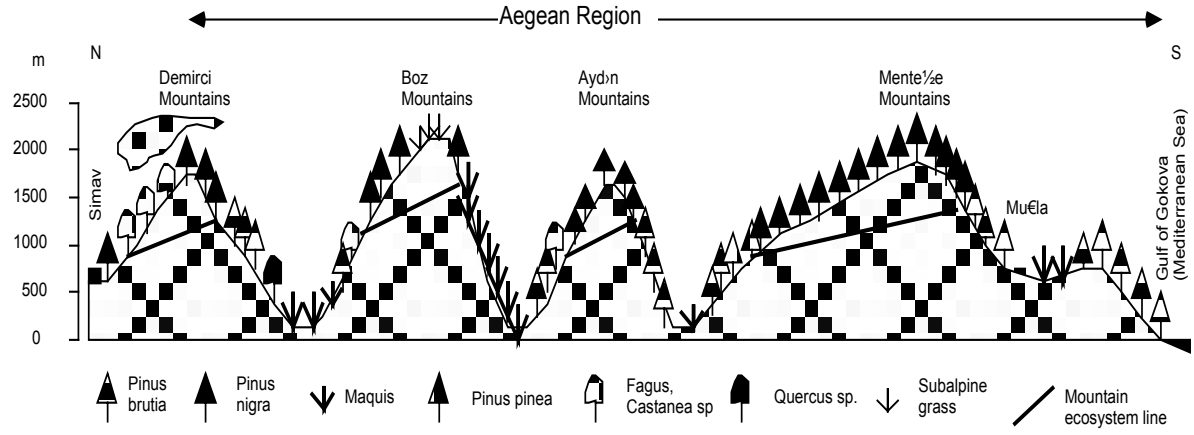

Figure12. *Orobiomes of the Aegean Mountains; here the orobiomes line or boundary is higher on the southern slopes than on the northern slopes due to the intense direct solar radiation and high temperature.*

Subalpine region: Natural sub-alpine grass vegetation is seen upon the natural timberline rising up to 2000 m in the Aegean Mountains. Here spiny cushion herbaceous vegetation composed of Astragalus and Acantholimon is widespread due to over grazing.

VEGETATION OF THE TAURUS MOUNTAINS

The Taurus Mountain range is the south branch continuation of the Alps in Europe. It starts near the Kerme Gulf, continues in the direction of N-S in the Teke Peninsula, after the Antalya-Isparta conjunction line it extends as a parallel to the Mediterranean coast, and goes on in N-S direction in the Gulf of Iskenderun (Nur Mountains). The SE Taurus Mountains run as convex in the northern part of SE Anatolia (Figure 1).

The leading mountains and their elevations in the direction of west to east are Ak M. 3014 m, Bey M 3069 m, Barla (Isparta) M. 2734 m, Dedegöl M. 2992 m, Geyik M. 2890 m in Bolkar-Ala Mountain range; Aydos H. 3480 m, Medetsiz H. 3529 m, Demirkazik H. 3758 m, Bey M. 3075 m, Nurhak M. 3081 m, Bey M. (Malatya Mountains) 2608 m, Akcakara (Bingol) M. 2940 m, Buzul (Cilo) M. 4116 m and Sat 3794 m.

A horst-graben system is also found in the Lake Regions which is located SW of Anatolia. Here some of the depressed areas are occupied by lakes such as Burdur, Aci, Beysehir and Egirdir, and uplifted blocks fit the main mountains i.e. Sogut M. (Figure 16).

The ecological conditions in the Taurus Mountains in the Mediterranean region are different than those in the inland

part of Taurus Mountains. The altitude and the influence of the Mediterranean Sea effects create an orobiomes in the Taurus Mountains. As such, the mean annual temperature of the coastal belt of Mediterranean Sea is about 18°C. This figure changes between 12°C and 6°C at an elevation of 1200-2000 m, respectively. During the vegetation period, the temperature of the coastal belt is over 25°C and about 16-18°C in the upper part of the Taurus Mountains. Winter temperature which is ca. 10°C along the coastal belt of the Mediterranean Sea is mostly under the freezing point in the Oro-Mediterranean areas. The mean annual precipitation changing between 600-1000 mm in the coastal belt reaches 2000 mm in the high parts of the eastern slopes of the Antalya Gulf and western high slopes of the Nur Mountains (Figure 2-6).

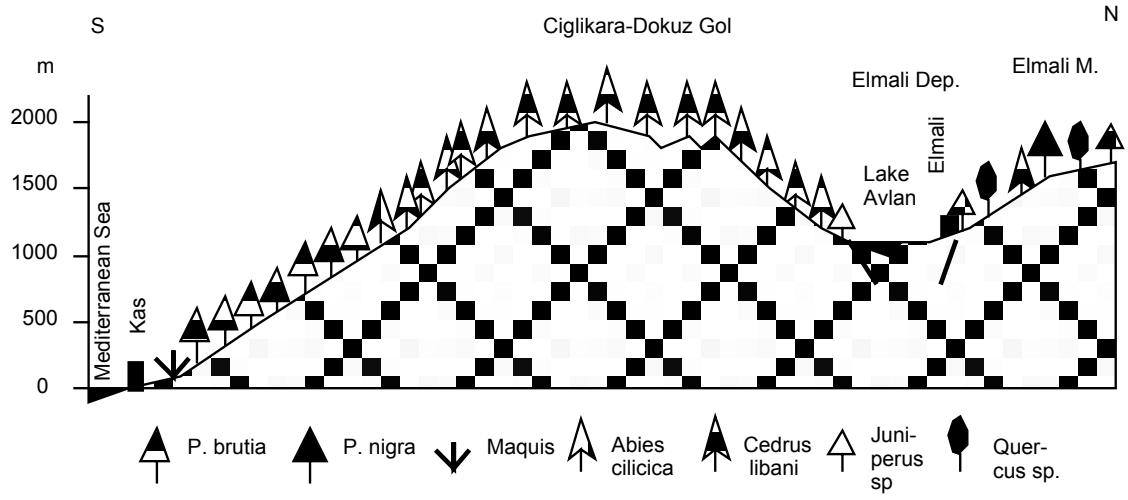

Figure13. *Topographic and vegetation distribution profile of the Taurus Mountains showing orobiomes*

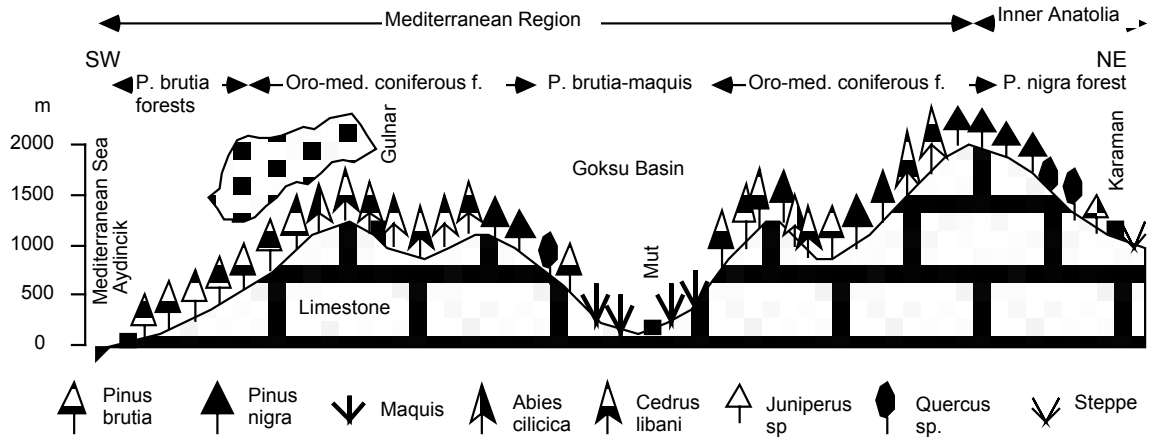

Figure14. *A profile representing the western part of the Taurus Mountains; good stand of cedar forest is found in the Ciglikara-Dokuz Gol locality on the north facing slopes of the Elmali depression*

The winter period is generally snowy in the orobiomes of the Taurus Mountains. What important properties of the southern up slopes of the Taurus Mountains are to get humid air mass and orographic precipitation? As is the coastal belt of the Black Sea region, there is a general air circulation from the Mediterranean Sea towards the south facing slopes of the Taurus Mountains. The humid air mass coming from the Mediterranean Sea leads to fog formation on the southern slopes of the Taurus Mountains. In other words the humidity of the southern slopes of the Taurus Mountains is higher during the summer period that that during the winter period. Decrease in the evapotranspiration produces humid-cool conditions in the Taurus Mountains (Figure 13-15).

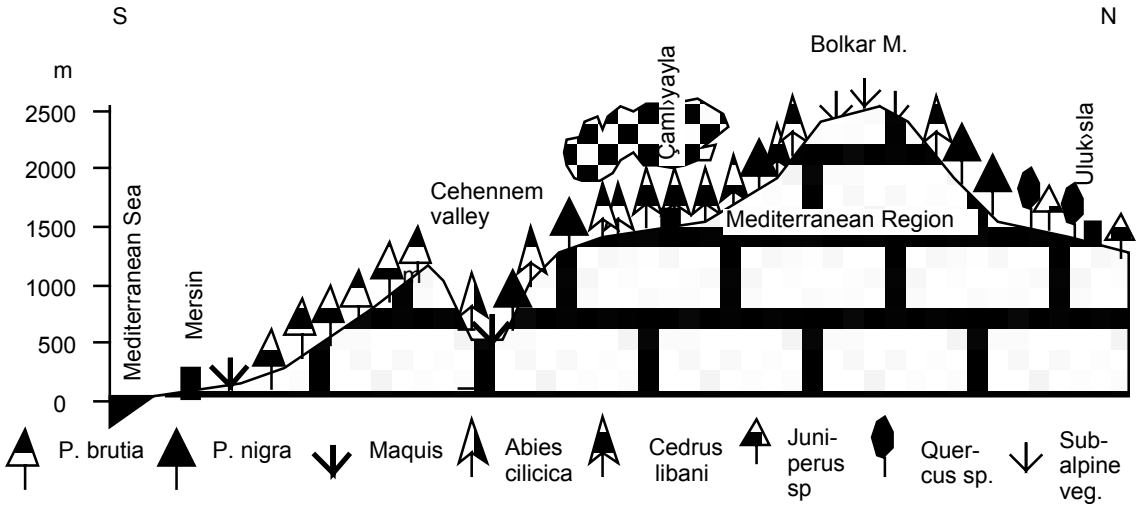

Figure 16. *A profile comparing Mersin and Ulukisla; here pure Abies cilicica forest is found in the Camliyayla locality receiving fog.*

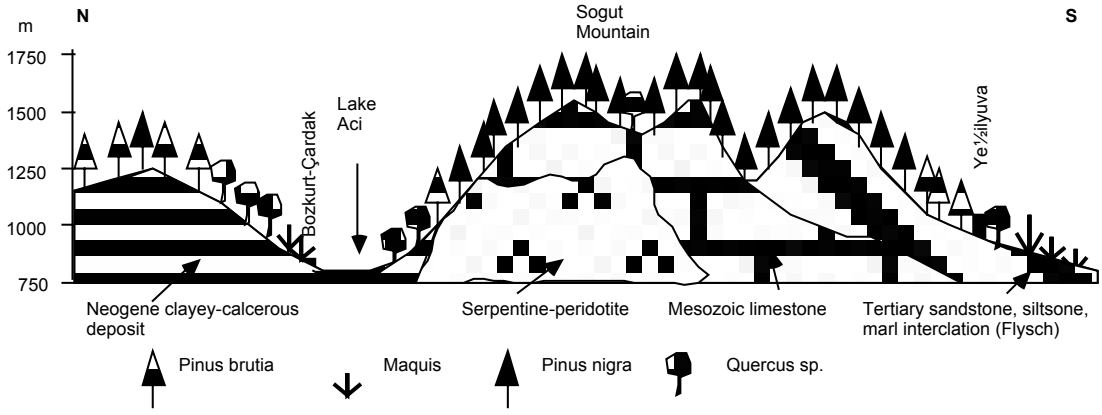

Figure16. *Vegetation profile representing the Lake Regions in the NW part of Mediterranean Region*

Continental effects provide the spreading of *Pinus nigra* forests in the orobiome of the inland part.

The altitude, the aspects and the influence of the Mediterranean Sea effect or humidity determines the distribution of oro-Mediterranean forest trees (Figure 13-16).

EU or thermo-Mediterranean belt: The lowland areas and the south facing slopes rising to 1200 m are the native occurrence areas of red pine (*Pinus brutia*) with maquis understory. *Pinus brutia* small clusters rise up as high as 1500 m on the south facing slopes of the Taurus Mountains. *Pinus brutia* forests both pure and mixed with oaks grow on the western lowlands of SE Anatolia. Humid maquis elements such as *Mrytus communis, Laurus nobilis* are more widespread here than in other Mediterranean climatic regions of Turkey. *Cupresus sempervirens* L. also grows in the vicinity of the Koprulu Canyon Locality in the Mediterranean Region.

Oro-Mediterranean Belt: Oro-Mediterranean coniferous forests composed of *Cedrus Libani, Pinus nigra, Abies cilicica* (Ant &Kotschy Carr subsp. *cilicica* and *Juniperus* species commence at an altitude of 800 m and continue to appear up to 2200 m on the south facing slopes of the Taurus Mountains and rise up to 2400 m on the north facing slopes of such mountains due to the continental effects. Broad leaved deciduous forests belonging to the oro-belt are commonly seen especially on the west facing slopes of the Nur Mountains and their northern continuation, E of the Mediterranean Region. The tree composition of the oro-Mediterranean forests changes considerably based on their ecological properties.

Cedar forests are found between 800-2000 m on the south facing slopes and between 1000/1100-2200 m on the north facing slopes of the Taurus Mountains and 550-2000 m in the Nur Mountains. They prefer the cool wind blowing both from the Mediterranean and the Aegean Seas (Atalay 1987, Efe 2005). Optimum growing areas of cedar are found on the north slopes of the inland part of the mountains and/or the Lakes Sub-region. Best example is the Ciglikara-Dokuz Gol (Nine Lakes) locality in the southern part of the Elmali depression. Here first site class cedar forests appear where the monument of the cedar tree named Ram cedar (677 years old, 38 m in height and 2 m in diameter) at an elevation of 1550

m is established, as of 2014 (Figure 14).

Pinus nigra grow far from the Mediterranean coast, especially in the somewhat continental sub-humid and direct solar radiation areas of the Taurus Mountains. Productive Pinus nigra forests are common on the south facing slopes of the Lakes Region in the western part of the Mediterranean Region (Figure 16). Taurus fir (*Abies cilicica*) trees are only found in mixed forests composed of *Cedrus libani* and *Pinus nigra* stands. Pure fir forests are only seen on the north facing slopes and in the foggy areas of the Taurus Mountains. Pure fir forests, for example, are seen in the foggy area of the Camliyayla locality, north of Mersin and on the north facing slopes of the Taurus Mountains (Figure 15).

The Nur Mountains extending in N-S direction in the eastern part of the Iskenderun Gulf from a distinct habitat in terms of orobiomes vegetation in the Mediterranean Region (Figure 17). Here there is an air circulation between the Gulf of Iskenderun and the Antakya-K.Maras tectonic graben. The air mass with rich moisture rising up on the west facing slopes of the Nur Mountains lead to fog formation and seldom orographic rain. Foggy areas of these mountains are the main spreading areas of broad leaved deciduous forest mainly composed of *Fagus orientalis, Acer, Alnus, Carpinus* species and humid bushes and herbaceous vegetation. *Pinus nigra* and *Cedrus libani* grow in the sunny areas of such mountains.

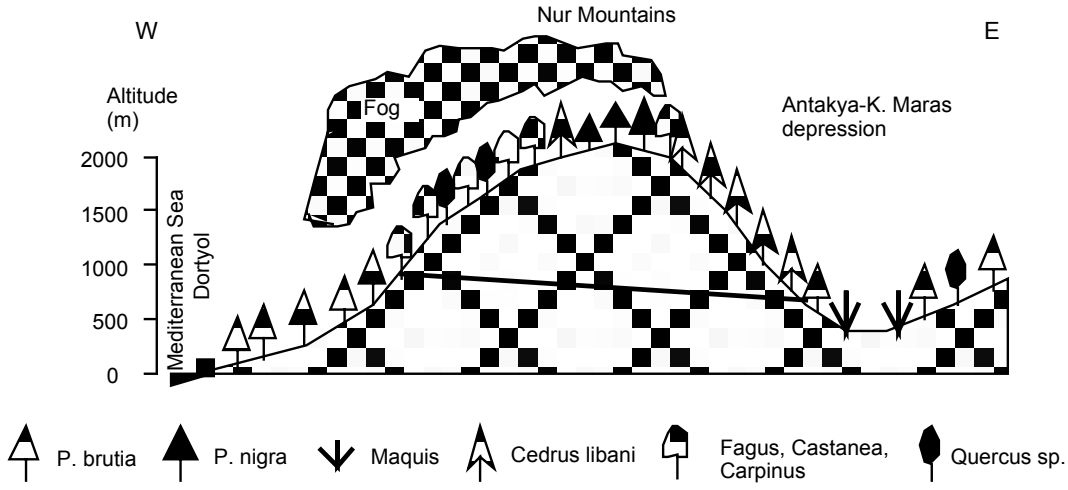

Figure28. *Nur Mountains display a great variety in terms of vegetation composition in the Taurus Mountains. Broad leaved deciduous forests are common on the west facing slopes of the Nur Mountains that receives fog.*

MOUNTAIN VEGETATION OF CENTRAL ANATOLIA

Topographically the lowland altitude of Inner Anatolia covering native steppe lies between ca. 800 m in the NW and rises up to 1000 m in the vicinity of Lake Salt and the Konya Plain or basin. It exceeds 2000 m in the volcanic cones. Main volcanic mountains in Central Anatolia are Erciyes (3917 m), Melendiz (1898 m), Big Hasan M (3268 m), Karadag (1819 m).

In the lowland areas of Inner Anatolia prevails continental semiarid climate due to which the mean annual precipitation is generally 400 mm. The mean annual temperature changes between 10-12°C, the temperature dropping to -1°C and -3°C in January and rising up to nearly 25°C in July. Low relative humidity during the summer period severely increases the evapotranspiration. Brown steppe soils containing abundant calcium carbonate accumulation in the subsoil are common (Atalay 2012). These circumstances support only the growth of steppe vegetation (Figure 3).

The orobiomes of Central Anatolia contain dry forests composed of pure oak (mostly *Quercus pubescens*), oak and juniper (Juniperus communis, J. excelsa) and black pine (*Pinus nigra*), and pure black pine forests. Scots pine (*Pinus sylvestris*) stands are common on the north facing slopes of Ak Mountain in the north of Akdagmadeni city. The poor or lowest productive Scots pine forest of Anatolia can be considered as relict forests (Atalay 1992, Atalay and Efe 2012).

The volcanic mountains of Inner Anatolia such as Kara M, Karaca M. and Melendiz M., are the main spreading area of oak, black pine and juniper mixed dry forests (Figure 3).

MOUNTAIN VEGETATION IN EAST ANATOLIA

Topographically East Anatolia, which is the highest region of Turkey, contains an orogenic range and high isolated volcanic cones. The low altitude areas fitting tectonic depressions changes between 850-900 m in the Malatya and Igdir depression and 1900 m in the Erzurum depression, and high areas attain more than 3000 m especially in the volcanic cones. The main volcanic mountains in the Eastern Anatolia area are Nemrut (2828 m), Suphan (4058 m), Tendurek (3660 m), Kısır M. (3197 m), Ala M (3138 m) in the surroundings of Lake Cildir, west and east respectively, Agri (Mont Ararat) (5137 m).

Climatically, severe continental climate characterizes the lowest temperature which is under -40°C during the winter period. The highest temperature exceeds 40°C in the lowlands such as the Malatya and Igdir depressions. The mean annual precipitation varies between 250 mm in the Igdir Depression and over 1000 mm on the highlands. Native steppe areas appear where the mean annual precipitation is less than 400 mm (Figure 2, 4, 5).

The altitude of NE Anatolia provides the vertical zonation of herbaceous and forest vegetation.

The orobiomes of the western part of East Anatolia are the oaks forests beginning after the steppe vegetation especially

in the depression areas such as the Malatya, Erzincan depressions. Productive oak forests are widespread in the Mercan and Bingöl Mountains and on the northern slopes of the Malatya and SE Taurus Mountains.

As far as the eastern part of Eastern Anatolia Is concerned, the lowlands of NE Anatolia are under the influence of the semiarid climatic regime on which tall grass steppe vegetation grows that is richer in terms of steppe species than that of Inner Anatolia. Toward the upland, the vegetation begins to change depending on the increase of precipitation and decreasing of the temperature. Mountain steppe begins above 2000 m in the Erzurum and Pasinler-Horasan depression and above 1700 m in the Igdir depression. Mountain grass and/or alpine-subalpine grass vegetation is widespread above 2500-2800 m in the high mountains such as the Allahuekber, Kisir, Aladag and Yalnizcam mountains. The Agri Mountain (5137 m), the highest mountain of Turkey, and the Nemrut volcanic caldera, NW of Lake Van, contain relict *Betula* sp. clusters (Atalay 1992, 2014, 2015).

The continental cold - sub-humid high mountains of Eastern Anatolia are the main spreading areas of alpine and subalpine grass vegetation. Such areas are animal husbandry especially cattle breeding places.

MOUNTAIN VEGETATION IN SE ANATOLIA

The South-Eastern Taurus Mountains rising over 4000 m from the lowland of the SE Anatolian region are responsible for the formation of orobiomes. Indeed, the scarce and very arid steppe vegetation beginning where the lowland rises up to 500/600 m on the south facing slopes of the SE Taurus Mountains. This area is the most arid part of Turkey. One of the productive oak forests of Turkey is found on the slopes facing south of the Taurus Mountain due to fact that the amount of the rainfall is over 600 mm and it exceeds 1000 mm above 1500 m elevation. But one can rarely see productive oak forests due to the heavy destruction.

The mountain ecosystem of Turkey is one of the leading or secondary livelihood areas of the rural people. Some of the peasants work in the forest exploitation and afforestation activities. Timber for construction and wood for fuel requirements of forest villages is obtained from the forests. The grasslands within the forest lands are being used for grazing. The subalpine meadows in the Taurus Mountains and the alpine meadows in the Northern Anatolian Mountains are the main grazing areas of rural people living in the forests and their vicinity. The meadows or grassland above the natural timberline serve also as a temporary settlement area for rural people. During the summer period some villagers stay in the yayla (meadow) in order to graze their own animals. Nowadays ecotourism activities are carried out in the orobiomes. On the other hand the orobiomes of the Taurus Mountains have created the transhumance activities and the nomadic tribes and/or societies called Sarıkecili and Yörüks in the Taurus Mountains and Beritan in the SE Taurus Mountains.

CONCLUSIONS

1. Forest vegetation covering 27% of the total area of Turkey, the alpine and sub-alpine grassland, and the mountain steppe are found within the orobiome and/or mountain ecosystem in Turkey.

2. Three altitudinal vegetation belts are found in the orobiomes in general: the first belt belongs to the lower level of the mountain on which main climatic type of region prevails; the second belt is covered with mostly coniferous forests growing under the cold and sub-humid - humid conditions in the coastal mountainous areas of Anatolia; the third belt includes the spreading areas of alpine and sub-alpine grass vegetation both in the coastal mountains and in the Inner Anatolian mountains most of which are of volcanic origin. In the SE Taurus Mountains and the western part of E Anatolia in the second belt there are mainly areas of oak forests. In the eastern part of Eastern Anatolia the orobiomes are composed of tall grass extending on the upper part of the steppe.

3. The orobiomes vegetation boundary is dissymmetric as compared between the northern and the southern mountain regions of Anatolia. In fact, this boundary beginning at the lower level on the north facing slopes of the Northern Anatolian Mountains rises a few hundred meters on the south facing slopes. This is related to the difference of humidity between the slopes of these mountains. The orobiome boundary is higher on the slopes facing south than that on the northern slopes in the Mediterranean Mountains. This is depended on the direct solar radiation differences between the slopes of these mountains.

4. The northern Anatolia orobiomes in the coastal mountains are the main growing areas of cold-humid/sub-humid coniferous forests. But the high southern parts of the Northern Anatolian Mountains are the home of cold resistant forests belonging to the continental sub-humid - cold northern hemisphere. In other words, the altitude contributes to the ecological condition of the northern hemisphere cold-humid conditions favourable for the growth of taiga coniferous forests in the NE Anatolia area.

5. The existence of orobiomes helps the increase of habitats and the plant richness of Turkey, and they contain many relict and endemic species belonging to past climatic conditions.

6. The alpine and sub-alpine orobiomes belt which is found above the natural timberline provides the main grazing areas and secondary livelihood for the rural people. The climatic difference between the lowland and the upland of the mountains especially in the Taurus Mountains has led to the nomadic way of life in animal husbandry.

7. Orobiomes contribute to the increase of precipitation is the main feeding areas of rivers and the groundwater of Turkey. Irrigation water of semi-arid agricultural fields in the lowlands like SE Anatolia is obtained from the dams constructed in the valley of Euphrates and Tigris. The main rivers flow into the sea. The vitality of Syria and Iraq as countries depends mainly on the Tigris and Euphrates.

8. Sustainable development also depends on the conservation of the mountain ecosystems and vegetation. In other words, mountains are the crucial importance in terms of the vitality of Turkey.

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INTEGRATED LANDSCAPE MANAGEMENT AND NATURE CONSERVATION IN THE ROMANIAN CARPATHIANS

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The Carpathian Mountains are the largest, longest and most twisted and fragmented mountain chain in Europe, overlaying eight countries: Czech Republic, Slovakia, Poland, Hungary, Ukraine, Romania, Serbia and Austria. The Romanian Carpathian Chain (over 43% of the entire Carpathian area) covers a surface of 69,872 km^2 (27.8% of Romania's surface-area) and a length of 900 km.

As an expression of both geographical diversity and local evolution of human-environment relations, the Romanian Carpathians mirrors unique and rich natural landscapes whose main traits include: the longest volcanic range in Europe, rich biodiversity, a great number of large carnivores, a large area covered with forests and semi-natural areas etc.

Currently, the Romanian Carpathians are subject to a wide variety of environmental challenges related to land abandonment, habitat conversion and fragmentation, biodiversity loss, deforestation, pollution, overexploitation of natural resources, waste management etc. As a result, the Romanian Carpathian Chain holds 22 major protected areas (8 natural parks, 12 national parks and 2 geoparks) covering approximately 1 million hectares and more than 600 reserves and natural monuments totalling over 50,000 hectares.

The paper is seeking to analyse the key environmental stressors which are affecting the Carpathian landscape (e.g. deforestation, built-up areas expansion, over-grazing, mining activities), as well as the sustainable management measures aimed at protecting and preserving its valuable features (e.g. environmental legislation, protected areas, urban plans requirements, forest management plans).

Keywords: *landscape management, nature conservation, environmental stressors, Romanian Carpathians, protected areas.*

FOREST MANAGEMENT AS A SUPPORTING TOOL OF BIODIVERSITY IN NATURA 2000 FOREST HABITATS IN THE DINARIC MOUNTAINS IN SLOVENIA

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In Slovenia, the Natura 2000 network covers more than 37% of the land surface. Within these areas managed forests dominate, and conflicts between nature conservation and timber production roles are possible. Forest management is a significant driver of diversity and, according to the options applied it may enhance or decrease the forest biodiversity.

For this study, the Dinaric fir-beech forests in Slovenia with significant forest-management and timber production functions have been selected. Moreover, these forests are the habitats of three large European carnivores, and of many other species of nature-conservation interest. Major part of these forests has been designated as a part of the Natura 2000 network. According to climate change predictions, they might also be among the most threatened forests in Slovenia in the future. With the aim to test the effects of different forest management options on the biodiversity, and particularly on the plant diversity of these forests, three sites across the Slovenian part of the Dinaric Mountains range have been studied. In each site, 9 plots were established at the bottom of the karst terrain depressions (sinkholes). The plant species diversity has been tested before and after the implementation of forest management measures of three intensities (control plots – no logging, logging of 50% and 100% of growing stock on 0.4 ha). Before the implementation of the forest management measures 151 plant species on all 400 m^2 sized plots were recorded. The number of species per plots varied between 29 and 68, and the value of the Shannon diversity index H' was between 1.23 and 3.30.

The implementation of different forest management options caused different magnitude of plant species turn-over. With higher intensity of logging the species turnover increased. More than 100 new plant species, mostly early successional species and non-forest plants appeared in the forest gaps created by the high intensity logging measures. In addition to the increased plant diversity and changed functional composition of the vegetation other benefits of gaps created by logging could be expected. Species-rich forest gaps have high feeding potential for larger herbivores and, consequently they may reduce the harmful browsing of young trees in the nearby forest stands. It is expected that increased plant diversity also promotes diversity of other organisms such as insects and other pollinators. Management actions that create the mosaic forest structures also improve the habitat suitability for many bird species, including the endangered capercaillie. However, the size and position of the forest gaps should be carefully adjusted to the sensitive karst terrain, especially in the southern exposed slopes so that forest regeneration and soil productivity should not be jeopardized.

Keywords: *forest management, plant diversity, mountain forest, Dinaric fir-beech forest, Natura 2000*

III. POPULATION AND HERITAGE: CHALLENGES IN MOUNTAIN REGIONS

CONTEMPORARY ADAPTATION OF TRADITIONAL CULTURE FOR TOURISM PURPOSES IN DOBARSKO VILLAGE (RILA MOUNTAIN)

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ABSTRACT

The paper examines the outcomes that emerge by exposing traditional culture to tourism industry in an attempt to provide memorable experience to foreign tourists.

The paper is based on the findings of a study conducted in two villages on the Southern outskirts of the Rila Mountain – Dobarsko and Gorno Draglishte that was part of a wider research on the interaction between local culture and tourism in the region of Bansko and Razlog. The method of participatory observation was applied in the study of two events representing the same traditional wedding ritual in the context of a tourist animation program and a contemporary family wedding. The comparison shows clearly the adaptation process of the original ritual into a story by transforming the meaning of several elements of the ritual being told to tourists.

The case study gives opportunity to elaborate on the question about the role of traditional culture in the tourist product and the inevitable consequences for the contemporary culture linked to that same tradition being exposed.

Keywords: *Anthropology of tourism, cultural heritage, cultural tourism, culture change*

INTRODUCTION

The relation between local culture and tourism development has become more complicated along with the growth of travel recreation needs in society. This relationship has a dualistic face, because as tourism includes local tradition among its other attractions it also has a variety of impacts on it, which are currently studied in the field of Tourism Anthropology. "One common characteristic of culture is its recipiency, which means tradition or inheritance" (Kroeber, 1948). But at the same time "anthropologists agree that society (and thus culture) change in response to environment and technology... This is particularly important to remember when attempts are made to 'preserve' culture" (Burns, 1999). Whether or not tourism has impact, local culture has its own endogenous way of change through the process of innovation.

Kroeber continues by revealing inheritance not only through generations in time, but also as geographic distribution through inheritance of elements from other cultures. This kind of exogenous change in culture, Kroeber argues, tends to assimilate quickly the new element and present it as own one (Kroeber, 1948).

When dealing with external influence on culture and especially by tourism, the concept of strangerhood is of particular interest. Simmel has defined the stranger like "temporary resident who does not share entirely the essence of local culture, resulting in a more formal mode of communication between guests and hosts" (Simmel, 1950). In similar setting during tourist encounters an important role is played by mediators who are defined by Valene Smith as "Cultural brokers". They are usually bi-lingual residents with entrepreneur impulse who organize the locals and are the centre of the forming tourism system (Smith, 1977). In this process culture uses its own capacity to adapt to the influence of the outer impact.

Naturally, culture that is of interest to tourism is located in rural and mountain areas where one can find people who remember the old times when tradition was still central in social behaviour. Often these regions are attractive for tourists, because of their natural and cultural heritage and along with the scarcity of economic opportunities for living, tourism may become of significant importance to mountain communities.

This paper is an attempt to examine the interpretations applied to a traditional wedding ritual in order to fit into tourist attraction of a local folklore group in the village of Dobarsko, the Rila Mountain, famous for its ancient church. The research makes comparison between this performance and the existing ritual at a local wedding in the neighbouring village of Draglishte.

The differences that emerge in performance and meaning of ritual's elements guides to the interpretations of tradition presented to foreign tourists. A closer look to this adaptation brings the researcher to influences from the Socialist period when the transition between traditional and modern society led to a general change in the way tradition is inherited.

DATA AND METHODS

The research is conducted using three methodological approaches – desktop research of secondary sources of information, field work and visual anthropology. The desktop research focused on theory about culture change, the nature of strangerhood, commodification of culture, and the interaction between tourism and culture. Empirical information was gathered through interviews with key actors, participatory observation and audio-visual recording.

Based on the empirical data a comparison was made between the performance for tourists and the performance at the local wedding. Additionally, both events were recorded to produce a video showing clearly the adaptation applied while explaining it in both cases.

The observation was also backed with key informant interviews, including:

- Elena Kamenarova – proficient in traditional dances, she organizes an event that is meant to be a living old

traditional gathering including series of authentic rituals and games. Her close look to the socialist heritage in the process of cultural change was important to figure out the evolutional background of tradition through the years of social modernization.

- Elena Buchkova – former primary school teacher in Dobarsko, she participates in the grandmother's folklore group who perform for the tourists. Elena is the person who presents the ritual of the wedding flag as part of the programme.
- Nina Bajkova – entrepreneur who firstly organized people from the village to welcome tourists for accommodation and incorporated the traditional ritual in the performance.

Additional information was included from tourists and other participants from the folklore group and among wedding guests during the participatory observation.

It is worth mentioning that both villages where the research takes place are situated in the vicinity of the international tourism destination Bansko. This town is also known as Renaissance culture centre and contemporary keeper of the national tradition. Considerable part of the interest in visiting the church in Dobarsko comes from tourists in Bansko.

RESEARCH FINDINGS

Socialist heritage and Culture change

In order to be able to identify the origins of changes in tradition it is needed to examine the process of modernization in society during the period of socialist development. The socialist paradigm was implemented for the constructing of society and triggered the change from religiously-driven traditional rural communities to scientifically-driven modern urban society. The combination of those two processes reflects in significant changes to the social value system.

If we have to generalize about the question of socialist impact on that part of culture dealing with folklore we need to closely look on the occurring changes in its social function during the period. The change consists of transition from sharing common heritage to experiencing historically reproduced showcases of traditional culture. In traditional society folklore arts were meant for everybody challenging them to participate and prove their belonging to the community. In modern and postmodern society folklore is demonstrated by proficient performers where other participants only experience the spectacle. The stage is inevitable requisite here and since these performances claim to present tradition it is only something defined by the interviewed Elena Kamenarova as 'stage authenticity'.

Socialism has a key role in this process, because thanks to the crotchety and extremely innovative desire for socialist spirit, during the materialistic modernization along with leaving back old technologies, the traditional values were transformed into a well described complex of spiritual actions. This complex is presented in designated events – folklore festivals – where it is performed to the wide audience, by folklore ensembles from different communities around the country.

Tourist attractions in Dobarsko

The village of Dobarsko has become famous for the discovery of the ancient church "St. Teodor Tiron and St. Teodor Stratilat" dated in XVII c. or even earlier in the Middle Ages. The church is part of the top 100 most famous tourist attractions in Bulgaria and is visited by both Bulgarian and foreign tourists. Along with the visit to the church a program performed by the local grandmothers' folklore group is offered in Dobarsko for organized tourist groups. The two attractions can be booked separately, but usually tour operators book both of them as a package for foreign groups. On such occasions the folklore group is prepared to welcome the tourists and perform for them after they have seen the church.

The program was designed by the folklore group leader Smilena Popova and the local travel agent Nina Baikova who was in charge for the sales to tour operators on behalf of the Dobarsko Tourism Association. From 7 to 10 participants perform in their own authentic costumes. The program is performed usually in the yard of the old church. The program consists of songs and demonstration of a traditional ritual – the preparation of a wedding flag, which is called 'feruglitsa'[1].

In the beginning performers welcome the tourists with a bunch of geranium. After a short introduction, the speaker of the group Smilena Popova notices the nationality of the group to shorten the distance. *"We will sing with pleasure, because it is for the first time that we welcome an organized Swiss group. We are glad you have come here from the land of thousand lakes, is that correct? I would like to wish you pleasant minutes with us. Have a nice rest and let you feel like you are in the centre of the city of Bern."* The program continues with several songs and then the performance of the ritual begins.

She shows the already prepared wedding flag and explains the symbols with their meaning forming the complexity of the ritual. After these explanations the group performs a song which is traditionally sung during the preparation of the flag. The information given to tourists is the following: *"The flag is prepared in the groom's house early in the morning on Thursday in the week when the wedding takes place. The flag is prepared by a girl with living parents in order the young couple to have prosperity in their life. The flag is made for the sole purpose of amusement at the wedding. The flag also includes several symbols, for example it always has a piece of red cloth which back in the ages represented the morality and honour of the bride. We are now joking and say that nowadays we can use any colour we like. But the tradition with the red colour is kept until today. The flower on top of the flag is a symbol of the beauty and youth of the young family. And three apples form a cross, the symbol of Christianity; these are the children in the family, which means prolongation of the kin. After the flag is prepared it is put at a high and visible place to show that in this house there is going to be a wedding. After*

1 The wedding flag is prepared always on Thursday, Friday or Sunday. For the region of the Rila and Pirin Mountains it is called 'feruglitsa'. In the region flags are prepared in the following combination: only for the groom or for the groom and for the bride. On top of the pole 1 to 3 apples are put with a green bunch of boxwood or ivy. A piece of red cloth is tied with red thread to the pole. Most often the cloth is red or varicoloured, and the colour of the flag of the bride is always white. (Hadzhinikolov, 1980)

having been used in the wedding the flag is disassembled and the apples are eaten by the young. Now we will sing for you the song that is performed during the preparation of the flag and will symbolically prepare this wedding flag." The symbolical preparation consists of imitated sewing with needle and thread. After that the group continues singing and starts dancing the dance which is traditionally performed at the wedding with the flag being waved in the air. The program finishes with distribution of small bunches of geranium and the following words: *"Now, when the flag is ready in the house of the groom, his mother will welcome the guests in the house with specially prepared wedding bunches, as we will now do for you"*.

The performance observed was the shortest version of the program. This was due to the late arrival of the tourists and the time needed for a short catering in one of the guesthouses in the village. Another reason for shortening the program sometimes may come from tour guides, because not all of them are good interpreters.

Rarely, when there is more time and interest from the tourists after the demonstration, they are offered to dress up with traditional costumes and learn how to dance with the performers. Another option is to include degustation of local domestic meals that must be booked separately.

In this particular case of observation, the tourists showed mixed satisfaction. They were interested in the performance, but some of them were intensively discussing something. The following opinion was shared by one of the tourists during the performance: *"They are singing with great pleasure and it seems they like their songs. I am impressed, that these women, who have not much left, are making such a present. Their songs... more or less we like it. And we see them performing with such a joy."* When it was finished the tourists left the yard of the church and some of them gave the flowers which they had received earlier to some kids in the street. The folklore group performing for the tourist groups is the elderly group of the Dobarsko folklore ensemble that also includes children's and women's groups. The ensemble participates in different folklore festivals around the country. Regardless of the activity of the folklore ensemble though, there are not many traditions kept in the village nowadays. Except for the common celebration of Christmas and Easter as national holidays in Dobarsko, Baptism of Jesus is celebrated on the 6th of January. Once there was a tradition in which girls at an age of 14-18 years-old gathered on this day and rehearsed a set of songs. On the next morning while celebrating St. John the girls would walk from house to house and sing different songs for prosperity of their hosts.

In 2008 Smilena Popova organized reproduction of this ritual. Young girls from the village participated and the celebration was successful. But that couldn't revitalize the tradition mainly because the girls from the village live permanently in the nearby town and visit their grandmothers on some weekends, so it is difficult to gather them all together.

THE WEDDING IN DRAGLISHTE

Independently from the event in Dobarsko, on the same day in the next village of Draglishte there was a wedding. Although not the whole wedding was prepared in traditional clothing, a set of rituals were planned including the preparation and use of a wedding flag.

The preparation of the wedding flag was done in the morning at the house of the best man. Three women prepared the wedding flag – two of them were older and knew the ritual; the third one was younger and had living parents. She was the main character of the preparation. The cloth was red with varicoloured figures. The flowers used were dried, which symbolizes the wish for the couple to grow old together. Three apples were put in cross on top of the pole – the apples on the sides represented the young couple, and the one in the middle their children to bind them together.

After sewing the cloth to the pole a cluster of greenery was attached along the side. It was explained that the cloth might have any colour. Different colours are explained in the song which accompanies the preparation of the flag. Colour represents different sides of one's lifetime – white, red, green, dark, because life is colourful. Thus the couple must be together in good and in bad times."

Later in the afternoon the best man was welcomed at the groom's house. The best man carried the wedding flag and led the round dance. The women who had prepared the flag were waiting at the door of the house with bread and wine.

There are also other activities at the weddings like a welcome at the house of the bride, as well as a chase of the wedding flag when the groom's and bride's kin are opponents in keeping the flag, and the one who has lost must pay it back. Some of these rituals are still performed at other occasions which are not observed in this research.

DISCUSSION

An encounter between culture and tourism is possible when something attracts the attention of tourists. In the study cases this means that culture must adapt its ordinary ritual to a more formal mode of communication, if we stick to Simmel's wording. This adaptation is defined, on the one hand, based on the expectations of the tourists and their institutions, and, on the other hand, the attitude of the hosts to the elements of their tradition and the meaning of their presentation in front of tourists. The encounter of their interests will define the characteristics of the cultural exchange between hosts and guests.

Table 1 shows the main differences between the ritual elements interpretations of their symbolic meaning in both cases observed:

Table 1. *Comparison of ritual elements interpretation between a tourist and a wedding performance*

Ritual element	Touristic interpretation	Wedding interpretation
protagonist	young girl with living parents	young girl with living parents
prepared for	best man	best man
flowers on top	green to symbolize youth	dried for long life of the couple
cloth	red for the morality of the bride*	varicoloured for good and bad moments in life
crossed apples	cross to symbolize Christianity, all apples represent kids	top apple represents kids who bind apples on the side - parents
general meaning	joy and happy mood at the wedding	central symbol of the best man's blessing for the couple

** the flag of the bride, if there is one, is always white (Hadzhinikolov, 1980), see p. 4*

Looking at the local culture elements that take part in the tourist product, on top of the list will be the perception of local identity proved with historical arguments of the ancient church and ritual. The church symbolizes the past when Dobarsko was a local cultural centre. The folklore programme is a showcase of intangible living heritage kept by the old ladies from the days before Socialism changed everybody's life, although the form of presentation of this heritage originates exactly from this modernization period.

For the purpose of tourism, festival presentations are shortened, because the tourists do not know much of the local culture and fairly understand the whole ritual concept and meaning. It is even possible that the performer is not a specialist in Ethnology but it is enough to know some basics in order to gain the tourists' attention. It is common this task to require much more skill in dealing with audience.

The general practices of traditional customs in the village indicate how much tradition is followed. The winter ritual celebrating St. John does not have annual continuation because the community is geographically fragmented. The old ladies are reconciled that the tradition is known and that they have shown their granddaughters what it is like.

In this situation tourism cannot achieve yet one possible positive impact by adding enough value to the local culture and motivate the community to respect and acquire the tradition themselves. And this is a critical issue for tourism itself, because now there are still some people alive who have experienced pre-modern tradition, and these people are happy to share their experience in front of audience. But what will motivate the next generation to sustain such practice for tourist animation.

CONCLUSION

It seems that tourism do not have much direct impact on the local culture yet, but is benefiting in the current circumstances from the living carriers of authentic tradition. Given that, in the bigger frame of tourism development in the whole region, with the influence of the super resort of Bansko, operated by foreign investors, if we are looking for positive impact this might be the long-term prosperity driven by socially and environmentally responsible economy. Only then community may reintegrate and be sustained by the local economy giving the opportunity to reproduce tradition in contemporary life.

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SOME ASPECTS OF THE STUDY OF THE CONFESSIONAL ENVIRONMENT IN THE NORTH CAUCASUS

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ABSTRACT

The confessional environment in the North Caucasus is a complex substance, which includes the interaction of many denominations of the Christian and Islamist religions due to their dualism. The study and, in particular, the classification of these territories is hindered by a number of problems, because it is insufficient to use only statistics to conduct a valid analysis in terms of an integrated geographical approach. A factor analysis applied in most cases does not allow evaluating the overall condition of the complex religious sphere. The author suggests using the coefficient of religious stability as an integral indicator that reflects the ability of the confessional environment to maintain its integrity under external influence (the expansion of new religions, government intervention, etc.) when studying the confessional environment. This coefficient is calculated at the level of administrative units and includes a number of indicators, from religious education to expert assessment of the time scale of the dominant religion in the unit in question. The coefficient of religious stability varies from 0 (low) to 1 (high) and can best reflect regional tendencies of building confessional environment. Relying on these data different types of the North Caucasus territories with low, medium, and high coefficient were selected. It was revealed, that the more homogeneous in the religious aspect the territory is, the more developed religious infrastructure it has got (religious educational institutions, buildings and structures, etc.), and the higher the level of the confessional environment integrity with the natural environment, and, as a result, the higher the coefficient of religious stability is.

Keywords: *confessional environment, religious sphere, coefficient of religious stability, denomination, religious dualism.*

INTRODUCTION

A confessional environment is a part of the global cultural environment and a complex many-sided system. In the past, the changes that occurred at its global and regional levels could have been called relatively latent because they were mainly caused by the changes on the ethnic map. However, due to the processes of globalization a quick shift of confessional fields and strengthening of the regional confessional patchiness of the regions at the border of two or more religious areas in particular, have been recently recorded.

The North Caucasus is a unique example of such boundary confessional environment which was formed across Islamist and Christian cultures. Although the dominant religion in the region is the Eastern Orthodoxy on the major part of the even land and Sunni Islam in the mountainous areas, there are elements of other religions such as Shia Islam, various denominations of Protestantism, some of the Eastern beliefs, etc. on this territory. All that makes the process of study of the regional confessional environment more complicated and it causes the need typologically similar territories to be selected according to a common criterion, i.e. geographic demarcation to be carried out.

The attempts to conduct demarcation of the confessional environment include the experience of cultural, historical and cultural, or cultural landscape demarcation. They are represented in the publications of such Russian scientists as Yu. A. Vedenin (2004), R.F. Turovskiy (1998), V.N. Kalutskov (2007; 2008), A. V. Lysenko (2009), A. G. Manakov (2001), etc. On the other hand, a researcher faces the problem of finding an integral indicator for the selection of the typologically similar territories. These can be indexes commonly used for the analysis of ethnic patchiness (Ekkel, 1976; Pokshishevsky, 1983), or particular indicators reflecting any characteristics of the confessional environment (Filimonova, 2006;).

DATA AND METHODS

A large amount of the material on the current state of the religious sphere in the North Caucasus was gathered by the author from September 2012 to January 2014. Official statistics about the registered religious organizations as well as information about the unofficial confessions (their structure, dissemination area, educational institutions, etc.) gathered during the field research on this territory were taken into consideration. Then, the materials were analysed and mathematical methods were applied to obtain various coefficients.

To calculate the coefficients, the data of a large-scale representative survey which was conducted by the Public Opinion Foundation in 2012 and involved 98.8 % of Russia's population were also used (The ARENA project, 2012). The benefits of this survey included a wide range of questions specifying both religious affiliation and the degree of the population religiosity (people attending religious institutions, not attending but religious, irreligious, etc.). However, it is important to mention that such territories as the Chechen Republic and the Ingush Republic did not participate in the survey for a number of reasons. That is why to identify the ratio of the religious groups on these territories we had to apply the percentage of the ethnic structure to the religious one as well as to use the data received as a result of our own public surveys.

Before the integral indicator to estimate the confessional environment was identified, the analysis of the current state of the North Caucasus confessional environment based on a number of functional maps produced by the calculation of the coefficients characterizing the state of the confessional environment had been undertaken:

- *the coefficient for degree of religiosity* (the ratio between the members of a particular confession in the region and

the total number of ethnic groups which are considered to belong to this confession traditionally) and *the coefficient for religious density* (the number of particular religion believers in the population structure on the territory in question) suggested by I. Yu. Filimonova (2006)

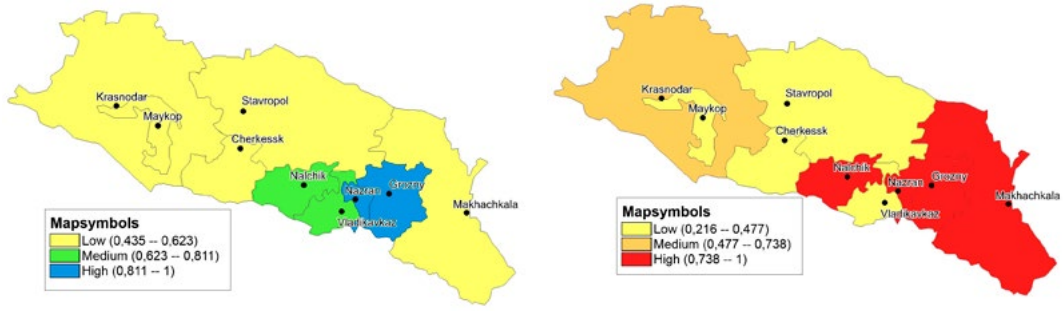
There is a noticeable correlation dependence (r = **0.774**; p<0.05) between the coefficients for degree of religiosity of the Orthodox and Islamic population on the North Caucasus territories (Table 1).

Table 1. *The coefficient for degree of religiosity and the coefficient for religious density of the North Caucasus territories*

	The coefficient for degree of religiosity		The coefficient for religious density	
Territory	**Orthodoxy**	**Islam**	**Orthodoxy**	**Islam**
The Stavropolsky Krai	0.566	0.299	1.93	0.047
The Chechen Republic	≈1	≈1	0.12	2.34
The Ingush Republic	≈1	≈1	0.045	2.446
The Republic of Dagestan	0.563	0.863	0.078	2.072
The Karachai-Cherkess Republic	0.435	0.216	0.576	0.345
The Republic of Kabardino-Balkaria	0.694	0.745	0.654	1.348
The Krasnodarsky Krai	0.588	0.659	2.13	0.025
The Republic of Adygei	0.559	0.454	1.44	0.295
The Republic of North Ossetia	0.631	0.269	2.01	0.095

It means that an increase or a decrease in the degree of religiosity in one confession typically leads to a change in the degree of religiosity in another. The highest degree of religiosity among the Orthodox and Muslim population is registered in the Chechen and in the Ingush Republics. In the Republic of Dagestan there is a high level of Muslim population (Picture 1). In general, it can be noted that the coefficients for degree of religiosity on all territories are rather high, particularly in comparison with other regions of the Russian Federation;

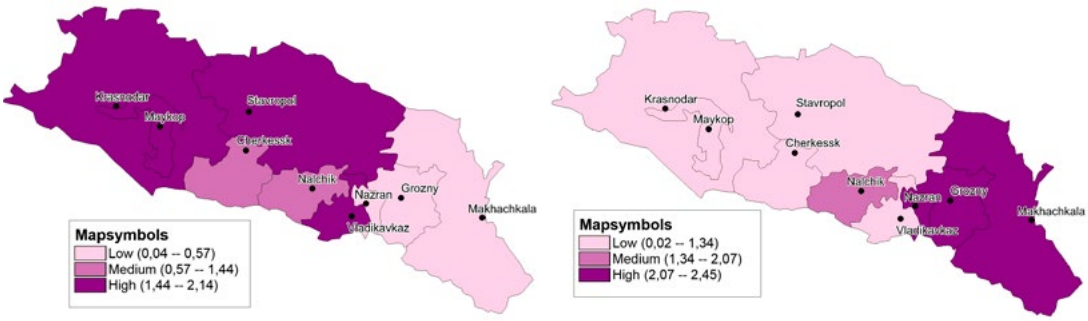
A) B)



Picture 1. *Degree of religiosity of the population on the North Caucasus territories:*
***A)** Orthodox; **B)** Muslim*

- *the coefficient for religious density* shows that in the west of the region there is a high density of Orthodox population, but in the east it is mostly Muslim. The territories of the Karachai-Cherkess Republic, Kabardino-Balkaria and Adygei are ecotones (Picture 2).

A) B)



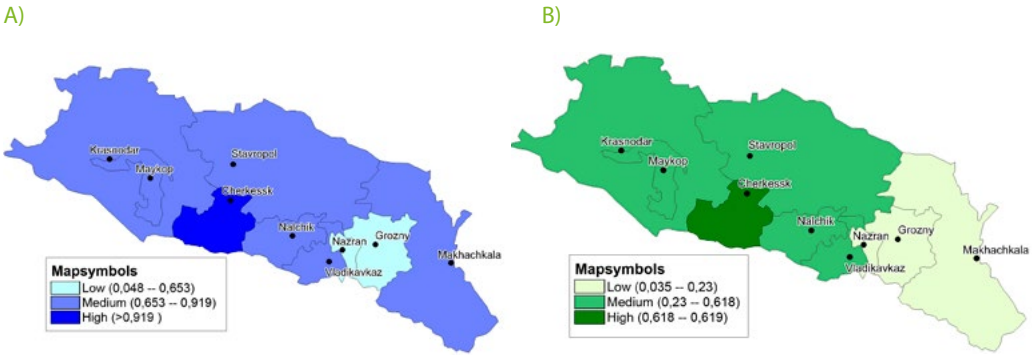
Picture 2. *Religious density of the population in the North Caucasus:*
***A)** Orthodox; **B)** Muslim*

The coefficient for religious density of the Orthodox population is rather high in the Stavropolsky and the Krasnodarsky Krai, as well as in the Republic of North Ossetia. The coefficient for religious density of the Muslim population in Dagestan, the Chechen and the Ingush Republics is generally higher than on the average in Russia. It is due to the larger part of the Orthodox or Islam population on these territories, and a high concentration of religious facilities of combined types (monasteries and convents, theological schools, madrasahs, religious educational institutions, etc.) as well as numerous pilgrimage objects of both confessions; - the *coefficients for patchiness* in which the indexes of religious patchiness (IRP) and religious structure patchiness (RSP) showing the degree of the confessional variety on the territories are used. There is a noticeable correlation dependence ($r = 0.818; p<0.05$) between their indexes.

Table 2. *Religious patchiness of the North Caucasus territories in 2012*

Territory	IRP	RSP
The Stavropolsky Krai	0.717	0.271
The Chechen Republic	0.127	0.102
The Ingush Republic	0.048	0.035
The Republic of Dagestan	0.653	0.154
The Karachai-Cherkess Republic	0.919	0.618
The Republic of Kabardino-Balkaria	0.716	0.332
The Republic of Adygei	0.771	0.311
The Krasnodarsky Krai	0.666	0.23
The Republic of North Ossetia	0.669	0.255

According to these indexes there are mono-confessional eastern areas, bi-confessional western areas and multi-confessional patchy central areas (Picture 3).



Picture 3. *Religious patchiness of the North Caucasus territories in 2012*
A) *the indexes of religious patchiness,* ***B)*** *religious structure patchiness*

The territory of the Karachai-Cherkess Republic is the patchiest of all. The major part of the religious people is Muslims who do not identify themselves either with Sunni or with Shia Islam. The percentage of them is 34%. Almost the same percentage are Orthodox believers, "none" and atheists (14, 12, and 7 per cent respectively). Such ratio between completely different religious traditions is the reason for the high religious patchiness of the territory. The territories of Dagestan, the Chechen and the Ingush Republics are the least patchy. The absolute majority of the population there are Muslims practicing different branches of Islam. Although there are affiliates of other religions on the territories, their number is small.

The use of these coefficients in the study of the confessional environment makes it easy to reveal the cause and effect relations between the different social and natural and cultural phenomena. For example, one can establish a correlation between the crime rate and the increased number of affiliates of alternative religions, or between the living standards of the population and the higher rate of "none" ("None" on the Rise…, 2012).

RESEARCH FINDINGS

The analysis of all aforesaid coefficients was conducted prior to the development of the integral indicator for the estimation of the confessional environment. It is *the coefficient of religious stability* ($C_{rs}C_{rs}$) that reflects the ability of the confessional environment to maintain its integrity under external influence. It is calculated by the following formula:

$C_{rs}C_{rs}=\frac{\sum_{i=1}^{n} k_i \sum_{i=1}^{n} k_i}{n}$, where $K_1K_1=K_cK_c$; $K_2K_2=K_uK_u$; $K_3K_3=K_{yp}K_{yp}$; $K_4K_4=E_iE_i$; $K_5K_5=E_pE_p$

n - is the number of coefficients under consideration;

K_cK_c - is the coefficient for religious density which is calculated by the formula: $K_cK_c=\frac{CC}{NN}$, where C is the number of the religious facilities on the territory, N is the total number of the religious facilities in the region;

$K_u K_u$ - is the coefficient for religious knowledge calculated by the formula: $K_u K_u = \frac{UU}{NN}$, where U is the number of the religious institutions of higher education on the territory; N is the total number of the religious institutions of higher education in the region;

$K_{yp} K_{yp}$ - is the coefficient for religiosity degree calculated by the formula: $K_{yp} K_{yp} = \frac{RR}{NN}$, where R is the number of the religious people on the territory; N is the total number of the population on the territory;

$E_i E_i$ - is the expert assessment of the dominant religion time scale on the territory (from 0.1 to 1);

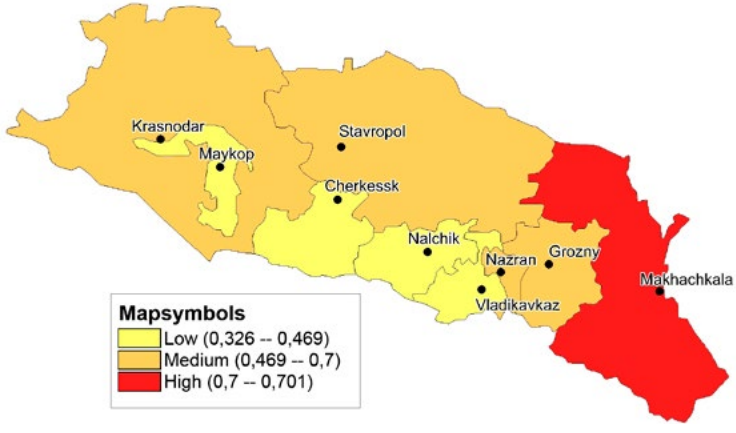
$E_p E_p$ - is the expert assessment of political and administrative intervention in the religious life of the population on the territory (from 0.1 to 1).

According to this formula the coefficient of religious stability on the North Caucasus territories was calculated (Table 3).

Table 3. *The coefficient of religious stability on the North Caucasus territories*

Territory	The coefficient of religious stability
The Stavropolsky Krai	0.515
The Chechen Republic	0.529
The Ingush Republic	0.501
The Republic of Dagestan	0.7
The Karachai-Cherkess Republic	0.365
The Republic of Kabardino-Balkaria	0.405
The Krasnodarsky Krai	0.469
The Republic of Adygei	0.326
The Republic of North Ossetia	0.397

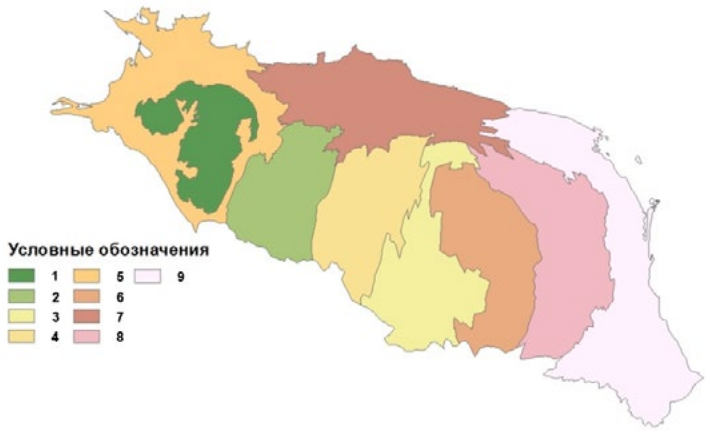
Previously, the quantitative analysis of religious facilities was considered to be the main indicator to study the confessional environment. The coefficient of religious stability allows evaluating the religious life on the territory in terms of political, cultural, historical, etc. aspects. It best reflects the regional tendencies of building the confessional environment of the North Caucasus. The coefficient is the highest in the Stavropolsky Krai, the Chechen Republic and Dagestan (Picture 4). It is the lowest in the Republic of Adygei, the Karachai-Cherkess Republic and North Ossetia. In the first group the position of the dominant religion is quite stable. It has rich historical background, an extensive network of religious objects and a system of social institutions (13 Islamic higher educational institutions in Dagestan; a theological school, a church choir school, theological faculties in the Stavropolsky Krai, etc.). In the second group the position of the dominant religion is quite unstable. It does not have rich historical background, centres of education; other confessions are widely spread.



Picture 4. *The coefficient of religious stability in the North Caucasus*

The data of the coefficient of religious stability are illustrated on the anamorphosis map (Picture 5) and can be used as a basis for the development of religious tourism in the North Caucasus. Depending on the level of religious stability on the

territory various types of religious tourism can be developed for the tourists with the most radical religious intentions (in the most stable areas) and, vice-versa, for the tourists with low religious intentions (in unstable areas).



Picture 5. *Anamorphosis - coefficient of religious stability of the North Caucasus*

1 – The Republic of Adygei; 2 – The Karachai-Cherkess Republic; 3 – The Republic of North Ossetia; 4 - The Republic of Kabardino-Balkaria; 5 – The Krasnodarsky Krai; 6 – The Ingush Republic; 7 – The Stavropolsky Krai; 8 – The Chechen Republic; 9 – The Republic of Dagestan

This geographic demarcation of the North Caucasus territory allows identifying the degree of the differentiation in the sphere of the religious tourism development in the North Caucasus: Will it be limited by the heritage of only one religious group? Is it possible to combine religious tourism with other types of tourism (for example, with pilgrimage on foot), etc.?

DISCUSSION

In conclusion, taking into consideration the specific features of religious tourism development in the North Caucasus, the following major areas can be selected:

1. *Kuban area*. There is an extended network of monasteries; the major part of them are new and almost do not have its historical background which can attract tourists by the rich heritage. These are convents – the Convents of the Icon of the Mother of God "Most-Holy Queen of All" (Krasnodar), Holy Trinity and St. George (Veseloye), in honour of the Mother of God of "the Inviolable Wall" (Apsheronsk), the Convent of Dormition (Korenovsk), as well as the Monastery of the Holy Spirit (Timashevsk) and the Holy Cross Monastery (SolokhAul). There is one convent – the Hermitage of Feodosiy Kavkazskiy (Gorny) founded at the beginning of the 20th century. However, the main objects of religious tourism are still monasteries founded in the 19th century and earlier. They are the Maria Magdalena Convent (Rogovskaya), the Lebyazhiy Hermitage (Lebyazhiy Island village) and the Holy Mikhail Afon Zakuban Cenobitic Hermitage (Pobeda).

2. *Terskaya area*. It can be mentioned, that the indirect flow of religious tourists to this territory is one of the highest in the North Caucasus because the Karachai-Cherkess Republic is a part of it. The restored Alexander Afon Zelenchuk Heritage (Nizhny Arkhyz) is situated there. It is difficult to divide visitors of the monastery situated in the republic into those with religious intentions and those without them. Many tourists usually come to the mountain resort Arkhyz and at the same time visit the monastery. However, almost all visitors use monastery services (order occasional services, buy votive candles, a church plate, etc.) which allows considering them as religious tourists. The Trinity and Seraphim convent founded at the beginning of the 20th century is also situated in Kabardino-Balkaria (Sovkhoznoe). It is less popular, although it is a compulsory object of pilgrimage to the Holy places of the republic.

3. *Stavropolskay area.* It has got own resources for the development of religious tourism; there are such historically relevant objects as the John and Mary Convent (Stavropol) and the Beshtaugorsk Second Afon Monastery of Dormition (Pyatigorsk).The latter is included into numerous Caucasus Mineral Water tourist routes as a key object which contributes to its development and improvement. In the short term, there are plans to restore the Host Resurrection Mamai-Madzhar Monastery (Budennovsk) that can become a key object of tourism in the eastern areas of the Stavropolsky Krai. There is also a new Monastery of the Icon of the Mother of God "Joy of All Who Sorrow" (Tatarka) in the vicinity of Stavropol which has recently been attracting a great number of holiday visitors.

4. *The North Ossetia area*. The main objects of religious tourism are a monastery and a convent founded in the 21st century. They are the Alan Monastery of Dormition (Fiagdon) and the Theology Alan Convent (Alagir). By general estimate, we can say that the tourist and pilgrim flows are enough for the sufficient performance and the development of the monasteries and convents.

5. *The East Caucasian area*. It is the only area in the North Caucasus that has the resources to develop religious tourism of both the Orthodox and the Islamic branches. However, the latter has a more extensive network. It includes the oldest Muslim mosques of Dagestan – the Kumukh Jumah Mosque and the Derbent Jumah Mosque, as well as the Holy Mount Shalbuzdag which is popular among Islamic pilgrims from all over the world. In recent years, a new mosque "Heart of Chechnya" (Grozny) has gained its popularity as a pilgrimage place. It is one of the biggest in Russia and has got a great number of Islamic relics. There are many locally venerated *ziyarats* (depositions of Islamic khatibs to which people make

prayer pilgrimage) on the territories of the Chechen, the Ingush Republics and Dagestan. They are both modern (Said-afandi al-Chirkavi, Khusein-Khadzhi Gardanov, OzievIlyas-kadi Ziyarats) and of the time of the Caucasian War (Kornaki, Akhberdilav Mohamed, Saltbi, Batal-Khadzhi). There is also one female ziyarat "Khadi Ziyarat" – sheik Kunta-Khadzhi Kishiev mother's mausoleum – which is very popular among the female population of the republic. The total number of the North Caucasus ziyarats runs into hundreds, although only the most worshipped and able to form a basis for the development of religious tourism in the Eastern Republics of the North Caucasus are mentioned in the article.

There is a New Sinai Orthodox Monastery of Protection of the Blessed Virgin (Ordzhonikidzevskaya) in the Ingush Republic. It was opened in 2014 and is supposed to attract the attention of the Orthodox tourists, as well to make religious routes to religious objects of both confessions possible.

CONCLUSIONS

As a result of the research conducted in the North Caucasus the following territories with different potential for religious tourism development have been selected with use of the coefficient of religious stability:

- with the highest coefficient (Dagestan) where it is possible to develop such types of religious tourism as pilgrimage, cultural and educational, recreational tourism;
- with medium coefficient (the Krasnodarsky and Stavropolsky Krai, the Chechen and the Ingush Republics). The major and the most promising type of religious tourism is pilgrimage to monasteries and convents in Orthodoxy and ziyarats in Islam;
- with low coefficient (Adygei, North Ossetia, the Karachai-Cherkess Republic and Kabardino-Balkaria). Pilgrimage tourism is the most promising type there but, however, for its sustainable development additional key tourist resources need to be formed.

In general, it is possible to say that due to the rich historical background of both Orthodoxy and Islam in the North Caucasus, the development of religious tourism in the region can give rise to the total number of tourists and revive forsaken spiritual omphaloses.

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CONTEMPORARY CHALLENGES OF BUILDING COMPETENCES THROUGH LIFELONG LEARNING IN MOUNTAIN REGIONS

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ABSTRACT
The paper examines life-long strategies in international and national scope and opportunities to adopt their priorities in regional strategies for improving the level and access to vocational training and qualifications in mountain regions in the Republic of Bulgaria. The educational and training system in the country is discussed: its advantages that could be used for providing training in mountain regions and its limitations that should be overcome. Recommendations are given for development of a national conceptual framework of vocational training targeted specifically at the population of mountain regions and facilitating access and quality of trainings that should be provided, as well as particular fields of study that would contribute to mountain regions' development through knowledge-based economy and smart specialization.

Keywords: *lifelong learning, learning outcomes, competence-based training, student-oriented training, vocational training*

INTRODUCTION
Among the main challenges facing humanity in the 21st century are educational and capacity building problems interlinked to the globalization processes and information society development imposing the permanent existence of an educational environment and learning skills in times when information is rendered along with the general resources of well-being and sustainable development of future generations. Thus, it is no longer more important to know everything but to have skills to obtain information and deal with it. That is a big challenge to society and the educational systems shifting to assurance of continuity in learning and building learning capacities, i.e. accenting on the abilities of self-learning. The fast development of science and technology in the last few decades poses tremendous challenges before individuals and societies in keeping *"up-to-date"* which is now underpinned in the significance of learning experiences and acquired learning skills. The *"school-long learning"* is now replaced by the life-long learning concept (Demirel, 2009). Continuing education considers individual, community and country economy and leads to personal development and abilities to understand, explain and process information (Laal *et al.*, 2014). Concerning citizenship, social cohesion and lifelong learning issues, education and training are priorities in many international and national policies because these are *"providers of security culture necessary for optimal management of the risks faced by modern society"* (Bostan, 2014). Lifelong learning implies encouragement of acquisition of essential knowledge and skills and expanding the opportunities of flexible and new learning (Öztaskin, 2010). Its purposes of encouragement all the parties to novelties are united in the main goal of increasing efficiency and motivation.
Lifelong learning *("education from cradle to grave")* is a holistic approach having as main targets *"generalising the pre-school education both in quantity and quality, constituting a real learning basis in compulsory education, facilitating progression from school to business life, encouraging adults to learn, renewing the resources of the system and establishing consistency between the parts of the system"*(Demirel, 2009). Lifelong learning comprises all phases of learning, from pre-school to post-retirement, and covers the whole spectrum of formal, non-formal and informal learning which means that learning is a diverse process adapted to the individuals and occuring at all times in all places providing not only individual needs *"in order to foster the continuous development and improvement of the knowledge and skills needed for employment and personal fulfillment"* but also community ones (Laam, 2011c). Lifelong learning is defined as *"lifelong, lifewide, voluntary and self-motivated pursuit of knowledge for either personal of professional reasons"* enhancing social inclusion, active citizenship and personal development, competitiveness and employability (Coúkun and Demirel, 2010). Life-long learning as *"deliberate, focused learning throughout a person's lifetime"* is connected to student-centered learning approaches (Coúkun and Demirel, 2010).
The current paper provides evidence that lifelong learning could assure the needed change in mountain regions development regarding knowledge and skills through a self-directed learning process assuring self-organization and solution of the most topical problems concerning low economic development, lack of managerial and marketing skills, and thus contributing to more general points of improvement of the living conditions, food security, social security and gaining independence of outer support. That will be a specific contribution to the strategic goals of increase in the educational level and employment rates, promotion of research and development, reducing poverty and uneven development of the urban and rural areas.

DATA AND METHODS
The paper makes a review of the concept of lifelong learning and sets out the main points in the continuing education and training activities. The educational system of the Republic of Bulgaria is analysed and conclusions and recommendations are made regarding building competencies in mountain regions through lifelong learning approaches.

RESEARCH FINDINGS

Globalization and development of an information society in the contemporary world put a number of challenges before the national educational systems fostered by the uneven regional development and unfair conditions for some areas which stay isolated and marginalised lacking competitive advantages of value-added and knowledge-intensive products and services requiring skills of high level. The lifelong learning concept is an alternative for capacity building in mountain regions offering new approaches and needing huge transformations in both educational systems and human minds, especially in educational institutions and local communities. The concept could be put into practice through new policies and strategies implementing flexible framworks, innovative pedagogical approaches, new forms of assessments and institutional collaboration (Chițiba, 2012).

Lifelong learning means *"continuous development and improvement of the knowledge and skills needed for employment and personal fulfillment through formal and informal learning opportunities"* based on the four pillars of education for the future (Table 1) encouraging *"creativity, initiative and responsiveness in people thereby enabling them to show adaptability in post-industrial society through enhancing skills to: manage uncertainty; communicate across and within cultures, sub-cultures, families and communities; negotiate conflicts. The emphasis is on learning to learn and the ability to keep learning for a lifetime"* – learning to know, to do, to live together and with the others and learning to be (Chițiba, 2012).

Table 1. *Various forms of learning (Laam, 2011c)*

Formal learning	Non-formal	Informal learning
consists of learning that occurs within an organised and structured context (formal education, in-company training), and that is designed as learning that may lead to formal recognition (diploma, certificate) an intentionally planned learning activity	learning consists of learning embedded in planned activities that are not explicitly designated as learning, but which contain an important learning element such as vocational skills acquired at the workplace forms by intentionally planned activities	defined as learning resulting from daily life activities related to family, work or leisure often referred to as experiential learning and can, to a degree, be understood as accidental learning non-intentional with no planning

Among the many challenges for lifelong learning in contemporary societies along with the most general ones as financial, demographic, technological, social, environmental and democratic, the following could be mentioned: *"better bridging among levels and learning settings; considering the need to maintain skills throughout life; considering financial issues to bring the discourse more decisively into policy discussion, and exploring the social dimension of learning"* (Laal and Laal, 2012a). What is important for learners are learning how to learn and the ability to organize and direct one's own learning skills. The results are presented by learning outcomes as knowledge, skills and competences (Figure 1).

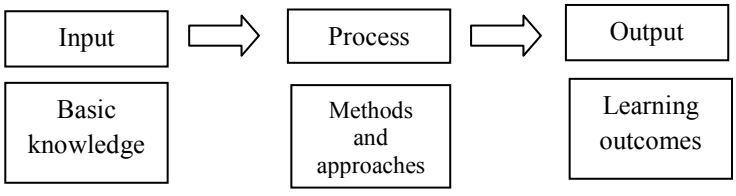

Figure 1. *The new educational paradigm of competence-based learning*

The necessary skills to *"understand, interpret and process different information"* impose the recognition of all forms of learning among which continuing education *"benefits individuals, communities and the country's economy"* providing needed knowledge, skills, values, attitudes and undertsndings, making communities more productive and strengthening the economy (Laal and Salamati, 2012).

Table 2. *Lifelong learning in different age periods (Laam, 2011c)*

Age 0-5 years	Learning provides a foundation for future learning habits and talents The age period with the highest amount of informal learning
Age 6-24 years	Learning primarily takes place in educational institutions - from primary and secondary to tertiary levels Family life, social organizations, religious institutions, and mass media have a role in learning during this time
Age 25-60 years	Learning informally through the use of instructional media, mostly from occupations, work-places, colleagues, touring, mass media, information technologies, environment and nature Learning from experiences and problem solving Need of continuous development of intellect, capability and integrity
Age 60+ years	Learning from activities suitable to age e.g. art, music, sports for the elderly, handicrafts and social work Voluntary work in community organizations, clubs and associations

Lifelong learning's advantages are considered in regard to adults' training opportunities and social inclusion

contributing to the adaptation processes and quality of life. Discussing the most important impacts of lifelong learning on quality of life (Escuder-Mollon, 2012) the following should have special attention: positive thinking, learning, memory and concentration, interpersonal relations, personal development (achievement and status in education, cognitive, social and practical personal competence, and performance – success, achievement, productivity), and self-detremination (independence, desires, expectations, choices, preferences). It is important to set in the proper way the training in respect to learning content, leaning environment, pedagogical approaches, etc. assuring active learning.

In comparison to traiditional learning, e-learning provides certain advantages as *"reduced time for getting in touch with the source of learning, flexibility of learning schedule which lacks the classic on campus classes, less costs for the participant due to the fact that the study does not involve travelling, accommodation"* (Pamfilie *et al.*, 2012). E-learning could be an effective and efficient alternative for continuous learning if virtual platforms have proper design and content according to the congnitive and cultural characteristics of the target learners (Pamfilie *et al.*, 2012). Thus, e-learning could provide the needed flexibility and accessibility for the population in mountain regions if relevant basic knowledge and skills, as well as wish, are available, especially considering different people of different ages and understandings.

Discussing *"emergencies in lifelong learning",* it is stated that early drop-out of formal education endangering economic and social security could find possible solutions in *"continuing education, reflections and practices on local, national, regional and global scale"* supported by the flagship initiatives of Europe 2020 Strategy within employment, social affairs and inclusion field (Bostan, 2014).

In the context of lifelong learning, the importance of career education has new dimensions bearing in mind that social integration is an active and lifelong process outlining the major purpose of education as preparation for life, thus changing the vision of educational content and imposing the need of considerations in the field of career planning (Dandara, 2014).

Barriers to lifelong learning could be economic, personal, social, foundational, technological, access, and motivational inextricably linked to one another (Laam, 2011).

The elements needed to develop lifelong learning in a society are identified as follows: partnership working, insight into the demand for learning in the knowledge-based society, adequate resourcing, and facilitating access to learning opportunities, creating a learning culture, and striving for excellence (Laal and Laal, 2012b). Eight key teachers' competencies necessary for lifelong learning are outlined and explained: cognitive skills, self-esteem, problem solving, and application of modern ICT, information, mathematical and language literacy, and ability of empirical research (Jovanova-Mitkovska and Hristovska, 2011).

In the European Union, lifelong learning became the central part of educational policies in the context of struggles for a knowledge-based society and the importance of developing more competitive lifelong learning strategies in national educational systems will be more and more essential for a successful governmental policy (Lazar and Lazar, 2012).

One of the four strategic objectives for the ET 2020 framework is making lifelong learning and mobility a reality and one of the major issues in putting it into practice is the educational system of each country which "is not yet prepared to develop lifelong learning competences" (Canțer and Brumar, 2011).

It is very important to think about educational policies *"able to increase beneficial effects both for individuals and for societies, to solve and avoid from cultural, social and economic disadvantages and to give a significant contribution to cooperating and social cohesion and stability"* (Aleandri and Girotti, 2012).

Lifelong learning is expected to *"deliver competence development and labor market-related qualifications within and outside enterprises as part of human resource development to sustain economic growth"* and *"to contribute to the maintenance of democratic values and institutions, and to societal and personal development, as well as reducing development gaps between the rural and the urban areas"* (Stanef *et al.*, 2012). Adaptation of lifelong learning approaches to the national educational systems has important implications recognizing education in all forms. The relevant frameworks (legislative, governance, financial, institutional, learning, informational, qualifications and regulatory) should be created in national policy development in order to engage different communities in learning, as well as collateral policies in related areas as "employment, welfare, rural development and poverty reduction and monitoring and evaluation of policy impact across many ministries and agencies in order to reduce development gaps between the rural and the urban areas" (Stanef *et al.*, 2012).

Examining schools in rural areas it is underlined that regarding socialisation the small size of schools and community facilitates *"the generation of a friendly, small-scale environment that helps pupils develop good relationships among themselves"* (Stanef *et al.*, 2012). In addition, rural schools could provide a wide range of benefits for local community in many ways as: involvement of rural schools in training programs for the local population; introduction of new technologies into the area and undertaking of initiatives that help in the cooperation with local community in educational projects that aim to promote local cultural production, local art, entrepreneurship and active citizenship; promotion and dispersion of new ideas beyond stereotypes, concerning multicultural societies, environment, gender equality etc.; participation in cultural activities (Stanef *et al.,* 2012).

The National strategy for lifelong learning 2014-2020 sets out the strategic framework of the state policy in education and training during the next program period according to the global goals put on the European level for smart, inclusive and sustainable growth as a response to all emerging challenges in regards to the social inclusion and economic growth. It accepts the definition of lifelong learning, as used in the EC Memorandum on lifelong learning (2000): "*all purposeful learning activity, undertaken on an ongoing basis with the aim of improving knowledge, skills and competence",* and covers all forms of education, training and learning outlining content, forms, environment and interactions among all the parties: learners; training providers; employers, trade organizations, labor unions, civil society organisations; regions, municipalities and local communities; governmental bodies as ministries and agencies, etc. according to the new scope of learning in conditions of quality assuranace, transparency and comparability (Table 3).

The strategic priorities are set as follows:

- *A step forward to a new educational approach and innovations in education and training;*
- *Increasing the quality of education and training;*
- *Ensuring the educational environment for equal access to lifelong learning and for active social inclusion and active citizen participation;*
- *Promoting education and training aligned to the needs of the economy and changes on the labour market;*
- *Impact areas in the National strategy for lifelong learning are:*
- *Ensuring the conditions for transition to a functioning system for lifelong learning;*
- *Ensuring the conditions for expanding the scope and enhancing the quality of preschool education and training;*
- *Applying a comprehensive approach to enhancing the educational achievements and reducing the share of early school leavers;*
- *Enhancing the quality of school education and training towards attainment of the key competences, improving the learners' achievements and personality development;*
- *Increasing the attractiveness and improving the quality of vocational education and training to ensure employment and competitiveness;*
- *Modernising the higher education;*
- *Development of opportunities for non-formal and informal learning for personal and professional progress. New opportunities for good quality of life following the working career's end;*
- *Coordinating the interaction among stakeholders in the implementation of the lifelong learning policy.*

Table 3. *Principles in the implementation of the National strategy for lifelong learning 2014-2020*

Principle	Short description
Quality	transforming lifelong learning into a factor for the success and competitiveness of the citizenry, the institutions, and organisations by providing the conditions to achieve higher educational objectives
Equality and diversity	ensuring equal opportunities for all individual and collective stakeholders to exercise their rights and duties arising from their participation in various and multiple forms of lifelong learning, which take place in diverse socio-economic contexts
Decentralisation	transfer of powers and resources from central government bodies and public institutions to the regional administrations, the municipalities, the setups of social partners, the non-governmental organisations, etc., and also to associations of training providers in order to ensure the access to lifelong learning activities for various target groups and specific participants
Cooperation	conduct of consultation processes at various levels, proactive dialogue and allocation of the rights, duties, and risks among all stakeholders in order to achieve the strategic objectives and priorities of the lifelong learning policy through implementation of the specific measures scheduled for the impact areas
Measurability	enhancement of the opportunities for monitoring and measuring the education objectives
Flexibility	preparedness of the stakeholders to respond, upon occurrence/ascertainment of unforeseen social and socio-economic processes, through expansion of the earmarked objectives and actions.

Lifelong learning is targeted as a guiding principle in the supply of education and training in the national context aiming at assuarance of quality, equality and diversity, decentralisation, cooperation, measurability and flexibility. Analysing the strategy, it should be noticed that small settlements and rural areas are specifically addressed in the strategy which is of particular importance for future mountain regions development. On the other hand, considering education and qualifications' system the conclusion which could be made is that student-centered and competence-based approaches, as well as transdicsiplinary resreach and integrated knowledge, are still big challenges to the Bulgarian educational system (Table 4, 5 and 6).

Table 4. *The Bulgarian educational system*

Levels	Types	Subjects
Primary Secondary Tertiary	Basic Education Specialized Education Vocational Education Vocational Training	Obligatory Elective Optional

Table 5. *National qualifications framework*

Type of Education/ Training	Where	Duration	In charge	State Educational Require-ments	Procedures of Changing Subjects in Schools	Level of Vocational Qualification	NQF Level according to EQF
Preparatory Education	Kinder gardens	2 years	MES	Strict	Clumsy	-	0

Basic Education	Primary Schools	Elementary 4 years	MES	Strict in terms of subjects and contents	Clumsy	-	1
	Secondary Schools	Basic 3 years	MES NAVET			Opportunity for LVQ I	2
Secondary Education	Secondary Schools	Basic	MES	Strict in terms of subjects and contents	Clumsy	-	3
		Vocational Education	NAVET LPVET	Not so strict	Facilitated	II	3
						III	4
Tertiary Education	Higher education institutions	Bachelor - 3 years 180 ECTS - 4 years 240 ECTS Master PhD	NEAA	NEAA Criteria Institutional and Programmes Accreditation	Depends on the higher education institution	-	6 7 8
Vocational Training	Centers for Vocational Training	Minimum 360 660 960 hours	NAVET	Not so strict Based on competencies Non-formulated yet for all professions and specialties	Short procedure for changing training curricula and programmes	I II III	
	Vocational Colleges	2 years	MES - Registration NAVET - SER	Not so strict Non-formulated yet for all professions and specialties		IV	5

Abbreviations: MES - Ministry of Education and Science; NAVET - National Agency for Vocational Education and Training; NEAA - National Evaluation and Accreditation Agency; SER - State Educational Requirements; NQF - National Qualification Framework; EQF - European Qualification Framework; LPVET - List of Professions for Vocational Education and Training in the Republic of Bulgaria

The Bulgarian educational system is suffering a great extent of conservatism regarding the introduction of new methods and approaches, the establishment of flexible learning paths and acceptance of knowledge and skills' validation. Primary and secondary school education are strongly regulated by the state requirements and very small changes are possible regarding the specific fields of study. Development of higher education institutions is marked by the enourmous competition on the market for students. The acquisition of specific vocational competences is possible through the system of vocational education and training although there is a list limiting the professions and specialities. On the other hand, the mentality of the biggest part of the population is focused on the significance of the diplomas and not on the learning results and real opportunities for realisation on the labor market or starting own enterprises is a big barrier in the development of vocational training and its recognition as the most valuable tool in career development.

Table 6. *State Educational Requirements in Vocational Training*

State Educational Requirements Contents	State Educational Requirements provide information in respect to:
• Requirements to the entrance level • Description of the profession • Opportunities for continuation of vocational training • Opportunities for realisation according to the National classification of professions and occupations • Objectives of vocational training • Training Outcomes – knowledge, skills, competences • Requirement to facilities and equipment • Requirements to the trainers	• carrier planning • training curricula and programs development • human resources planning and management • human resources training and competences evaluation • developing proposals for changes in the contents of vocational training

Considering the great number of issues impeding successful capacity building in mountain regions, as infrastructural and financial limitations and access, as well as the specific development of some sectors in those regions, as agriculture and tourism, ways of applying the above-discussed opportunities of lifelong learning should be sought, as well as of making the education and qualification system of the country more flexible and targeted to the real needs for regional development.

DISCUSSION

In today's economy the economic growth, development and progress of an economy are subject to investment in people, to the increased role of education and lifelong learning and improving the educational and employment policies (Ionela, 2012). The importance of lifelong learning on the labor market is underlined in the increase of work efficiency because *"by participating in lifelong learning individuals adapt more easily to changes in the labour market and better face strong competition from the global economy"* and these advantages on individual level are supported by the advantages

on organization and even national level *"by the fact that well prepared people are always a long-term investment of society, becoming the support of economic growth and development"* (Ionela, 2012).

Lifelong learning is in the basis of the reforms on different levels because of its significance for assurance of quality of life and social security, the links to globalization and technological changes and economic opportunities. Contemporary challenges of building competences through lifelong learning in mountain regions are connected to educational technology, policy, levels, programs, relationship to community and local culture and historical development, etc. For establishing a national conceptual framework of vocational training through lifelong learning focusing on capacity building in mountain regions there are some key points that could be summarised as follows:

- recognition of non-formal and informal learning;
- encouragement of vocational training;
- development of trainers's skills;
- creating culture of learning through increased learning opportunities, improving access and participation, stimulating learning demand;
- inclusion of a broader scope of learners in respect to age, occupation, educational and professional background, etc.;
- Partnership approach – collaboration of all stakeholders in planning, implementation, funding, resources allocation, etc.
- communication and coordination;
- developing mechanisms for quality assurance, evaluation and monitoring;
- continuous improvement and renewal of policies and system.

Establishing the right educational policies based on preliminary needs' analyses and providing equal opportunities is part of the effective strategies for overcoming unemployment and conributiing to social cohesion and stability. The harmonization of the European, national and local strategies is necessary for provision of efficiency, assurance of funding and resources and long-term effects (Table 7).

Mountain regions development could be interlinked to rural regions' development and policies underlying strategies on national and regional levels. Regarding vocational trainings needed specific fields could be determined as integrated knowledge in farming, tourism and management of micro, small and medium-size enterprises.

Table 7. *Key issues and there linkages in lifelong learning development*

European and national regulatory framework				
Strategic partnerships	Teaching	Learning	Administration and support systems	Monitoring and control system
Relationships	Roles of participants		Access	Quality assurance
Policies encouraging lifelong learning in disadvantaged regions				

Table 8. *Mechanisms for fostering lifelong learning*

Communication and coordination	**Recognition of skills**	**Employability**	**Quality assurance system**
Pedagogical innovation	Qualifications framework	Flexibility in learning programmes	
Learning pathways	Validation procedures	Needs'analyses	
Learning outcomes			
Participatory approaches			

There is a need of measuring whether the current education and qualification system answers the needs of inviduals and organisations, as well as how to apply best lifelong learning in order to assure improvements in qualifications and recognition (Table 8). The outcomes should be measured as quality skills giving competitive advantages to learners and making them adaptable and mobile. However, all the interventions should be carefully analysed before entering into force according to the specific characteristics of some regions and their population in connection to the exisiting culture and understandings. The introduction of the culture of lifelong learning would not be an easy and fast process. Significant efforts in motivation activities should be put and it should embrace all the parties: the state through regulatory requierements, policies, strategies and specific support; the business – actively participating, determining the needs and providing support; educational and training institutions – building capacities and assuring inclusion; potential learners – willing to change.

CONCLUSIONS

Mountain regions' development needs a number of capacity building activities and needs a specifically targeted lifelong learning application policy based on the broad participatory approach and using available resources and modern information and communication technology. It should provide implications for solutions of the main problems connected to access, as well as teachers' skills of lifelong learning approaches, especially in curricula development based on enhancement of personal skills, and further evaluation and quality control mechanisms. Networking as a collaborative learning opportunity could provide the needed flexible framework of learning any time at any place concerning the individual needs and learning abilities. The creation of a new learning culture is the first necessary prerequisite in motivation activities and making learning more accessible in mountain regions in the country. The application of such a strategy will need support of the institutional system (educational and training instituttions, state, non-governmental and business

organizations) and a relevant infrastructure on regional level. The development of partnerships should be substantiated by the identification of the needs (both of learners and the labor market) and relevant resources respecting the cultural, ethnic and linguistic diversities.

Development of lifelong learning programmes for specific target groups in mountain regions is important because of the opportunities they provide for assuring employment, higher quality of life and social inclusion, as well as for the economic growth and community development as a whole. Lifelong learning policies are needed because permanent trainings lead to acquisition of valuable skills providing competitive advanatages of individuals on the labour market under the conditions of globalisation of the economic and social life, fast technological changes and increase in the importance of knowledge in economy.

Discussing concrete measures of support in lifelong learning in the country, and in connection to capacity building in mountain regions in particular, some common aims could be identified concerning also the national education and qualification system: improving communication and cooperation between the state, the educational institutions, the business organizations and society, adaptation of the training to the labour market demand and improving the training programmes on different levels and types, motivation for lifelong learning and career development. The educational measures should be connected to the labour market measures, social and fiscal policies in order to increase employment, labor efficiency and motivation for self-improvement.

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VOICE OF THE MOUNTAIN POPULATION – A LESSON ABOUT SUSTAINABILITY - CASE STUDIES: CRNA TRAVA, KNJAŽEVAC, KURŠUMLIJA AND UŽICE MUNICIPALITIES (SERBIA) -

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ABSTRACT

Demographic change, expressed through population aging and depopulation, represents one of the challenges mountain regions face, particularly in their villages. It also indirectly influences the labour and education structures as well as emigration, thus putting three components of the sustainable development – social, economic and ecologic – out of balance. The demographic change in mountain villages goes that far to endanger the existence of the population, hence, seriously weakening their cultural and biological sustainability.

Spatial planning is one of the comprehensive tools to address balance between the components of the sustainability. Therefore, this paper researches on the rural mountain population point of view – their understanding on the current situation, and how it influences their social, economic and environmental actions. The results reveal the problems the mountain population faces in order to learn about improvement of mountain region sustainability.

The research design will be based on a case study approach, choosing four mountain municipalities in Serbia, thus covering various mountainous regions and embracing economically more and less challenged examples. The data will be found in statistics, literature and interviews, analysed through the grounded theory methods. There are 17 interviews used, conducted with the local population in 2009.

***Keywords**: mountain population, sustainable development, demographic change, spatial planning, Serbia*

INTRODUCTION

Most of the European mountain regions, when compared to lowlands, share common characteristics: well preserved ecosystems, a greater number of demographically small settlements and depopulation caused by negative natural growth and emigration. The mountain regions of Serbia make no exception. Physically isolated, small mountain communities have developed specific cultural patterns throughout the centuries named "sources of rural culture" (Bryden et. al., 2005), which altogether represent significant cultural diversity in relatively small space (Prodi, 2002).

Numerous studies and activities focused on sustainable development prove the relevance of mountain regions regarding this topic. So, there is a monograph - Key Issues for Mountain Areas (Price et. al., 2004) – which is dedicated to mountain sustainability worldwide; there is a whole range of activities of the European Association of Mountain Areas – EUROMONTANA at the European level; and the study on Sustainable Development in Mountain Regions (South Eastern European Mountain Research Network - SEEMORE) at a regional level. The Alpine (1991) and Carpathian (2003) Conventions aim to preserve sustainability at the level of the mountain massifs, and finally, laws, spatial plans and development programmes embrace the sustainability principle at a national level (Pantić, 2014).

The mountain regions of Serbia encompass the Carpathians, the Balkan Mountain Massif, the Dinaric Alps and the Rhodopians. Areas above 600 m altitude, which is usually taken as delineation criterion for mountains, inhabit about 10% of the total population of Serbia, but in mountain municipalities[1] there was about 40% of the total population in 2011 (SORS, 2014). Their average age is 44. Since 1991, 10 settlements have remained demographically empty and there are 92 villages with population of only 10 or less inhabitants. Besides endangered demographic capacity, mountain regions are exposed to the whole range of problems and challenges in the field of environment, economic development, accessibility to technical and social infrastructure and governance (Pantić, 2014). Ecosystems often suffer due to superficial monitoring and negligence of natural heritage; demographically, they are exposed to severe depopulation, aging and gender imbalance (Nikitović, 2011; Pantić, 2014); economically, they are challenged by higher construction and maintenance costs than in lowlands, economic transition common for all post socialist regimes in Europe, unemployment and under-average incomes in a national context, lack of competitiveness and low profiled labour; malfunction or even absence of health care and education is what many mountain villages encounter nowadays; and finally, universal measures for all types of regions do not help in solving the problems efficiently.

Even though small size of the settlements and sparsely populated space are among the main preconditions for preservation of the ecosystems, in times of climate change (Radovanović, 2011) and at a moment when the demographic existence is endangered (Nikitović, 2011), it is a question of the existence of the most significant values of the mountain regions, too. A protection against torrents and forest fires, caused by global warming, can be fought only with people present in the area; the economic potentials of the mountains recognised in tourism and organic production are in direct relation to the presence of the population; and the remote communities creating diverse cultural patterns is the third component of the sustainable development that cannot be preserved without native inhabitants. So, as Nikitović (2011) notices, sustainability of the mountain regions is endangered by demographic change; therefore, this paper researches sustainability from the aspect of those the sustainability depends on the most but who are rarely involved in the decision making process (Pantić, 2014) – the mountain population.

1 Mountain municipalities are those with at least 1% of the territory above 600 m altitude.

DATA AND METHODS

A research core of this paper is the data collected by interviews. The interviews were conducted with 17 households in 16 mountain villages in 2009. The villages pertain to the Crna Trava, Knjaževac, Kuršumlija municipalities and the Užice City, all located in Serbia, thus covering the Balkan Mountain Massif, the Dinaric Alps and the Rhodopians as mountain regions. The aim was to embrace economically differently positioned examples, from good practices to deprived economies.

Interviews were semi-structured with open-ended questions, conducted in the form of conversation in order to secure the possibility of asking additional questions when an unexpectedly relevant topic would emerge. Their contents was equal in each case, embracing four topics: (1) current state and changes in the economic activities of a household, (2) land use change, (3) responses and measures of the national and local government with regard to the situation in their households and mountain villages in general, (3) the awareness on spatial planning and spatial plans and (4) the motivation and vision for the future.

The choice of interviewees was made combining critical case sampling and the convenience sampling method. The convenience method, also known as accidental sampling, represents non-probability sampling which involves the sample being drawn from those close at hand (Patton, 2001). In the range of settlements similar in their problems and circumstances, it was considered that choice of particular interviewee does not make a significant difference from any other interviewee. This approach was combined with a preliminary list of villages above 600 m altitude. The interview conduction required field work that was also used for collecting situational observations, later used as a source of information, too.

Regarding the method choice, this paper is a contribution to qualitative research, being based on grounded theory approach (Glaser, 1978, Strauss and Corbin, 1998). The approach is emphasising generation of a theory from data collected in the interviews. Due to the structured interview form - questions were already grouped in topics – open coding was bypassed, going directly to the recognition of series of thematic codes. The codes were grouped into categories and sub-categories, which were the basis for the creation of the theory**.**

RESEARCH FINDINGS

This section of the paper presents categories and sub-categories - a systematic order of issues, which in this case is closely related with the interview structure. Thus there are expected categories - agriculture, land use, awareness on governmental actions and motivation, but also a few unexpected categories which occurred in the coding process: informativeness and know-how, sense of dependency and innovativeness. There where it was applicable, the categories were dissected to the recognized causes under which a phenomenon occurs.

Category "Agriculture"

There appear to be two kinds of households that have given up agricultural production: those in infrastructure better equipped settlements (spa and municipal centres) and households of elders (average age above 65) in remote and economically depressed areas. This means there is a tendency for decrease of rural activity diversification not only due to population aging, but also with the introduction of an alternative activity.

The intensity of the agricultural production has been decreased significantly since the 1970's, which is, among other circumstances, also a consequence of population aging. The production is the most often limited to physically less intensive activities and activities in the nearest vicinity of a house i.e. small garden behind the house. Even those physically capable for more intensive labour are not motivated to increase production because the income is insecure (depending on yield) and support of the government changes between types of agricultural production yearly. Another reason for the production intensity drop is reported in the Kuršumlija municipality, located on the administrative border with Kosovo: bombing in 1999 caused mezzo-climatic changes, which decreased the behaviour of the plants and decreased the yield.

Due to the aged population structure, a variety of types in agricultural production does not increase (elder population is closed to change and innovation), but decreases on expense of physically more demanding types – grain production and cattle husbandry. The average number of cattle used to be 4.1, of sheep, pigs and goats 30.3 and of poultry 21.5. Today it is 1.5 cattle, 5.8 sheep, pigs and goats, and 9.0 for poultry in average. Most of the interviewed households stopped breeding cattle, but only a few stopped breeding sheep, pigs, goats and poultry. This again means that physically the most demanding husbandry type is the first to be given up.

In all cases a primary aim of agricultural production is self-sufficiency. Besides self-sufficient production, the majority of the households practice commercial production, but in insignificant extent: selling cow's milk or sheep meat occasionally. Due to the lack of job offers in the village or in the municipal centre, self-sufficient production secures the basic nutrition needs of the households. In other words, this is a way for the households to decrease their expenditures.

Within these facts there are the following categories, dissected on causes:

- *Giving up on agricultural production*
- *Loss of economic diversity*
- *Due to aging*
- *Due to introduction of alternative activity*
- *Loss of production intensity*
- *Due to age structure*
- *Due to insecure income*
- *Due to climate change*
- *Loss of diversity within agriculture*
- *Due to age structure*

- *Aim of production*
- *Self-Sufficiency*
- *Due to the lack of employment possibilities*
- *Commerciality*
- *Due to insecure income*
- *Due to inaccessibility to the market.*

Category "Land Use and Land Ownership Change"

Changes in the intensity and type diversity of agricultural production result in land abandonment. Most of the households reported that they had abandoned the agricultural land and it spontaneously had turned into shrubs, weeds and even forests. There where land was still used, the main use switched from arable land to pastures and meadows, meant to be used for husbandry. Therefore, the percentage of arable land has been decreasing on expense of non-arable agricultural land and forest land.

Half of the interviewees stated that they were or had been renting land for agricultural production, but most of them had been doing it only in the past. Those who still did rent – they rented meadows, and this again indicates that husbandry gains priority over tillage. In majority of the cases, current and hereditary generations do not plan to rent or sell the agricultural land, primarily for currently low prices of the land and absence of prospective buyers. However, by any means, they are not willing to sell their houses and yards.

Transfer of land ownership is not commonly found among the interviewees, but there are households that would be interested in selling the land if the value on the market would rise. The interviewees also commented on cases of neighbours who sold the land: the land was sold to Serbian in diaspora, but originally not coming from their village or the region.

Within this category there are the following subcategories:

- *Land use change*
- *Land abandonment*
- *Arable land shifts to meadows and pastures*
- *Land ownership change.*

Since both – land use and land ownership changes - are the consequences of giving up on agricultural production, causes recognised behind these categories are the same as in the case of the category "agriculture": population aging, insecure incomes, climate change, and appearance of other economic activities.

Category "Informativeness and Know-How"

A strong majority of the interviewees claimed that they had heard of a spatial plan that covered their area or its vicinity. In contrast, only few of them were aware of the plan's contents. Again, what they were familiar with was what they had heard from employees in the institutions that conducted the plan realisation in the location – from direct conversation with them, which was not intentional. How insignificant knowledge on plans' contents was, is recognisable in the fact that only in few cases households did make some change in their activity based on spatial planning decisions, and one of them made the change because the state had directly asked them to expropriate their land. Those who were considering selling their land willingly are the most interested to sell it when introduction of tourism raises buyers' interest.

The mountain population has a sense that state and local government is not aware of the demographic situation and their needs in general. Only few interviewees who claimed opposite, gave a positive statement for local (not state) government and it was because they were personally involved or in touch with someone directly in charge for some of the actions. The perception of low quality of life certainly reflects to the notion of government's problem awareness (low quality of life is equal to "nobody cares about us"), but it is also absence of access to information. The bad informativeness is also recognisable from an absence of distinction between responsibilities of the state and a local government. Finally, a relevant fact is that even those who know about some type of government support do not make use of it.

Mistrust comes from the fact that the mountain villages are among the most neglected with regard to financial support, infrastructure and that majority of the government's actions are limited to "promises immediate before elections".

So, in this category there are the following sub-categories and their causes:

- *Spatial plans*
- *Not familiar with a plan contents*
- *Measures and support by the government*
- *Unclear distinguish between state and local government responsibilities*
- *Due to lack of information*
- *Measures are not used*
- *Due to complete lack of information*
- *Due to insufficient information*
- *Due to mistrust in the government.*

Category "Innovativeness"

A cause for keeping the same types of agricultural production is that the elder population is not open to innovativeness. One of the "innovations" reported in only one case was beekeeping, and it was the case of a household with four members under the age of 45.

Reasons for lacking innovativeness are:

- *Population age structure*

- *Lack of information*
- *Lack of know-how.*

Category "Sense of Dependency"

Earlier existence of state farmer cooperatives secured placement of the agricultural products on the market but by their sudden extinction, the farmers remained disorganized, which induced decrease of production and cut down the regular household income. Additionally, the cooperatives used to possesses mechanisation such as tractors that was rented to those who did not have one. In small villages this was exceptionally rational, since one tractor could cover the needs of all households. Since the cooperatives have been suddenly shut down, the majority of the households nowadays do not practice production that requires mechanisation.

Services such as health care, schools, electrification, etc. are of very bad quality and low accessibility for the mountain population. They are directly dependent on governments' decisions and financing, so the sense of depending on the state and local government is not irrational.

Therefore, the reasons for the sense of dependency are:

- *Inaccessibility to the market*
- *Lack of mediators between the farmers and the market*
- *Issues beyond the population's jurisdiction.*

Category "Motivation"

Road infrastructure appears to be one of the most relevant factors for development. It is mentioned by the interviewees in a context of motivation for staying in the mountain village, but also in a context of potential changes – selling the land, starting up a business in tourism. Besides the roads, the inhabitants also need schools when it comes to young people who are about to establish a family.

Market price for milk, as regulated by the state, is very low ("milk is cheaper than water"), for which farmers are not keen on producing it in greater quantities than those they personally need. No motivation to stay, live and be economically active in mountain villages comes from measures of the state or local government. Other answers showed that modernisation of agricultural production can help in making a decision to stay – mechanisation and allowances.

The households also realise that agriculture needs complementary activities, while tourism or trade are the most commonly mentioned as such. In general, the household members are optimistic in seeing tourism as an alternative for agricultural production; nevertheless, some of them are also sceptical about it because of scarce financial and knowledge capacity of the rural households and for the doubts in the government's support.

There is only one case a household was motivated to stay in the village thanks to decisions made in the spatial plan. This was certainly the consequence of the low awareness of the contents of the spatial plans and lack of informativeness. There was other couple of cases of households that a spatial plan motivated to change (land use): one because it was necessary according to the plan and the other for starting up a business in tourism.

Besides practical motives, some inhabitants also recognise natural beauty, environmental quality and connection to the place where they were born as reasons to stay in the mountain village. In contrast, some of them stay because they do not see an alternative.

Most of the interviewees have a suggestion what can be done in order to motivate young generations to stay or return to mountain villages. Some of the suggestions are limited to their personal case instead of having a general notion. A large majority believes that there is an alternative to agricultural activity, although sometimes only in their personal case.

Sub-categories in this category are the following:

- *Infrastructure*
- *Road infrastructure*
- *Education infrastructure*
- *Economic aspect*
- *Low prices of agricultural raw products*
- *Modernisation and allowances*
- *Tourism as an economic activity complementary to agriculture*
- *Spatial planning as motivation set up*
- *Starting up a tourism business*
- *Inspired to sell the land*
- *Emotional perception*
- *Environmental quality*
- *Attachment to the place of origin*
- *Sense of having no alternative.*

DISCUSSION

Category "Agriculture"

In order to improve the chances for an increase in economic diversification and to protect the cultural heritage, the economic development policies should secure complementary activities instead of exchange of activities. A list of autochthonous species of animals and cultivated plants should be prepared nationally and, based on that, development policies need to ensure production and breeding of species there where they originate from. The problem of product placement on the market might be mitigated by organising mediators between the farmers and the processing industry/

market; implicitly, this will also create jobs.

Even though sustainable agricultural production does not necessarily require commercial production, it is not realistic to expect from active mountain people to keep living in villages covering solely subsistence needs. Quality of life demands indispensable improvements (housing, job opportunities and infrastructure) in order to keep the population in the villages. Besides, measures on agricultural support need to be consistent and locally adapted to the potentials of land and identity. Thus the conditions for commercial agriculture and its competitiveness should be improved.

Category "Land Use and Land Ownership"

Land use plans should bring more organisation and control over the land which is not anymore needed in agricultural production. Even though scrubbing and forestation of the land is considered desirable, these processes should be result of controlled decisions or ways of their reuse in agriculture should be defined and stimulated.

If extinction of tillage does not bring extinction of traditional production patterns and customs, policies should support husbandry because it appears more appropriate to the current demographic structure. This might be a way to save agriculture in remote areas, as well as to potentially reinforce its diversification through the less demanding type of activity.

Willingness to sell agricultural land is directly related to market value of the land. If spatial and master plans increase the value, it might happen that the land will be sold out easily; therefore, the plans and policies need to consider under which conditions land ownership change is allowed i.e. allowance of land use change to traditional patterns of use or adaptation for sustainable tourism.

Shift in land ownership from local inhabitants to allochtonous persons might endanger sustainability in development since potential buyers from outside of the region cannot be expected to be equally interested to secure the traditional activities and to be familiar with the local identity. Therefore, plans and policies should consider rules to control, limit or forbid land selling to persons who are not attached to the area or do not intend to invest in sustainable activities. Simultaneously, current and potential owners from a local region should be supported to act sustainably, too.

Change in land use does not influence only the functional aspect, but the visual-identity aspect, too. In order to improve the economic diversity of the mountain regions by introduction of tourism, it is necessary to take care of their visual character and geographic identity. The topic has been introduced to spatial planning in Serbia just recently, and people are still waiting for it to be realised in practice.

Category "Informativeness and Know-How"

Informativeness on spatial plans of concern is very low and limited to intentional contact to employees in state companies in charge to prepare land for the realisation of plans. The factor of coincidence in informing the population about plan contents needs to be improved to a level where the mountain population will have it available online and in info centres. The situation requires more active engagement in information flow adapted to age structure. Thus, young generations can mostly benefit from access to the internet, while elder generations prefer tête-à-tête communication and television. Certainly, the state should support the establishment of info centres, a timely updated online platform with information of concern for the mountain population and local television stations with informative broadcast. The know-how for younger generations should be secured through formal and for the rest of the through informal education.

Also, trust between the mountain people and the government is valuable for involvement of the population in sustainable patterns instead of land abandonment and spontaneous unsustainable behaviour. There are three relevant aspects in building the trust: consistency in decision making, in decision realisation, and the most important – allowing active participation of the population in the decision making process.

Categories "Innovativeness" and "Sense of Dependency"

Motivation of younger generations to return to rural areas might improve the readiness for innovativeness combined with parallel education about the alternatives and agricultural production in general. Related to the lack of specific education and informativeness in general, mountain households still feel the need to be supported by the state and the local government. They are not realising their capacities and possibilities to increase the intensity of production, to start up new business or try out in commercial production before they have practical support and guarantee from the state that it is going to provide consistent financial assistance.

Category "Motivation"

The research has shown that the role of spatial planning in motivating mountain inhabitants to stay or return to their villages, as well as behave sustainably, regarding all the sustainability aspects, is insignificant. The main reason is the lack of information about the contents of the spatial plans and their role in general. Therefore, local governments need to be more actively involved in presentation of a plan contents, but of utmost important is inclusion of the local inhabitants in decision making. In this way, they would be more motivated to act sustainably when they feel empowered to create their own future. An additional target group to be involved should be of young people who live in municipal urban centres and have inheritance in a mountain village, because they represent the second closest group to return.

With no doubt, road infrastructure and employment primarily, and social infrastructure (schools, health care) secondly represent the most relevant preconditions for living in the villages. Therefore, they should be a priority and the preservation of sustainable existence is the most rational and needed choice. Close to the top of the list is also tourism, but in order to make sustainable tourism a greater part of mountain economies, the local population needs education in this field and financial support by the state and the local government. Mountain inhabitants who primarily stay in the villages because they enjoy this style of life and the environmental quality it brings should be recognised as a group particularly convenient

to learn, practice and pass further the knowledge about sustainable development. Market prices for agricultural products in favour of the farmers could be also regulated by the state, especially for the products with geographic origin. Thus the agricultural sector would be "enriched" with other economic activities, including small family manufactures (organic products, wool products, herbs, honey products, wooden products, etc.).

CONCLUSIONS

The conversations with local people in mountain regions of Serbia have indicated their primary problems, needs and motives as well as their awareness on tools they can use and responses they (can) undertake. The codes extracted from what they have said and categories summarised from it represent a foundation where the theory on sustainable mountain regions is grounded on. The theory states that:

Sustainable development and demographic sustainability of mountain regions (in Serbia) in the future depends the most on mitigation of their age structure, provision of information and know-how, and of securing stable incomes.

Since the smallest settlements are the most numerous group of settlements, the state needs to prioritise them according to their relevance regarding the natural and cultural heritage, landscape and strategic role. The prioritised cases should be the first to get the basic preconditions fulfilled – transport and educational infrastructure and regulation of the market for the mountain products. Provision of these preconditions can be expected to slow down exodus from the mountain villages and potentially attract young people to move in. Also, gained information and know-how would strengthen the role of locals in decision making and spatial planning. And finally, by thoughtful adjustments of the agricultural product market, the mountain population would be enabled to take more care of their other needs and be independent in succeeding sustainable future.

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NATURAL DISASTERS VERSUS CULTURAL AND NATURAL HERITAGE

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ABSTRACT
Natural disasters are a threat to cultural and natural heritage. Floods, earthquakes, landslides, fires, and extreme weather can cause irreparable damage. In the "relationship" between cultural heritage and natural disasters, there are a number of possible interrelations: (1) natural disasters damage or destroy cultural heritage, (2) some cultural assets have become important elements of cultural heritage due to past natural disasters and the history of their destruction, and (3) accounts of ancient natural catastrophes have become part of cultural tradition. Natural disasters also threaten natural heritage, and damage to this heritage is perceived as something bad, as in the case of cultural heritage. However, this may not be justified because natural events are responsible for the origin of this heritage. The question arises whether it is appropriate to preserve the current situation and "conserve" nature and natural heritage, or whether processes should be preserved even if this entails the "destruction" of exceptional natural heritage.

Keywords: *natural disasters, cultural heritage, natural heritage, Slovenia*

INTRODUCTION
Natural disasters refer to natural phenomena and processes in a landscape that affect society to such an extent that they cause damage to it (Zorn and Komac, 2011). This also applies to assets perceived as cultural and natural heritage.

The interrelation between cultural heritage and natural disasters can take different forms; for example, (1) natural disasters damage or destroy cultural heritage, (2) some cultural assets have become important elements of cultural heritage due to past natural disasters and the history of their destruction (e.g., the destruction of the Roman town of Pompeii), and (3) accounts of ancient natural catastrophes have become part of cultural tradition (e.g., the story of the disappearance of Atlantis; Migoń, 2013).

If natural disasters destroy "manmade" heritage in the case of cultural heritage, then in the case of natural heritage they "destroy" what nature has made (especially related to geosites or geomorphosites). From this perspective, the question arises whether it is appropriate to preserve the current situation and "conserve" nature and natural heritage, or whether processes should be preserved, thereby allowing change, even if this entails the destruction of exceptional natural heritage in the long term (Komac, Zorn and Erhartič, 2011).

Heritage may be threatened by high-magnitude short-term processes (e.g., earthquakes, volcanic eruptions, landslides, floods, and adverse weather conditions) or by low-magnitude long-term processes whose impacts accumulate over a long period of time (e.g., ground subsidence, cliff retreat, and accelerated weathering; Migoń, 2013).

This article uses examples from Slovenia to present the damage that floods cause to cultural heritage and the "damage" that geomorphic processes cause to natural heritage.

CASE STUDIES
Floods and cultural heritage
"High water appears every year in Slovenia and is common. It can appear in any season, but most often in the fall. ... Over the past century, not even a decade has been without major floods. They have appeared across all of Slovenia" (Polajnar, 2002, 247). They cause a lot of damage and also affect cultural heritage.

A flood vulnerability assessment of immovable cultural heritage was carried out in Slovenia based on over 28,000 units on the immovable cultural heritage register. Eight risk categories were defined (Figure 1; Zorn and Komac, 2014).

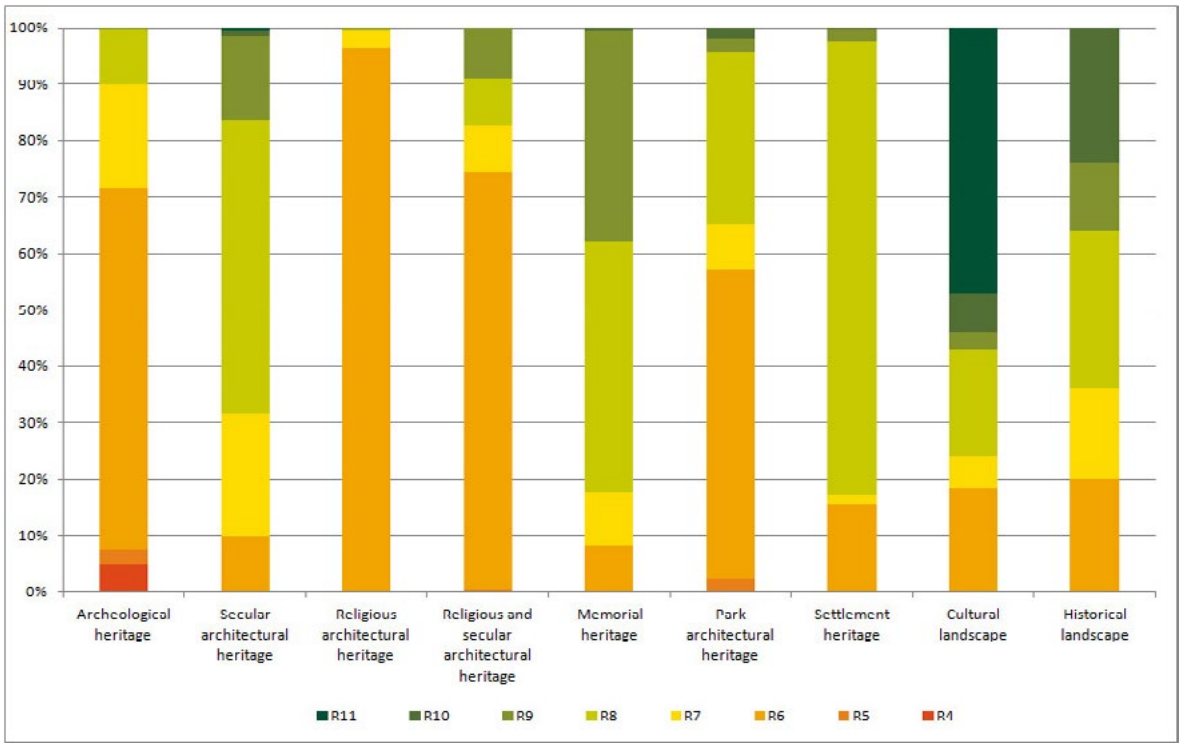

Figure 1. *Immovable cultural heritage by vulnerability category (a lower number indicates a higher vulnerability category) (Zorn and Komac, 2014).*

In the past decade, large-scale floods occurred in Slovenia in 2003, 2007, 2010, 2012, and 2014. They all caused damage to cultural heritage structures.

In late August 2003, flash floods hit the Upper Sava Valley (northwest Slovenia) and the neighbouring Val Canale Valley (in northeast Italy). The most affected settlement in this area was Ugovizza, where the village centre was devastated; among other things, the church tower was swept away (Figure 2). This settlement had experienced a similar fate almost precisely a century prior to that (Zorn, Natek and Komac, 2008).

Figure 2. *At the end of August 2003, Ugovizza in the Val Canale Valley, Italy, was devastated by a flash flood. Above: the damaged church, which lost its bell tower during the flood. Below: the renovated church and bell tower and the modified riverbed (photo: Matija Zorn).*

In September 2007, several dozen Slovenian municipalities were affected by floods; the most affected was the Municipality of Železniki (western Slovenia; Rusjan, Kobold and Mikoš, 2009). These were predominantly flash floods, which affected many old village centres in the narrow valleys of the Škofja Loka Hills and the Cerkno Hills (western Slovenia). The numerous cultural heritage structures damaged also included the Franja Partisan Hospital from the Second World War, a monument of national importance on the European Heritage List, which was nearly completely destroyed (Figure 3. The hospital was fully renovated by May 2010 (Zorn and Komac, 2014).

However, floods are not the only natural threat to the Franja Partisan Hospital. Because it stands in a canyon, it is also threatened by rock falls. A major one occurred in January 1989, when 8,000 m^3 of debris destroyed three barracks (Bevk, 1989).

Figure 3: *The Franja Partisan Hospital after the flash floods of September 2007 (source: Cerkno Museum archives).*

In September 2010, Slovenia was affected by even more extensive floods. They are considered one of the major natural disasters that have occurred in Slovenia over the past few decades (Komac and Zorn, 2013). They affected more than half of the municipalities in the country. The floods were of several types: flash floods, lowland floods, karst floods, and urban floods. On September 19th and 20th, 2010, aerial photos of the floods in north-eastern and south-eastern Slovenia were taken, in which photos were also taken of the Krka River flooding and the flooded town of Kostanjevica na Krki (southeast Slovenia; Figure 4), whose town centre has been declared a cultural and historical monument (Zorn and Komac, 2014).

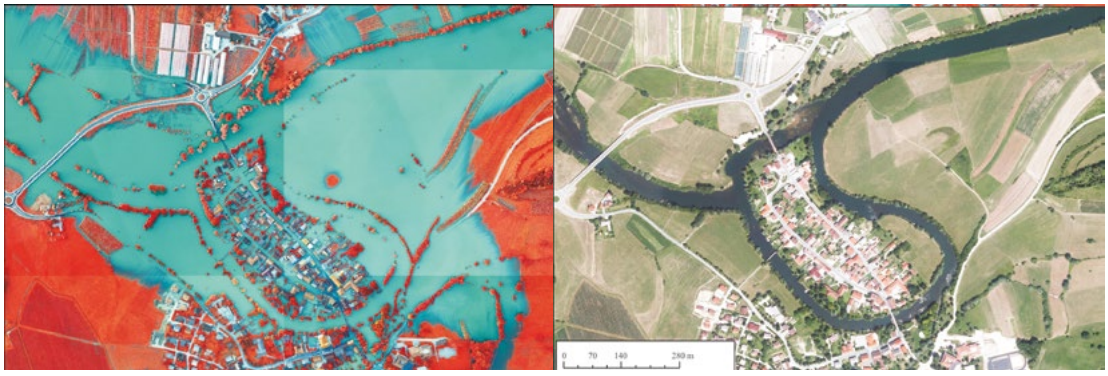

Figure 4: *Flooded Kostanjevica na Krki (above) during the September 2010 floods.*

Slovenian cultural heritage is also threatened by sea floods. Piran (southwest Slovenia) is the most at risk among the coastal towns because exceptional floods can threaten a major part of its historical centre (Figure 5). In addition, the central Tartini Square and several other streets are affected by annual floods. The most endangered cultural heritage also includes the Sečovlje Salt Pans (southwest Slovenia); a major part of them is affected in the annual floods and they are completely under water in the event of exceptional floods (Kolega, 2005).

Figure 5: *Coastal floods threaten the historical centre of Piran (Kolega, 2005).*

Geomorphic processes and geomorphic natural heritage

In some landscapes, natural disasters occur more frequently than elsewhere because the regions differ widely in geology, relief, climate, and other features. In certain places such strong natural processes are a characteristic landscape feature, and in other places they are variable. If one looks at the geomorphic features or geomorphosites, they can be named after the processes that have created them, such as a "weathering geomorphosite," "erosion geomorphosite," "accumulation geomorphosite," "flood geomorphosite," "river geomorphosite," "rock fall geomorphosite," or "landslide geomorphosite." From a geomorphic processes point of view, this characterization of the geomorphosites is of limited use because in most environments geomorphosites are usually shaped by various processes and they are changed sooner or later by another, different geomorphic process. In other words, geomorphosites change their position in the system of geomorphic processes in the long run. These changes may be abrupt (e.g., in the case of natural disasters) or they may be relatively slow (Komac, Zorn and Erhartič, 2011).

A geomorphosite may lose or gain additional value with the help of natural processes (Reynard et al., 2007). An example can be seen in Figure 6 with a Pleistocene conglomerate river terrace in the Bovec Basin (northwest Slovenia) as a geomorphosite *per se*. In 1998 the terrace was partly "damaged" by an earthquake when a rock fall occurred. The terrace as a primary geomorphosite was given additional value by an earthquake-induced rock fall.

Figure 6: *Rock fall on a river terrace (photo: Matija Zorn).*

The opposite is the case when an "exceptional" natural heritage feature is partly "destroyed," as was the case at Čedca Falls (the Kamnik–Savinja Alps, northern Slovenia; Figure 7). The waterfall is a geomorphological and hydrological heritage feature of national importance, which entirely changed its own appearance during several rock falls in 2008 (Triglav Čekada and Zorn, 2014). The rock falls did not endanger the settlements or the infrastructure, but caused many disturbances in the natural environment. Some claim that the collapse represented a loss of national heritage: the highest waterfall in Slovenia (130 m). However, the waterfall still exists, although it is no longer as tall as it was before the collapse (Figure 8). This example shows that in this case the only continuity is the continuity of the hydro-geomorphic processes.

Figure 7: *The rock wall before the collapse, left, and after, right (photos: Matej Gabrovec, left; Bojan Erhartič, right)*

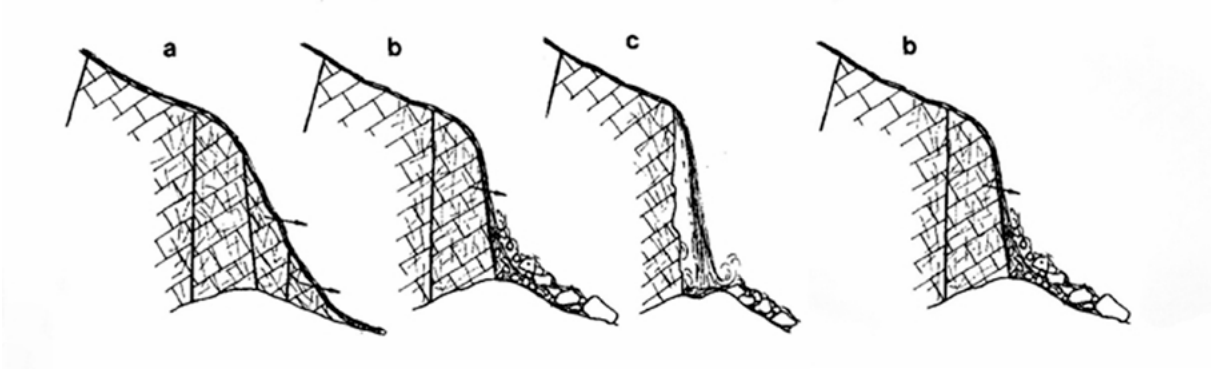

Figure 8: *The evolution of Čedca Falls according to Ramovš (1983). With the rock fall in 2008, the evolution went back to Phase B*

Another example is the flysch coastal cliffs on the Slovenia's Adriatic coast. Geomorphic processes are constantly reshaping them; the cliffs retreat few centimetres a year (Zorn, 2012). Due to constant abrasion, they preserve their shape through parallel rock wall retreat (Savigear, 1952). In some cases, the cliffs were "preserved" by building a hotel attached to the rock wall, or by building buttresses below the church in Piran (Figure 9) in the past centuries; these buttresses are now regarded as cultural heritage. In this way, a geomorphosite can be preserved from natural processes, but at the same time the geomorphosites are no longer visible.

Figure 9: *Buttresses below the church in Piran preserved the coastal cliff from natural processes (photo: Matija Zorn)*

CONCLUSION

It is very difficult to prevent cultural heritage sites from being damaged in natural disasters because immovable heritage sites cannot simply be relocated to safer areas. For example, many historical settlements developed in earthquake-prone areas or along coasts that are threatened by tsunamis and many were established in landslide-prone areas or in areas threatened by floods (Zorn, Komac and Moscatelli, 2014). The view that natural disasters are a threat to cultural heritage is clear, but this view is not so clear when talking about natural heritage. Does preservation of natural heritage mean that all natural processes should be allowed and protected only from unnecessary human intervention, or should this heritage also be protected from the processes that have formed it? Natural heritage is often valuable and interesting precisely due to its changing nature.

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TRADITIONAL PLANT-BASED PRODUCTS FROM BULGARIAN MOUNTAIN REGIONS

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ABSTRACT

Utilization of wild and cultivated plant resources has been a foundation of the livelihood of the mountaineers in Bulgaria for centuries. Production of pickles and non- and low alcoholic beverages primarily based on the gathering of wild fruits and berries has receiving little attention and their sustenance in mountain village communities is at risk. We present a selection of plant-based products and reveal details of their production technology, associated ethnobotanical data, cultural and socio-economic related issues. Studies of lyuto, krushov razsol, pickled guruleta s piperki, krushevo kiselo and langyur are discussed and approaches for preserving local knowledge and plant diversity through implementation of long forgotten rural practices in tourism and entrepreneurship innovations.

Keywords: *ethnobotany, fermentation, fruits, rural areas*

INTRODUCTION

Mountains in the Balkans host rich, intertwined, multicultural and multi religious communities. This area of Southeastern Europe has increasingly become the focus of ethnobotanical field studies that share a common goal of documenting and conserving traditional knowledge of plant use by the people of this region (e.g., Menkovic´ et al. 2011; Mustafa et al. 2012; Pieroni et al. 2011; Redžic´ 2006; Rexhepi et al. 2013).

With its orographic, climatic, biological and ethnic diversity Bulgaria is among the countries that are richest in traditional ecological knowledge in the Balkans. However, recent targeted ethnobotanical studies have been scattered and not systematic with the clear prevalence of ethnomedicinal research while food plants have been neglected (Ivancheva & Stantcheva 2000; Leporatti & Ivancheva 2003; Ploetz & Orr 2004; Nedelcheva & al. 2007; Kültür & Sami 2009; De Boer 2010, Bertsch, 2011). Common trend in the Balkans (and Bulgaria) is that more work has been done on the documentation of wild food plants and less on the traditional knowledge related to plant processing.

The most ancient way of processing and preserving plant products is fermentation. People have used and relied on fermentation as a means of processing foods for millennia (Etkin 2006) due to the following advantages of this technique: 1) diminishing undesirable elements of the raw product (i.e., toxicity); 2) improving food digestibility and nutrient availability; 3) enrichment of the food with vitamins and amino acids; 4) reducing cooking time (because the food is pre-digested, cooking time is reduced or eliminated as a preparation step); 5) salvaging food waste; and 6) improving shelf-life and decreasing spoilage (Etkin 2006).

Various pickles and low-alcoholic refreshing beverages used to be a part of the winter diet in Bulgaria (Markova 2011). Gradually, this knowledge has faded away due to several reasons: replacement of the wooden and clay pots with plastic ones, reduction in fruits and vegetable cultivation and the commercialization of some pickle types. Some more general trends in rural areas like depopulation and aging of the local communities can be added as having negative impact on the fermentation traditions.

Recently, there has been a revival of the scientific and related business interest to the local traditional knowledge of using plants, including the knowledge of fermentation. Several EU-funded projects have been implemented with the aim to study and utilize the food knowledge of local communities in Europe. Some major ones are: EuroFIR (Trichopoulou & al. 2007), BaSeFood (Dilis & al. 2013), Truefood (www.truefood.eu). They deal with different aspects of traditional food. Quave & Pieroni (2014) make a review of the fermented foods in the Balkans and comment on their role and the traditional foodways for food sovereignty and food security in emerging and developing countries. They outline the link with eco-tourism, small-scale food specialty markets, and local health strategies.

Although fermented food has been recently recognized as functional food and source of healthy substances for the human body it has been very little a subject of specific scientific interest in Bulgaria. One important attempt in this direction is the project BaSeFood which investigates the bioactive substances and traditional foods in the Black Sea region, including Bulgaria (Dilis and al. 2013).

The current paper is a contribution to the knowledge on traditional fermented food from different mountain areas in Bulgaria. It presents the biological and cultural diversity of this food together with the existing and potential threats for them. The paper also comments on the significance of this knowledge and food heritage for the development and diversification of local business in rural areas such as sustainable tourism, artisan food production, etc.

DATA AND METHODS

Subject of the study were kinds of local fermented food of plant origin - pickles and beverages from locally collected wild fruits. The data have been collected in the summer and autumn of 2013 and 2014 by conducting in-depth, semi-structured interviews concerning local fermented food. The current research has been focused in mountain areas of Bulgaria where local communities are still active and practice their traditional livelihoods. We visited local communities

in the Rhodope Mts. (Satovcha, Orehovo, Smilyan, Batak and Velingrad), in the Rila Mt. (Gorno Dragliste), and in the Stara Planina Mt. (Cherni Vit). Informants were targeted in villages and small towns where the production and consumption of home-made fermented food of plant origin is still preserved in the local livelihood and habits. All producers were women aged between 25 and 65. The broad age range has allowed us to assess the resistance of the production practices in different generations. Informed consent was verbally obtained from each informant prior to each interview according to the American Anthropological Association (2012). During the interviews, the informants were asked to describe and/or to show the quoted plants. Voucher specimens and digital photographs were taken for the quoted wild plants, when available. For taxonomic identification the Handbook for identification of plants in Bulgaria (Delipavlov and Cheshmedjiev, 2011) was used. Plant nomenclature follows Flora Europaea (Tutin et al., 2010).

RESEARCH FINDINGS

Etymology of the names

Some of the names of the products refer to their contents or taste, e.g. *lyuto* - local word in the Rhodope dialect to describe the sour taste of the beverage. *Krushovo kiselo – krushovo* is an adjective deriving from *krusha* (pear) in Bulgarian, *kiselo* is common Bulgarian word for sour, referring to the pungent to acidic drink from pears. *Langyur* – a Bulgarian colloquial word for a low alcoholic beverage. *Kokaza* and *brusnitsa* are the words for lingonberry *Vaccinium vitis-idaea* L. in Velingrad and Batak respectively.

The word *razsol* is more widely used in Bulgaria for pickles (with or without salt). In the specific case described in this study the word is used to describe a pear pickle, which does not contain salt. *Guruleta* is a local word for immature cherry plums and *piperki* is a word for peppers. A local form of cherry plums called "*chupenka*" (from "*chupya*" – crush, split) is used as the fruits are easily to split.

Denomination	Product type Local use	Preparation	Distribution areas	Ingredients			
				Family	Species	Bulgarian common name	Part used
Lyuto	Refreshing beverage	Fermented in water for 3-4 weeks, low alcoholic gassy drink, repeated feed-batch culture in wooden casks with spigot	Orehovo and Smilyan villages, Rhodope Mt.	Rosaceae	Malus sylvestris Miller.	Kiselitsa	ripe fruits
				Rosaceae	Pyrus spp.	Diva krusha	ripe to macerated fruits
				Rosaceae	Prunus spinosa L.	Tranka	ripe to macerated fruits
				Rosaceae	Rosa spp.	Shipka	ripe fruits
				Rosaceae	Crataegus spp.	Glog	ripe fruits
				Adoxaceae	Sambucus ebulus L.	Bazak	ripe fruits
				Ranunculaceae	Clematis vitalba L.	Povet	stems
				Poaceae	Hordeum vulgare L.	Echemik	grain
Krushov pazsol	Pickled fruits	Fermented in fresh water, in clay pots, placed in cold storage	Gorno Draglishte village, Rila Mt.	Rosaceae	Pyrus spp.	Diva krusha	macerated fruits
Guruleta s piperki	Pickled fruits	Lacto-fermented in water for 4 weeks in clay pots, placed in cold storage	Gorno Draglishte village, Rila Mt.	Rosaceae	Prunus cerasifera Ehrh.	Dzhanka	immature fruits
				Apiaceae	Apium graveolens L.	Tselina	fresh stems and leaves
				Solanaceae	Capsicum annum L.	Lyuta chuska	ripe fruits
				Apiaceae	Petroselinum crispum (Mill.) A.W.Hill	Magdanoz	fresh stems and leaves
				Apiaceae	Anethum graveolens L.	Kopar	fresh stems and leaves
				Alliaceae	Allium sativum L.	Chesan	young bulbs
				Brassicaceae	Armoracia rusticana P.Gaertn., B.Mey. & Scherb.	Chryan	root
				Apiaceae	Apium graveolens L.	Tselina	fresh stems and leaves
Langyur (Kokaza, Chorba ot brusnitsi)	Refreshing beverage	Fermented in water for 3-4 weeks, low alcoholic gassy drink, repeated feed-batch culture in wooden casks with spigot	West Rhodope Mt.	Ericaceae	Vaccinium vitis-idaea L.	Chervena borovinka	ripe fruts
Krushovo kiselo	Refreshing beverage	Fermented in water for 2-3 weeks, low alcoholic gassy drink, repeated feed-batch culture in wooden casks with spigot	Cherni Vit village, Central Stara planina Mt.	Rosaceae	Pyrus spp.	Diva krusha	ripe fruits
				Rosaceae	Malus sylvestris Miller.	Kiselitsa	ripe fruits

Table 1. *Plant-based fermented traditional products used for food and beverages*

Species composition of the studied foods

Five local fermented plant products (pickles and beverages) have been recorded during our field visits (Table 1). The products are produced mostly from wild fruits. The majority of the plants belong to the family *Rosaceae* and genera *Pyrus*, *Malus* and *Prunus*. *Langyur* and *Krushov razsol* are made from a single plant ingredient – *Vaccinium coccineum* and *Pyrus* spp. respectively. *Lyuto* is a mixture from wild fruits collected from the surrounding forests of the villages. Well-ripened fruits of *Sambucus ebulus* can be optionally added to enhance the colour of the drink. Branches of *Clematis vitalba* can also be added, to ensure the conservation. *Krushovo kiselo* consists only from wild pears and crab apples. *Guruleta s piperki* is a mixture of unripe cherry plum fruits, accompanied by hot peppers (Capsicum annuum, summer ripening varieties). The pickle is diversified with garden vegetables (mostly garlic cloves) and herbs depending of the personal preference.

Preparation technique

Prevailingly, the wild fruits are collected in the mid to late autumn, when the maceration has started and continues by the first frosts. They are put in containers and only water is added. Traditionally the containers used to be from wood or clay, but today plastic containers can also be used. The mixture is then stored in a cool place (10-12°C) for 2-4 weeks to ferment. After that the product is ready for consumption. Water is added after the liquid is over so to feed-batch the culture. In recent years some local people avoid big containers (hence do not use the feed-batch technique for production of the *langyur*), but stop the fermentation with sodium benzoate.

Guruleta s piperki and Krushov razsol are used as pickles and the liquid is not used. The fruits are covered with fresh water, in clay pots, and placed in cold storage.

The timing of the preparation of Guruleta s piperki slightly differs since the cherry plums are collected in July and pickled in fresh water without salt. Afterwards a number of cultivated garden vegetables and herbs are added according to their ripening period (i.e. young garlic bulbs, hot peppers, fresh parsley and dill, and optional horse-radish and celery). Added peppers are from early-season hot varieties (i.e. Arnautki).

Mode of consumption

Lyuto, *langyur* and *krushovo kiselo* are used generally as refreshing beverages. *Langyur* is applied also in the folk medicine as diuretic. Fruits from the *Krushov razsol* and *Guruleta s piperki* are eaten by the local people as an accompanying dish (meze or starter) for spirits (Rakia). All these fermented products are used over the winter until the Easter fasting when in fact they constitute a significant part of the plant component of the food.

Treats and challenges

Traditional production of the described products is associated with laborious collection of wild fruits. In the past these activities were the "duty" of the youth. With the progressive aging of the rural communities and depopulation of the remote mountain areas there is a shortage of young people that would take part in the fruit collection. Moreover, in the past the production was imposed by the lack of easily accessible food sources in the cold part of the year. Nowadays convenient availability of industrial food has demotivated many of the rural people to produce products with a complicated manufacturing process. Amendments like usage of preservatives like Sodium benzoate are used so to maintain the production but in undated more convenient way. Some of the products are of interest as an agro-touristic attraction in guest houses (culinary tourism). The development of these traditional recipes to market products preserving their natural taste and composition is challenging as they have a relatively short shelf-life.

DISCUSSION

Fermented food used to be a part both of the everyday and festive diet of Bulgarians. Two main groups can be distinguished according to the mode of consumption – food and beverages. (Markova 2011). These foods used to be very popular until the first half of the 20th century and since then have gradually lost their significance. Current findings revealed that household fermentation practices using fruits collected from the wild still play an important role in the diet of Bulgarian mountain communities. Producers' age varied in a large range which could be considered as a positive tendency in the frame of the population aging and depopulation of the rural areas (NSI, 2013). Involvement of younger producers is evidence that traditions are still handed down in the generations and well preserved. Practices for the production of wild fruit beverages are greatly cherished by Muslim communities where the consumption of alcohol and fizzy drinks are not allowed (Bertsch, 2011).

Most of the used wild fruits and herbs are universally known in the source of food and beverages and are popular in the Bulgarian tradition (Nedelcheva, 2013). The usage of *C. vitalba* that is poisonous as fresh plant material should be noted. Respondents acknowledged its role for prevention of the spoilage of the Lyuto beverage. This could be associated with the anti-microbial and namely anti-yeast effect of the extracts of young *C. vitalba* shoots that is shown on broad range of pathogenic yeast and yeast-like microorganisms (Buzzini and Pieroni, 2003).

The last decades marked a revival of artisan food and related knowledge both from the point of view of consumers and scientists. Originally these products served for a diversification of the everyday food with fresh and vitamin containing ingredients. Recently traditional products (foods and beverages) proved to have positive effects on the human health, enriching and improving the diet of the population across the whole continent (Trichopoulou et al. 2007). In some cases they could be used as medicine as well like langyur as diuretic. The described beverages could have potential as a dietary alternative of industrial beverages containing large amounts of sugars, as their consumption by Bulgarian children has increased recently (Doichinova et al, 2015).

The fermentation tradition has economic importance as it reduces waste and spoilage of local edible resources and

contributes to food security especially during the winter when local communities are isolated by the heavy snows in the mountain areas (Quave and Pieroni, 2014). Thus fermented food products of plant origin can be still found in their original form in mountain communities in the country. Having strong cultural and ethnographic context local food can serve to cast bridges of understanding the traditions of local communities far beyond the national borders and exhibit parallelisms in different Balkan states in terms of language recipes and way of consumption (Kabak and Dobson 2011; Papp et al. 2014).

Investigation and registration of traditional foods contributes to the preservation of important elements of a nation's culinary heritage and culture. This allows future generations, both from the native population and from other countries, to be acquainted with, and to experience traditional foods. Unfortunately, throughout Europe some traditional foods are threatened with extinction due to altered lifestyles. Therefore, there is a genuine need to study traditional foods to preserve important elements of the European culture.

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PLANT GENETIC RESOURCES AS SOURCE FOR ENVIRONMENTALLY SUSTAINABLE SOCIOECONOMIC DEVELOPMENT OF MOUNTAIN RURAL AREAS IN BULGARIA

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ABSTRACT

Mountain areas of Bulgaria harbour great diversity of plant genetic resources and related local farming methods that reflect the long-lasting human-nature interactions. Fast depopulation and aging of inhabitants of mountain rural areas are the reasons for genetic erosion of plant resources and loss of traditional knowledge which in its turn could serve for nature-friendly decision-making and sustainable local development in time of climate change. Along with the use of wild species by local communities, the knowledge about cultivated plants is also of a major interest since the large variety of land races are adapted to specific climatic conditions and are closely related to the lifestyle and habits of the local communities. During Communism the local land races were replaced by "modern", more productive varieties, thus pushing old land races in home gardens and private farms, causing gradual loss of genetic resources and the knowledge related to their cultivation. We present preliminary data of an ethnobotanical field study in rural areas in the Bulgarian mountains. Special attention is given to the existing and potential factors that threaten the diversity of wild and cultivated food plants. We recommend conservation measures that are relevant to the livelihoods of the local communities.

Keywords: *ethnobotany, local land races, rural areas, traditional knowledge*

INTRODUCTION

In an era of global environmental changes, the conservation of plant genetic resources and the knowledge related to their use is crucial for Bulgaria and Europe as a whole. Merging fundamental research on plant genetic resources with their sustainable management is a recent trend in Europe and is reinforcing the implementation of the Global Strategy for Plant Conservation and Nagoya Protocol (Pardo-de-Santayana & al., 2010; Pieroni & al., 2011, Heywood, 2011) to the Convention on Biological Diversity. According to the Nagoya Protocol, genetic resources are the fundament of diverse culture, traditions and identity of each nation (Secretariat of the Convention on Biological Diversity, 2011). Their safeguarding and sustainable use and management are a prerequisite for local development and improvement of human well-being contributing in the same time to the mitigation of the climate change impacts.

Global climate changes and human activities in the recent decades have caused serious environmental deteriorations on a global scale (Vahdati and Leslie, 2013), thus endangering wild and cultivated plant genetic resources. Research on their genetic characteristics is a global priority that ensures data on the adaptive potential of the wild and cultivated plants to specific environmental conditions.

Knowledge about plant genetic resources and the related human activities can serve also as a source of information for sustainable nature conservation measures in protected areas. Plant genetic resources are the basis for the development of important economic sectors in Bulgaria such as agriculture, perfumery, cosmetics and the pharmaceutical industry.

According to the Convention on Biological Diversity genetic resources are "genetic material of actual or potential value". Bulgaria has a significant diversity of cultivated plants and their wild relatives (Krasteva, 2009). The National Seed Genebank at the Institute of Plant Genetic Resources in Sadovo contains 57,684 seed samples of which 13 269 are of Bulgarian origin. This is the richest collection of plant genetic resources preserved in a gene bank in Southeast Europe (http://eurisco.ecpgr.org). Over 70% of the samples are kept at conditions for long-term storage. The available gene pool is enriched on an annual basis. Its preservation is strictly controlled. Upon request plant seeds are sent to national and international research centres. Specialized genetic collections are maintained in other scientific centres as well, such as the Institute of Plant Physiology and Genetics (seed bank with 118 samples from wheat, oat, sunflower, maize, pea, tobacco, tomatoes and pepper), the Agrobioinstitute, etc.

The need of knowledge on the interactions between humans and nature has been recognized by the European scientific community and the response to it is the establishment of a new branch of life sciences – ethnobiology, i.e. the study of the biocultural domains that develop in the dynamic relationship between human beings, biota and the landscape. It emerged in the 1970s and 1980s and gradually (at the beginning of the new century) it has become a complete field of research (Ellen, 2006). The issues related to traditional knowledge and the need for conservation and sustainable use of biodiversity still does not receive the due attention in Bulgaria. It is expected that after the ratification of the Nagoya Protocol and the creation of national legislation necessary for its implementation, this issue will cause larger and focused interest in research institutions, NGOs and businesses.

To support the efforts of the country to safeguard its plant genetic resources different activities have been performed by the civil sector. In 2004 Bulgaria joined the worldwide movement Slow Food (www.slowfood.com). Its main objective is the preservation of local communities and their knowledge about the sustainable use of agrobiodiversity. Therefore,

Bulgaria has established a network of local communities that provides support for the preservation of local breeds, varieties and traditional food.

In 2012 Slow Food, together with partners from nine Balkan states, started the project ESSEDRA (Environmentally Sustainable Socio-Economic Development of Rural Areas, http://www.essedra.com). The goals of this project are to analyse the obstacles facing small-scale farmers and producers of traditional and artisanal food to maintain their production and sustainable farming practices. After 2 years of field research more than 40 products, breeds and varieties from Bulgaria have been included in the global catalogue, the Ark of taste, maintained by Slow Food (http://www.slowfoodfoundation.com/ark # risultati). Four traditional Bulgarian products are supported directly by the Slow Food Foundation for Biodiversity Conservation (http://www.slowfoodfoundation.com/presidia).

In this paper we present the ethnobotanical data that derive from this field research. The results show a vast diversity of species and techniques that are used by local communities.

DATA AND METHODS

The study has been conducted since December 2012 for 2 years in Bulgaria. We visited more than 20 locations, most of which are in mountain areas of the country – the Rhodope Mts., the Stara Planina Mts., the Strandzha Mts., the Rila Mts., etc. The field studies were based on semi-structured interviews that were conducted in the local communities in the mountain areas. Recognizing the importance of plant genetic resources as a national heritage and understanding the challenging and sometimes contradicting policy and managerial actions that have been taken by the state and the local administration, the Bulgarian team has chosen the inventory of plant genetic resources as its priority in the field research within the ESSEDRA project. The areas of inventory were preselected based on previous experience of the experts and available literature; existing local communities and previous knowledge on local food biodiversity and food communities; areas with preserved nature and local livelihoods; developed rural tourism and small-scale and artisan food production. For the elaboration of the questionnaire for the field research the Slow Food strategic approach in identification of traditional food products has been integrated (Milano & al., 2012). The efficiency of the methodology has been tested in different parts of the world. It has been implemented in all partner countries of the ESSEDRA project as well which allows reliable comparison of data at regional level – the Balkans. The core of the questionnaire consists of the following types of information:

- *name of the product, including in the local dialect;*
- *description of the products;*
- *history of the products origin and primary area of production;*
- *approximate quantities of production;*
- *commercialization of the product (access to market or home consumption);*
- *existing and potential threats*

RESEARCH FINDINGS

Diverse range of local plant varieties and plant-based products were described in the studied areas. Nominated products are available on the http://slowfoodfoundation.com/ark#risultati. We present here three typical case studies that illustrate human-plant interactions in the Stara planina Mt. and the Rila Mt. They describe unique, locally adapted plant varieties and food products and reveal their role in the livelihoods of the local communities.

1.1. Case studies

1.1.1. Karadzeyka plum

Karadzeyka is a local plum variety (*Prunus domestica* L.), traditional for the Gabrovski Balkan (the Central Stara Planina Mt.), mountain villages in the municipalities of Sevlievo, Gabrovo, Dryanovo and Tryavna, Central Bulgaria. Plum growing is traditional for the whole region.

Karadzeyka plums are propagated by grafting on rootstock of another local plum variety – "*majarkini*". Grafting is performed in early spring or in late summer by so called "bud grafting". Initially the variety was propagated by seeds but in the last 50 years it is done only by grafting. Trees are ca. 3-8 m high. The flowers are white, and the blooming is prevailingly in March-April. Honey plant. *Karadzeyka* plums have relatively small fruits compared to other plum varieties, roundish and glossy. Fruit measures are about 3-4 x 2-3 cm with average weight of 7.5 g. Even the green fruits are sweet. The hard pits do not easily separate from the flesh. The *Karadzeyka* variety has summer and winter forms. The latter has delightful taste and ripens at the end of August-early September. The fruit flesh is golden-yellow, juicy, very sweet, slightly sour and flavoured. Fruits are hardy and transportable. The high sugar content allows the production of jams and *Pestil* (the so called Gabrovo chocolate) without any additional sweeteners. Fruits could also be consumed fresh or used for the production of *slivova rakiya* (сливова ракия, plum brandy).

The name *Karadzeyka* probably derives from the local word for wholesale traders "*kardzei*". Before the 18th century they used to buy crafted products from the region, retailed them in other regions and brought back commodities of interest. Among the goods traded by them were the *Karadzeyka* plums and the *Pestil* made from them. Till the second half of the 20th century plum growing and processing were important livelihood for many small artisans in the region. The Plum Growing Research Institute was established (now part of the Research Institute of Mountain Stockbreeding and Agriculture, Troyan). Due to the new and large-fruited varieties the *Karadzeyka* plums were pushed aside. Till 1980-90's *Karadzeyka* plums were used mainly for *Pestil* making. It was produced by local artisans and then again sold to state trading companies for retailing.

The Stara Planina Mt. (Gabrovo and Lovech districts) is considered as the major plum (prune) production area in Bulgaria. The terrains are mainly mountainous and semi-mountainous. Mountain climate is important for the plum growing and many of the local varieties are frost-and disease-resistant. Rich harvests could be easily obtained and the fruits are used

for different purposes.

Local people point out that the variety could be found only in higher resp. colder places. Single trees have survived in abandoned gardens and orchards in the local villages. Some of the old trees are diseased and rarely bear a small number of fruits. Climate change and global warming are possible reasons for the tree condition to worsen. In the last decades the home production of *Pestil* has become almost extinct and there is no great demand for this product. In the village of Gergini the local community centre has developed a project for revival of local varieties in home gardens and yards, but the process of their discovery is hard since new varieties had spread everywhere.

1.1.2. Belishki luk

Belishki luk is a local variety of *Allium cepa* typical for the town of Belitza, Blagoevgrad district, Southwest Bulgaria. *Belishki luk* is grown in small fields or in home gardens. The bulbs are oblate. They can reach 8 cm in diameter, but smaller ones (5-6 cm) are preferred for consumption. The colour is purple with rusty shades on the outer scales; inner scales are light purple. The taste is specific – sweetish and dense with inconspicuous pungency.

Propagation is done by seeds collected in the fall. Sowing time is March, with replanting of the seedlings in May. Harvesting starts in mid-August, when the bulbs are still immature (so they are called milky onion) that is used for direct consumption. The bulbs gathered in September and October are stored dried in ropes. Dried *Belishki luk* is used for cooking and for seasoning of salads.

Belishki luk is famous in the area and is being sold at local markets in bigger towns like Yakoruda and Velingrad. The variety has become famous and its growing is one of the distinctive local livelihoods. The people from Belitza are even collectively called "*kromidari*" – from the word "*kromid*" (local word for onion). Traditional cultivation of *Belishki luk* dates back 80 years ago. Characteristics of this onion variety highly depend on the local climate and soil in the vicinity of Belitza.

Historically *Belishki luk* was produced in the outskirts of the town of Belitza, on the Southern slopes of the Rila Mt. at 950 m a.s.l. Nowadays it could be still found on the local markets in the towns of Yakoruda and Velingrad. The limited cultivation area of the *Belishki luk*, together with other natural and sociological factors, is among the main factors for the disappearing of the variety. In 2014 the harvest was greatly diminished by the unusually rainy and cold summer. The production is also threatened due to population decrease in Belitza and the emigration in the past decades.

1.1.3. Murov med

Murov med is a honey-like product made from the green cones of the Macedonian pine (*Pinus peuce* Griseb.). *Murov med* has been produced in the area of the town of Razlog for at least 60 years. The "honey" is chestnut-red in colour, very fragrant with intensive resinous flavour. Cones are collected in July when they are still tender and especially resinous. The cones are boiled for 20 min in water and the syrup is mixed with sugar in 5:4 ratios. Boiling continues within up to 3 days on low fire till honey-like thickness is obtained. Hot "honey" is poured in air-tight glass jars.

The product is used mainly as a medicine for respiratory diseases. It is applied together with mustard seeds (*Sinapis alba* L.) for cough treatment.

The reasons for the disappearing of the product are complex. Macedonian pine is hard to harvest as its habitats are distant from the settlements. Additionally Macedonian pine trees are rather high and harvesting of the green cones is laborious for the aging population in the area.

There is another variety of this product - *Borov med*, which is produced from the Scots pine sprouts following a similar recipe. However, this product is considered of less Importance and is less praised by the local community.

1.2. Raising awareness on local varieties among stakeholders

The studies on the diversity of use of wild and cultivated plants are among the major topics of research of the authors of this paper. Working in the field is only the first step in the challenging task to preserve the local plant genetic resources and especially the knowledge for their use and sustainable management.

Therefore parallel to the field research a set of activities to raise public awareness among various stakeholders have been conducted. They have targeted the major actors in the research and conservation of plant genetic resources:

- *decision-makers - to promote a sustainable rural development model;*
- *researchers – to increase the scientific interest for inventory, mapping and conservation of the existing agro-biodiversity and local food culture;*
- *citizens - to impact their daily food choices and increase the demand for local fruits and vegetables and processed food produced from them.*

DISCUSSION

The mountain areas of Bulgaria still shelter the agrobiodiversity and related knowledge that have been lost in the lowlands of the country. One of the major reasons for this is the fact that mountain areas with their steep relief and unfavourable climatic conditions have not been suitable for the development of intensive industrial agriculture in the past two centuries. The harsh living conditions in the mountains stimulated the local communities to diversify the use of plants in their everyday life. Thus, the human selection together with the orographic and climatic conditions contributed for the large diversity of plant varieties and food products based on their use. Such observation has been made by Kültür (2008) who shows that people who live in the mountain villages with very little arable land and who do not have sufficient funds to invest into contemporary agricultural tools use the plants for making traditional agricultural implements. Their remoteness from bigger cities and industrial food makes their consumption of local plant varieties as food very reasonable. The villagers with low income level benefit strongly from plants by maintaining their traditional customs.

Minev & al. (2011) have shown that thanks to the steep relief around the city of Troyan (the Stara Planina Mt.) local

apple orchards (*bachtcha*, in Bulgarian means fruit orchard) have been preserved in the last 50-80 years. Some of the trees are from old local varieties adapted to the microclimatic conditions. The study shows that despite the age of the trees they are healthy and fruit abundantly. Furthermore, the fruits are resistant to various plant deceases. Hence, they do not need intensive agrotechnical measures like the new and more sensitive varieties. The authors claim that thanks to these characteristics the local apple varieties can serve for a source for successful organic farming activities.

The case study with the *Karadzeyka* plum shows that the local community recognizes the importance of the local varieties. Moreover, the fact that two popular products that can be easily commercialized (*pestil* and *rakiya*) are produced from the plum variety brings hope that the variety itself will survive and the orchards will be slowly increased. The nomination of the plant variety and *Pestil* for the Ark of Taste will increase the awareness about these products and probably will stimulate local people to increase the cultivation of *Karadzeyka* plums.

A recent survey of the current knowledge about the local varieties and cultivars in Bulgaria shows that the information is scattered and not uniformly organized. Joint efforts of farmers, scientific institutions and state administration are needed to elaborate the necessary definitions and approaches at national level so that Bulgaria can guarantee the conservation and sustainable use of its local plant genetic resources. Specific measures and approaches for in situ/on-farm conservation are discussed in the frame of the National Strategy for Sustainable Development of Agriculture in Bulgaria (2014-2020) and the new Rural Development Program (2014-2020) of Bulgaria.

The only successful way to safeguard plant genetic resources and related knowledge is to create favourable conditions for the rural communities to sustain their livelihoods (Bertsch, 2011). This is why the *in situ* conservation (i.e. the conservation of diversity in its natural habitat) of plant genetic resources very quickly becomes the major tool for conservation. It involves the designation, management and monitoring of the population at the location where it is currently found and within the community to which it belongs (Maxted et al., 1997). This poses a great responsibility to farmers and local communities. The society expects from them to both preserve the biodiversity and satisfy the nutritional needs of a growing population.

Recognizing the importance of the *in situ* preservation of plant genetic resources the European commission has issued two important directives:

- *Directive 2008/62/EC providing for certain derogations for acceptance of agricultural landraces and varieties which are naturally adapted to the local and regional conditions and threatened by genetic erosion and for marketing of seed and seed potatoes of those landraces and varieties;*
- *Directive 2009/145/EC providing for certain derogations, for acceptance of vegetable landraces and varieties which have been traditionally grown in particular localities and regions and are threatened by genetic erosion and of vegetable varieties with no intrinsic value for commercial crop production but developed for growing under particular conditions and for marketing of seed of those landraces and varieties.*

Further on Regulation № 1305/2013 (for the new agroecological measures for RDP, 2014-2020) envisages the member states to provide support not only for autochthonous breeds but also for the local varieties in the member states. This is the first attempt of the European Commission and its Common Agricultural Policy to support the cultivation of local plant varieties and related local knowledge.

It is obvious that traditional knowledge is the key to both sustain biodiversity and to ensure global food security. However, the challenge that emerges is that the farmers do not control all factors in the process, especially those related to the agricultural policies, incentives, markets or consumption patterns, and therefore they need support and understanding from their governments. Hence, further efforts and political commitments are needed to effectively empower the farmers and the local communities.

ACKNOWLEDGMENTS

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IV. MOUNTAIN ECONOMIES: TOURISM, AGRICULTURE, AND FORESTRY

DESIGN AND IMPLEMENTATION OF AN INTEGRATED MANAGEMENT SYSTEM BASED ON OPEN SOURCE TECHNOLOGY IN A GEO-INDUSTRIAL TOURIST DESTINATION

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ABSTRACT

The paper concerns the design and implementation of an integrated management system in the geosite of the Gianna Mine, a mine reconverted into a tourist destination situated in the North-West of the Italian Alps, in the Piedmont Region.

The system is based on a wireless network system, called Scatol8®, which provides information to the TIQMS (Territorial Integrated Quality Management System). These tools have been developed by a research unit within the Commodity Science Area of the Department of Management, thanks to the participation in the multidisciplinary research project "PROGEOPiemonte". The project aims at enhancing the quality of the tourist package in order to improve tourism in the area based on geo resources as well as the industrial heritage.

Scatol8® is a remote sensing network of environmental, landscape and management variables based on open-source technology (hardware and software) that consists of a central and peripheral units connected in a network. Numerous sensors are inserted in the peripheral units, which transmit the data to the central one and, thanks to a server, to the Internet. The sensors and peripheral units can change in type and numbers depending on customers' requirements; thus, it is possible to create a real-time monitoring of each measured variable as well as to evaluate their performance over time.

To set up the Scatol8® wireless network in the Gianna mine geosite, some critical points (due to the microclimate and the morphology of the gallery in terms of low temperature, high humidity rate and wireless communication) have been faced and overcome. In the end, the complete network has been designed and partially implemented, identifying steps for the complete implementation, which is expected on June 2015.

Data can be input for the territorial system. TIQMS is a methodology that allows the user to analyse a region by many points of view, regarding quality, landscape, environmental, occupational health and safety, and social accountability aspects.

All these features are managed because of the European Landscape Convention adopted by Italy and the following international standards: ISO 9001:2008, ISO 14001:2004, OHSAS 18001:2007 and SA800:2008. All these standards require the assessment of some specific indicators that can be evaluated thanks to the information supplied by Scatol8®.

Keywords: *Mining site, tourism, remote sensing network, integrated system*

INTRODUCTION

The paper aims at presenting some provisional results and the methodology adopted for implementing a management tool in a mining site, situated in the North-West of the Italian Alps, currently converted into a tourist destination.

This action represents one of the goals of the three-year research project "PROactive management of GEOlogical heritage in the Piemonte region: innovative methods and functional guidelines for promoting geodiversity knowledge and supporting geoconservation activities (PROGEO-Piemonte)" started on March 1st, 2012 and funded by the Compagnia di San Paolo di Torino.

The PROGEO project consists of several actions, all of them focused on the valorisation of the georesources in the Piemonte region, in North-West Italy, and, in particular (Ferrero, et al., 2012):

- *Review and improvements of the regional geosite inventory;*
- *Assessment of the main thematic areas of the Piemonte geodiversity;*
- *Specialised analysis on related critical issues of Earth Sciences knowledge;*
- *The Monviso massif (MM) and the Cottian Alps (CA) as symbols of the Alpine chain;*
- *Experiments on visual representation of geological environments and processes;*
- *Development of geodiversity action plans including educational impacts;*
- *Promotion of "geodiversity economics".*

In this general context, a specific activity has been devoted to enhance the role of an ex-talcum mining site, converted into a geotourist destination in the mid-'90 and actually visited and seen by about 14,000 people a years (in most cases, students).

Although the most recent definition of geotourism is supposed to be especially related to "a form of natural area tourism that specifically focuses on geology and landscape" (Newsome & Dowling, 2010), several authors highlight the positive role of the mining site in enhancing tourism in old European mining Regions (Rybár, 2006). It is, for example, the case of Poland and Germany (WóJtowicz, Strachowka, & Strzyź, 2011).

In the last few years, an intense literature focused on tourism in ex-mining sites has been produced. Some authors

(Pretes, 2002) (Cole, 2010) underline the importance of the involvement of the local community in the conversion of these sites into tourist destinations and the possible economic benefits and opportunities from mining heritage (Edward and Lluedés i Coit, 1996) (Conesa, Schulin, & Nowack, 2008). Furthermore, in several studies and researches, a geosite is considered a vector for an educational experience based on georesources and plays an important role in order to enhance the benefit of the tourist activity (Walliss & Kok, 2014).

If, on the one hand, this is a form of tourism that can entail economic benefits for the local communities, and on the other hand, a tool able to help managers in the management of the mining sites, it may represent a fundamental key for improving the quality of the tourist experience.

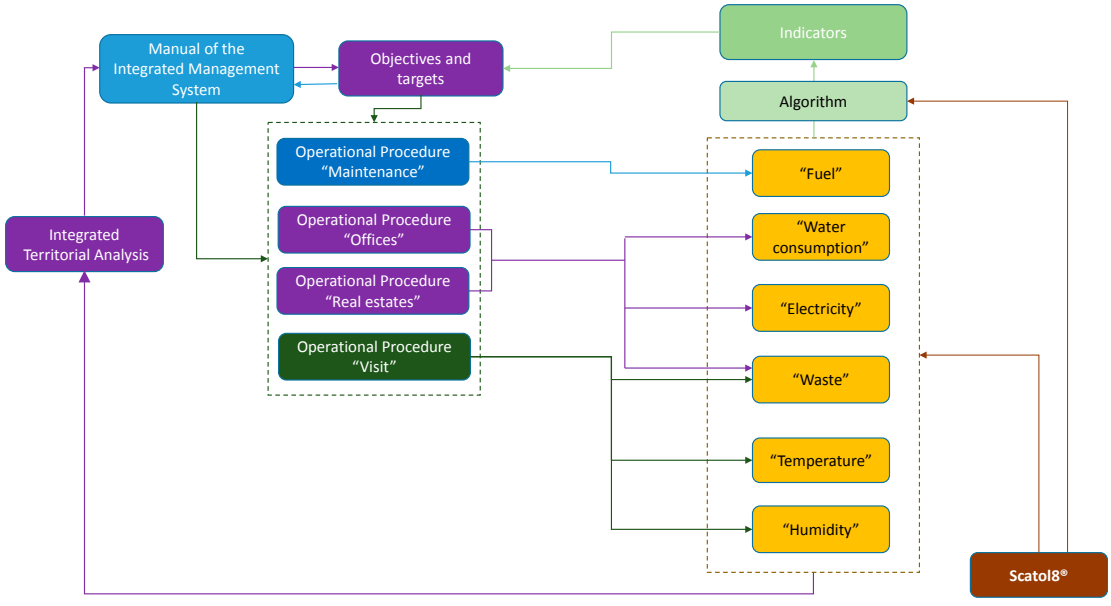
DATA AND METHODS

The methodology adopted for enhancing the ScopriMiniera/ScopriAlpi site as a tourist destination is represented by the integration of two tools: an Integrated Management System and the remote sensing network of environmental variables, called Scatol8®, both of them elaborated within the Commodity Science area of the Department of Management (University of Torino).

As far as the integrated system is concerned, it is a management system based on the TIQMS - Territorial Integrated Quality Management System - model. TIQMS analyses the management of the site under different perspectives: quality, environmental and landscape, health and safety, and social accountability (Beltramo, Duglio, & Caffa, 2009). All these aspects are taken into account thanks to the adoption and integration of the following international standards: ISO 9001:2008, ISO 14001:2004, OHSAS 18001:2007, SA800:2008 and the European Landscape Convention.

The starting point is the Integrated Preliminary Analysis that studies the operational processes of the organisation's activities and their environmental and health and safety implications paying simultaneously attention to the customer satisfaction. Due to this preliminary analysis, the TIQM system offers a tool and a methodology to implement a set of managerial and operational procedures in order to control and improve the quality of services, the environmental and landscape performances of the organisation and, at the same time, to take care of the employers.

TIQMS was supposed to be implemented *in primis* by the Public Administration as a tool for ruling territorial areas (Beltramo, Vesce, Duglio, & Giardino, 2011). Because of the adaptability of this tool, however, in this specific context the most important elements characterising the TIQMS have been drafted and implemented (see Figure 1).



Source: internal data

Figure 1. *The system*

In the first application of the TIQM system to the ScopriMiniera/ScopriAlpi mining site, special attention was paid to the most important elements of the system, in other words the operational aspect of the tourist processes. The research team carried out Integrated Preliminary Analysis in order to identify the core processes related to the tourist package with a special focus on the quality and environmental implications. Thanks to this first step, four Operational Procedures, reported in the following list, were drafted:

1. Visit
2. Real estates
3. Offices
4. Maintenance

From each of them, one or more records on environmental variables derive. These records allow the evaluation of specific indicators, useful for understanding the achievement of the management system targets.

For collecting the environmental data, the TIQM System is integrated with Scatol8®, a remote sensing network of environmental, landscape and management variables entirely based on free and open technologies, with a view of controlling the costs, the openness and ease of access (Beltramo & Margarita, 2012).

Scatol8® consists of a central unit and peripheral (end) nodes, connected in a network. Numerous sensors, able to detect and monitor variables, are connected to the peripheral nodes, which transmit the data to the central unit, connected with a server. The sensors and peripheral units change in type and number depending on the customers' requirements.

Designed under the perspective of sustainability, Scatol8® is inspired to meet three main criteria:

1. Modularity. The system is constituted from time to time, according to the requirements and specifications of each application.
2. Accessibility and dissemination. Hardware and software are fully based on open technologies and software in view of cost containment, openness and ease of access, even for training purposes. Scatol8® is not only a product, but also an initiative to spread knowledge, which aims to involve young people in the creation of technology (and not only in its use). It is accompanied by information tools on the relationship between observed variables and sustainability and proposals.
3. Environmental compatibility. When possible, all electronic devices are placed in recycled containers, coming mainly from the food and electronic industry, transformed and adapted to their new functions, or in containers made of wood (a renewable resource), or even cardboard.

The sensor network is usually composed by the following blocks (Figure 2):

Sensors

Sensors already included in the platform are resistant to temperature, humidity, water and electric power consumption, wind speed and direction, rain and snow quantity, gas and intrusion detection, air pressure, light, soil moisture, radiation and others.

Node

Despite not been connected to the same sensor, each node shares the same basic construction. The core part has been implemented using the prototyping platform Arduino UNO, which is based on the ATIMEL ATmega328 microcontroller. The second layer of the architecture is the wireless SD shield. It adds one socket for connecting XBees and another one for using a microSd card. This last opportunity is used in case of faults: if the coordinator node is not reachable, data are stored on the node just until the moment when the coordinator availability would come back. The last layer is the groove base shield produced by Seeedstudio. It offers many groove standard connectors for mechanical interfacing with sensors.

Coordinator

The coordinator node is based on the prototyping platform Arduino mega. This microcontroller differs from the one used in the end node (based upon Arduino UNO) because the RAM is not sufficient for the SD, XBee and Ethernet library at the same time. The Ethernet connection and the micro SD functionalities are covered by the Arduino Ethernet Shield, which is based upon the WIZnet W5100 chip. The Arduino XBee shield interface offers a socket for the XBee ZigBee based radio. Data packet transmission between the microcontroller and the radio uses the digital port 0 and 1 of the micro while, on the other hand, GND and VCC pins of the Ethernet shield have been physically connected to the ICSP corresponding on the ArduinoXBee because the first one has not a female ICPS connector ready to use.

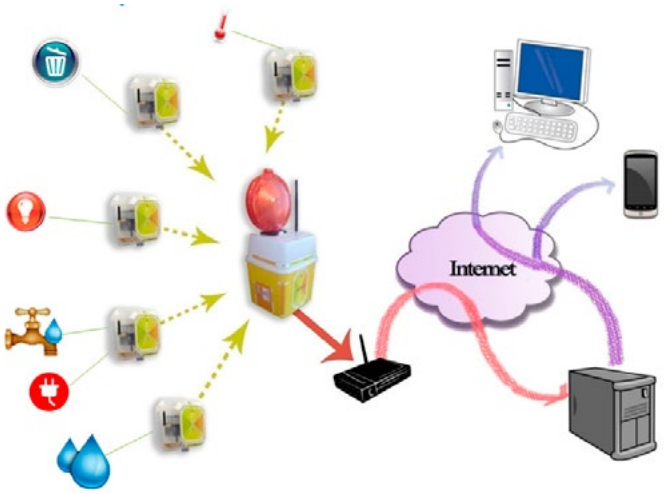
ZigBee network

Zigbee is a specification based on the IEEE 802.15.4 standard used to create a personal area network with small and low-power radios.

The most used radios in the Scatol8® network are Digi XBee series2 pro version. It is possible to mix "pro" and "simple" versions because they only differ in the kind of current absorption and covered wireless range (Digi). Despite sometimes a star network topology would be sufficient, we choose to adopt mesh radios (series 2). The reason is that series 1 and 2 cannot speak together and so adopting ZigBee radios from the beginning is the only way to easily switch from star to mesh network topology in case of WSN future expansion.

Server

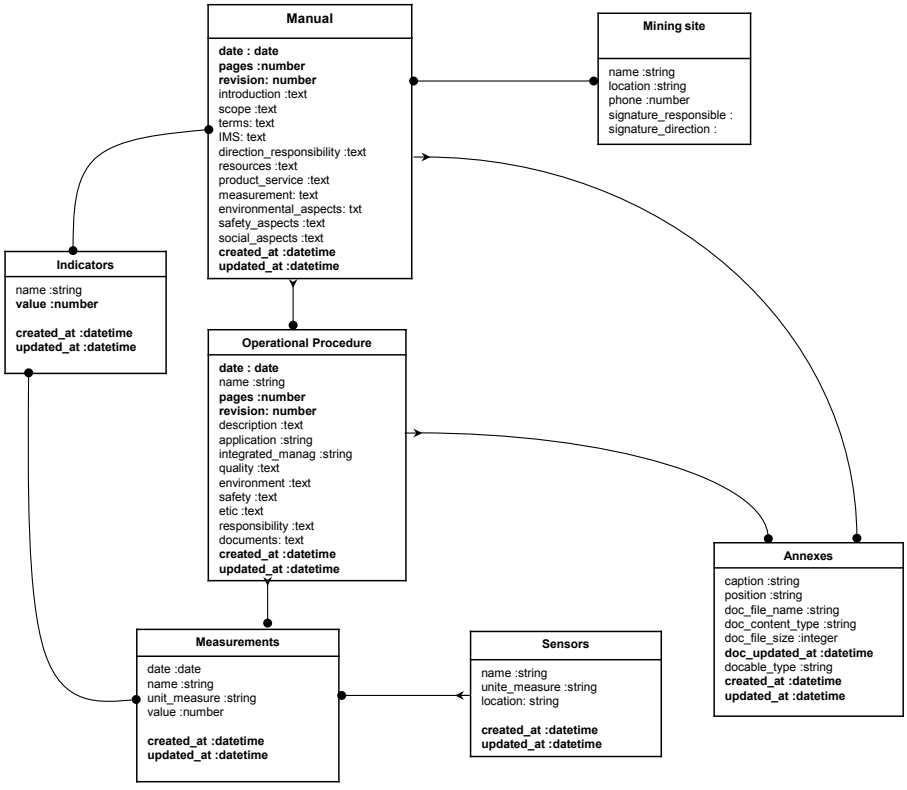
The data collected by the coordinator are sent to a server through the internet. Using open source technologies you can use Apache as a server, the database engine Mysql and Php for creating dynamic web pages that show collected data.



Source: internal data

Figure 2. *Example of Scatol8® network*

Furthermore, the data collected by the coordinator are sent not only to the internet, but also to the TIQM System, thanks to its computerized procedures. The architecture of the computerized structure is reported in Figure 3.



Source: internal data

Figure 3. *First application of the database to TIQM system*

3. RESEARCH FINDINGS

1.1 Project steps

The application of Scatol8® in the particular environment of the mine required many steps. Because of the complexity of the project, we decided to divide it into 5 parts:

- Hardware safeguard.
- In mine communication.
- Sensors.

- In situ visualization
- Remote data synchronization.

The following two paragraphs show how the first two points have been implemented. The last three steps are currently under development.

1.1.1 Hardware safeguard

1.1.1.1 Problem and solution

Humidity in the mine could be very high. In some areas the relative humidity reaches 95%. Looking at our hardware datasheets it is possible to affirm that humidity over 60% should damage electronics components. Two main kinds of phenomenon can occur: corrosion (De Sanctis) (Ambat) and short circuit (Apiste) (Multisorb) (Seai).

Three solutions satisfy the cost, size and feasibility requirements:

- Protective electronic circuit spray.
- a heating pad to increase the temperature and consequentially to ensure the relative humidity decrease (Robert B. Comizzoli, 1999).
- hygroscopic salt

We have implemented all the solutions at the same time. The chosen heating pad is the SparkFun COM-11288 that is built to work at 5V. As shown in the product video (SparkFun, 2012) it can safely works at 9 or 12 volt increasing a lot the heat production. The use of that heating pad requires a power supply able to assure a 2A current, although the Scatol8® networks usually adopts a current of 0.7A.

Source: internal data

Figure 4. *The heating pad connected to one node*

Another problem related to the mining environment is electricity flicker that should be caused for example by lightning strike. The presence of a power plant nearby also produces noises on the electric line.

The mine was equipped with many surge protectors to solve the first issue. On the other hand, a noise filter into each node neutralizes small electric noises.

1.1.1.2 Test and results

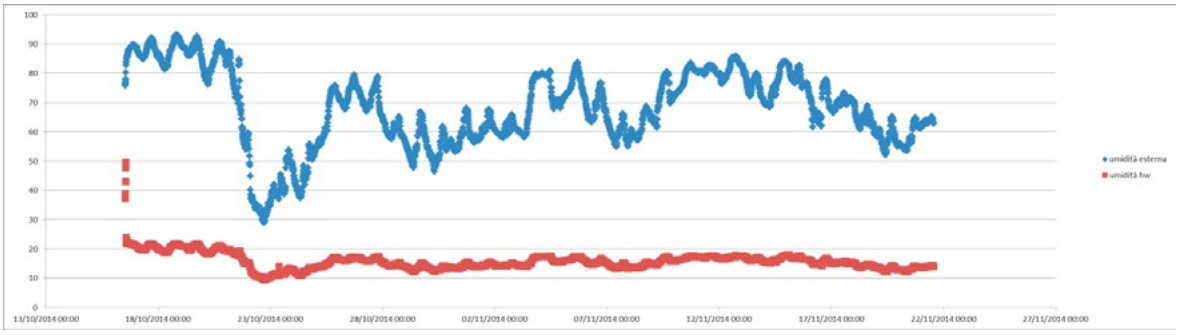
The best way to test our system efficacy against humidity was to sense temperature and humidity inside a node and to compare them to the ones outside it.

We decided to place one node at the beginning of the mine where there is less moisture because of the air exchange with the outside and one node into a small room near the principal corridor because it was one of the most humid places with almost no air exchange with the rest of the mine. Figure 5. The test node map shows where the nodes were placed during the first step of the tests, which lasted from the 16/10/2014 to the 21/11/2014.

Source: internal data

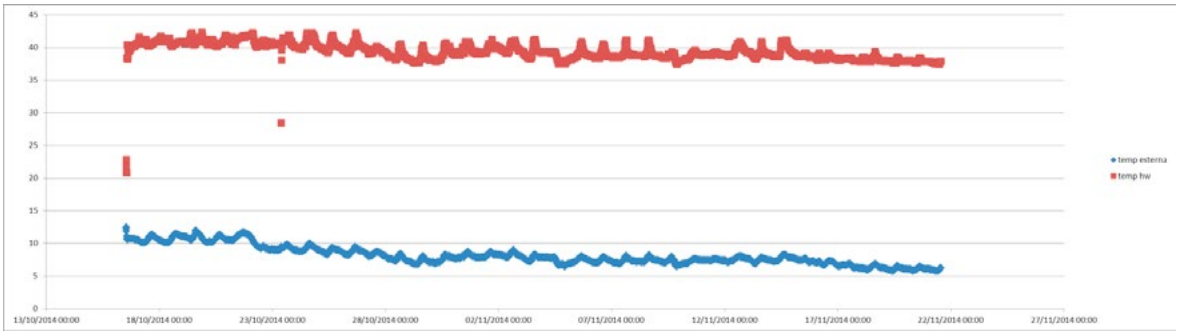
Figure 5. *Test node map*

Figure 6. Node 1 humidity and Figure 7. Node 1 temperature demonstrate that the relative humidity inside the node 1 (the red line) is not only lower compared to the outside (the blue line), but also that the range of values is smaller. The moisture outside the node influences the air inside the box that is not isolated.



Source: internal data

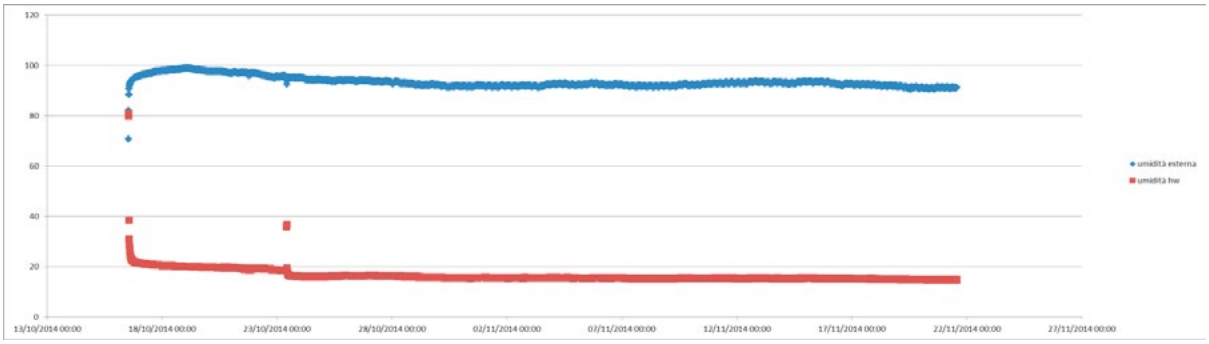
Figure 6. *Node 1 humidity*



Source: internal data

Figure 7. *Node 1 temperature*

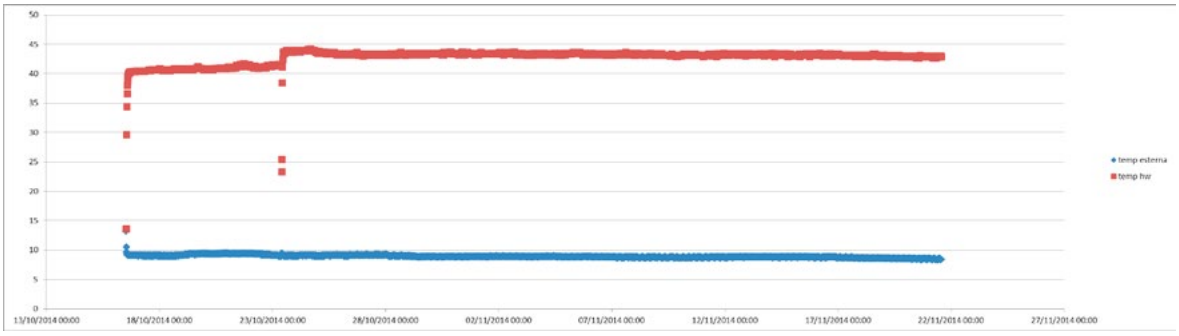
Figure 8. Node 2 Humidity and Figure 9. Node 2 Temperature show the inside and outside temperature and humidity for the node 2. Compared to the node 1 graphs it is possible to notice that the data of node 2 are linear because they are less influenced by the outside mining environment.



Source: internal data

Figure 8. *Node 2 Humidity*

Changing the heat pad voltage has a direct impact on the temperature and the humidity. On the 23/10/2014 the heat pad voltage of node 2 has been increased from 9V to 12V. Due to the box opening you can see some values measured on that date that differ from the average.



Source: internal data

Figure 9. *Node 2 Temperature*

1.1.2 **In mine communication**

1.1.2.1 **Problem and solution**

Trying to transmit data between nodes, we have considered three main possible solutions: to use the existing optic fibre line in the mine, to implement a wireless solution and to install a new-cabled line.

We decided not to adopt the optic fibre solution because only a small part of the mine has already been cabled: the price to extend the line is high compared to the other solutions. Another problem is avoiding collision between the existing data and the sensor network ones on the net.

The most critical point of the wireless solution is the number of radio and antennas necessary for transmitting data. This number changes a lot if the antennas are in the same line of sight or if there are some bands.

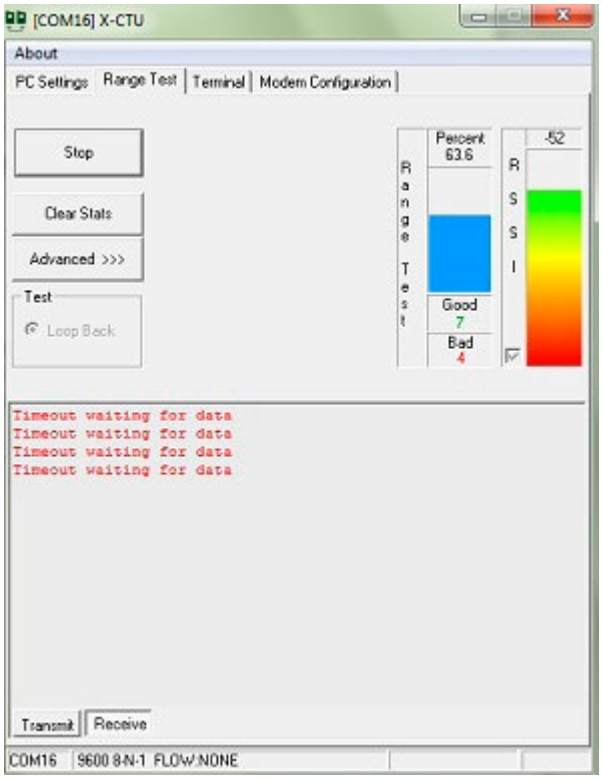
Adopting new-cabled lines increases the costs and needs a longer test time compared to an already tested transmission method like ZigBee.

Once having discovered that the wireless solution was the best, we have tested two kinds of radios (and antennas): the XBee ZigBee that works at 2.4GHz and the XBee 868 that transmits at 868MHz.

1.1.2.2 **Test and results**

The Digi program X-CTU can be used to test the coverage range of both radios. This utility gives two main pieces of information: the percentage of received packets and the "received signal strength indication". Because the tests showed that the XBee 868 is not the best solution in a mine gallery, we have concentrated our attention on the ZigBee radios. This radio standard has already successfully been used in mining monitoring (Wang, Wang, & Fan, 2013) (Tiantian & Zhanyong, 2011) (Pandit & Rane, 2013).

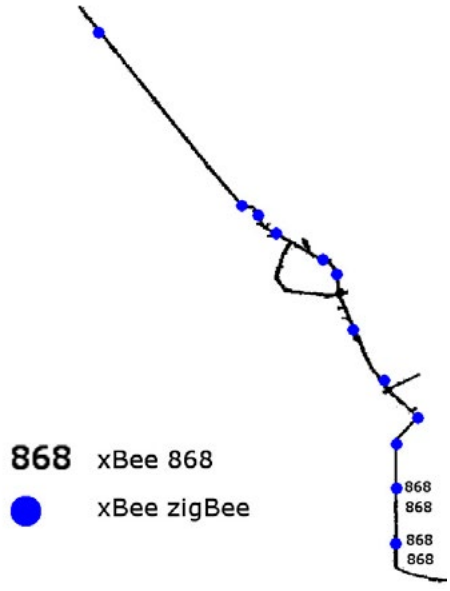
We have started from a side of the mine moving from one point to the next and the last one covered by wireless signal and electric supply. Our objective was to test how many radios should be used to cover the entire mine gallery that is approximatively 5 km long.



Source: www.digi.com

Figure 10. *X-CTU range and RSSI test*

Figure 11. The position of the radios shows the right ZigBee positon so that the mesh net is fully connected. The full XBee 868 position has not been mapped because this radio standard requires too many nodes with respect to the ZigBee to cover the same length. The choice of powering nodes from the electric line despite of using batteries influenced their positions.



Source: internal data

Figure 11. *The position of the radios*

1.1.3 **Next steps**

The following table shows the points of the project that are currently under development.

Table 1. *Next steps*

Sensors	Main parameters of interest are temperature, humidity, radioactivity, earth tremor, water flow.
In situ visualization	Because a part of the mine is a tourist destination, it would be useful to show sensed parameters to the tourists. One solution should be using a single-board computer with a screen at the entrance. This PC must act as a server for the coordinator and must synchronize the data with a remote server if needed.
Remote data transmission	As there is no internet connection in the mine, two hypotheses are possible: connection to a GSM network or making a bridge using xBee 868 or other wireless technologies between the mine and the offices.

Source: internal data

Modularity is one important feature of the Scatol8® networks. Only two nodes were placed for the "Hardware safeguard" test. Once four nodes will be steadily installed the system will not be close allowing the possibility to easily add more nodes to just theoretically cover the entire mine length.

DISCUSSION

Surveys on mining tourism tend to study the trend of visitors, in relation to general data on tourism, within a specified area, and to relate the number of visitors to the natural characters of a destination. Sometimes they refer to marketing strategies and actions, adopted to promote mining sites, by themselves or within a regional tourism supply.

There is a lack of information about management systems, if any, adopted to organize the visit and guarantee environmental and safety conditions, in addition to visitors' satisfaction.

Management systems are ultimately organized information, relevant to significant aspects that are identified and controlled to ensure a sustainable tourism supply.

To implement a management system for a mining site from scratch involves integration of different skills and definition of a detailed program, divided into stages of hardware and software systems design, laboratory tests, in situ tests and, lastly, installation and use. Such a management system is a true "nervous system" of the mine, capable of sending to the managers, in real time, the values of the significant variables. Furthermore, the system must be able to intervene in case of abnormal situations occurring. At this stage, indicators are under discussion and they will be implemented within the integrated management system. For instance, some of them are reported in Table 2.

Table 2. *Indicators*

Area	Theme	Indicator
Environment	Energy	Percentage variation of energy consumption Year (n-1)/year (n)
	Water	Percentage variation of water consumption Year (n-1)/year (n)
	Waste	Per capital waste production (kg/tourist)

Source: internal data

The paper has illustrated the general objectives of the research and activities conducted to date. We believe that the results can be considered encouraging as regards installations performed and the laboratory tests that will lead to the realization of the complete network.

CONCLUSIONS

The paper reported the provisional results of an ongoing project, which has reached approximately half of its actuation program. Its development involves the integration of management methods, related to internationally recognized management system models, and the design and implementation of networks for the monitoring of environmental and management variables. The overall project aims to identify and improve indicators of operational efficiency and effectiveness, thanks to real-time monitoring and integration with an enterprise information system. The results are promising and confirm the ability of open source hardware and software systems to be adapted to the needs of economic organizations, also very peculiar ones, like a mine used for tourism purposes.

If one considers the international expansion of the mining tourism, it would be very stimulating to try the application of the model in other situations, to verify its ability to adapt to different territorial, social and economic contexts.

ACKNOWLEDGEMENTS

This work was written as part of the three-year research project "PROactive management of GEOlogical heritage in the Piemonte region: innovative methods and functional guidelines for promoting geodiversity knowledge and supporting geoconservation activities (PROGEO-Piemonte)". The authors would like to express thanks to Dr. Luca Genre, Director of the ScopriMiniera/ScopriAlpi mining site for his support and suggestions.

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SERVICES OFFERED BY THE ACCOMMODATION ESTABLISHMENTS AT THE MOUNTAIN RESORT OF BOROVETS AND AT THE MUNICIPALITY OF SAMOKOV: A COMPARATIVE ANALYSIS

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ABSTRACT

Hotel establishments at mountain resorts offer a variety of additional services. Some of them are typical for a winter mountain resort (e.g. ski equipment rentals) and others are required by the market segments that they are aiming to attract as their customers. A typical example of a winter mountain ski resort in Bulgaria is Borovets. Due to its traditions in service the resort offers a wide range of additional hotel services.

On the one hand, the availability of various additional hotel services is determined by the national legal requirements. This issue is important in view of the changes that have often been made in the past and are expected again in the near and distant future. In this respect the accommodation establishments are required to offer their customers a wide range of additional services in accordance with their category / stars.

On the other hand, the resort of Borovets has undergone significant changes during the last few decades. Entering the stage of renewal of the cycle of the tourist destination development of Butler, among other things, the resort needs to offer attractions and entertainment to its visitors. One way to accomplish this is a wide range of services to be developed by accommodation establishments in order to diversify the stays of visitors.

Moreover, with a view to resort renovation, development of tourism at the nearby settlements is required. This in turn will result in diversification of the tourism product and sustainable development of the region as mass tourism is combined with specialized types. With regard to these considerations the aim of the paper is a comparative analysis and assessment of the availability of services offered at the hotel establishments, located in the mountain resort of Borovets and to be performed in the rest of the Samokov Municipality.

Analysis of the availability of services in accordance with the categories / stars of the accommodation establishments is performed too. For the purpose of the study information obtained from internet - specifically hotel web-sites - is used.

Despite the disadvantage of the approach that accommodation establishments often do not point all the services they offer, there are advantages too. A significant advantage is that it is precisely the information, which the potential customer would like to receive.

Keywords: *mountain resort, hotel, accommodation, service, Borovets*

INTRODUCTION

Hotel establishments at mountain resorts offer a variety of additional services. Some of them are typical for a winter mountain resort and others are required by the market segments that they are aiming to attract as their customers, most of which participate in skiing and other winter sports.

As Lawson points out, in recent years besides skiing mountain resorts offer their visitors a wide variety of other winter sports such as hockey / ice-skating rinks, curling rinks as well as attractions such as winter events. Moreover, they provide extensive facilities for other sports, such as enclosed swimming pools. In addition, the author claims that "the summer season is important for commercial viability and provision must be made for dual use of central areas, such as tennis courts and gardens in the summer months" (Lawson, 1995).

A typical example of a winter mountain ski resort in Bulgaria is Borovets. Founded in 1893, Borovets is the oldest mountain resort in Bulgaria. It functions as a multifunctional resort (Yaneva, 2008). Due to its traditions in service the resort offers a wide range of additional hotel services.

On the one hand, the availability of various additional hotel services is determined by the national legal requirements. In this respect the accommodation establishments should offer their customers a wide range of additional services in accordance with their category / stars. According to the Regulation for Categorization of Accommodation and Food and Beverage Establishments in Bulgaria from 2005 along with the requirements for the construction, furniture and equipment, service and professional and language qualification of the staff, there are also requirements about the availability of services provided depending both on the category and the type of the accommodation. This issue is particularly important in view of the changes in legislation concerning accommodation in Bulgaria that have been made often in the past, in the recent years and are expected again in the near and distant future.

In 2013 a new Tourism Act has been adopted. There are some differences from the previous Act concerning the new classification of the accommodation establishments. In accordance with the changes in the Tourism Act a new Regulation for categorization should had been adopted within a few months. However, due to the changes of governments and the unstable political situation in the country such a Regulation has not been adopted yet. At the end of 2014 still in force was

the Regulation for Categorization of Hotel and Food and Beverage Establishments from 2005. Further, new changes in this regard could be expected.

On the other hand, the resort of Borovets has undergone significant changes during the last few decades. As V. Yaneva states, a critical problem of the Resort of Borovets is "focusing on winter tourism product specialization, which is a factor for strong seasonality of 2-3 months a year."... "It is to be emphasized that on the international market Borovets exists as offering "destination Bulgaria" exclusively in the form of winter ski packages, which reasonably raises the question about the nature of the tourism product in the rest of the year" (Yaneva, 2008).

Entering the stage of renewal of the cycle of the tourist destination development of Butler, among other things, the resort needs to offer attractions and entertainment to its visitors. One way to accomplish this is a wide range of services to be developed by accommodation establishments in order to diversify the stays of the visitors.

Moreover, with a view to resort renovation, development of tourism in the nearby settlements is required. This in turn will result in diversification of the tourism product and sustainable development of the region as the mass tourism is combined with specialized types.

In the municipality of Samokov there are preconditions for the development of the following types of tourism: winter; summer; ecotourism; cultural-historical; spa and wellness; conference; sports, etc. (http://samokov-info.com).

To adequately solve the problems of Borovets the following can be pointed out: "diversification of the tourism product is needed - creating sites for entertainment, sport, culture, art, crafts, balneology and spa, emphasis on ecological, rural and cultural tourism that meets the high modern requirements of the consumers and the rich resource of the destination" (Yaneva, 2008).

With regards to these considerations the aim of the paper is a comparative analysis and assessment of the availability of services offered at the hotel establishments, located in the mountain resort of Borovets and to be performed in the rest of the Samokov Municipality. Analysis of the availability of services in accordance with the categories / stars of the accommodation establishments is performed too.

DATA AND METHODS

For the purpose of the study information obtained from the web-site of a specific on-line agency (pochivka.bg) is used. There the additional services, provided by each accommodation establishment are pointed out. Their representatives have had the opportunities to choose among the same wide range of additional services. That allows the data to be summarized and analysed and a service classification to be prepared.

Despite the disadvantage of the approach that accommodation establishments often do not point out all the services they offer, there are advantages too. A significant advantage is that it is precisely the information, which the potential customer would like to receive. Thus, if the service is available at a hotel but is not promoted/ advertised, customers often will not become aware of it and therefore if the service is a criterion for selection, they will not choose the hotel.

However, there are significant differences between services available at the site and services, required under the Regulation for Categorization of Accommodation and Food and Beverage Establishments in the country. Furthermore, different services are required not only for different categories, but also for various types of accommodation (e.g. hotel and motel of the same category, etc.). Therefore, direct comparison between the services of establishments pointed out on the web-site and the requirements according to the Regulation cannot be done.

Few services are listed in both sources (on the site and in the Regulation) with concepts that have identical meaning, i.e. have the same name. These include: telephone services, safekeeping, laundry, ironing, dry cleaning, business services, room service, car rental, provision of guided tours, hairdressing, beauty services, use of washing machine and iron, massages, provision of spa and wellness programs and packages, currency exchange, internet, parking spaces, garage, kitchen, food and beverage services, TV, radio and equipment rental.

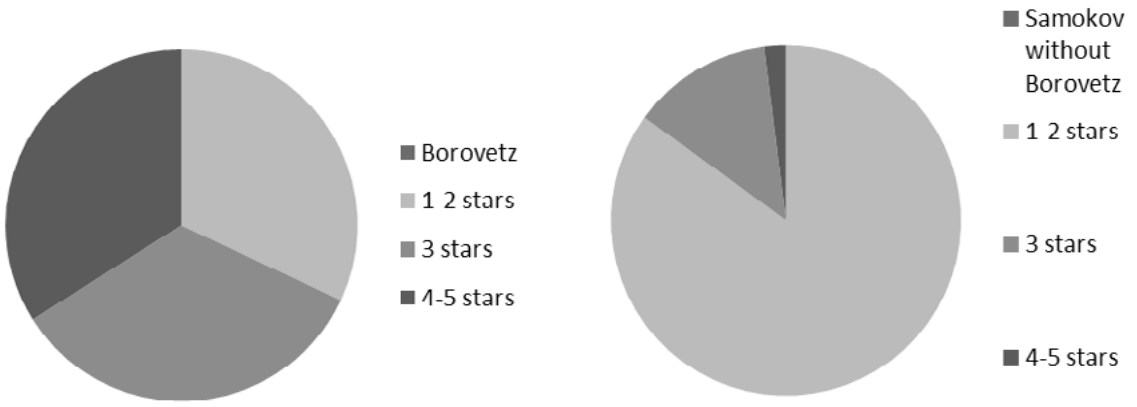
The names of other services pointed out on the site and in the Regulation partially differ. For example, according to the Regulation some establishments are required to provide sports services. However, the types of sports are not specified. Unlike the Regulation, the site provides opportunities for accommodation representatives to point out specific sports.

Other services are required under the Regulation but are not listed on the site. These include: information provision, postal services, calling a taxi, rentals, purchasing of vehicle tickets, shuttle, etc. Still others are not required under the Regulation but are available on the site. Such services are some specific types of hotel food and beverage establishments, transport services, bike rental, animation, snow jet rental, etc.

RESEARCH FINDINGS

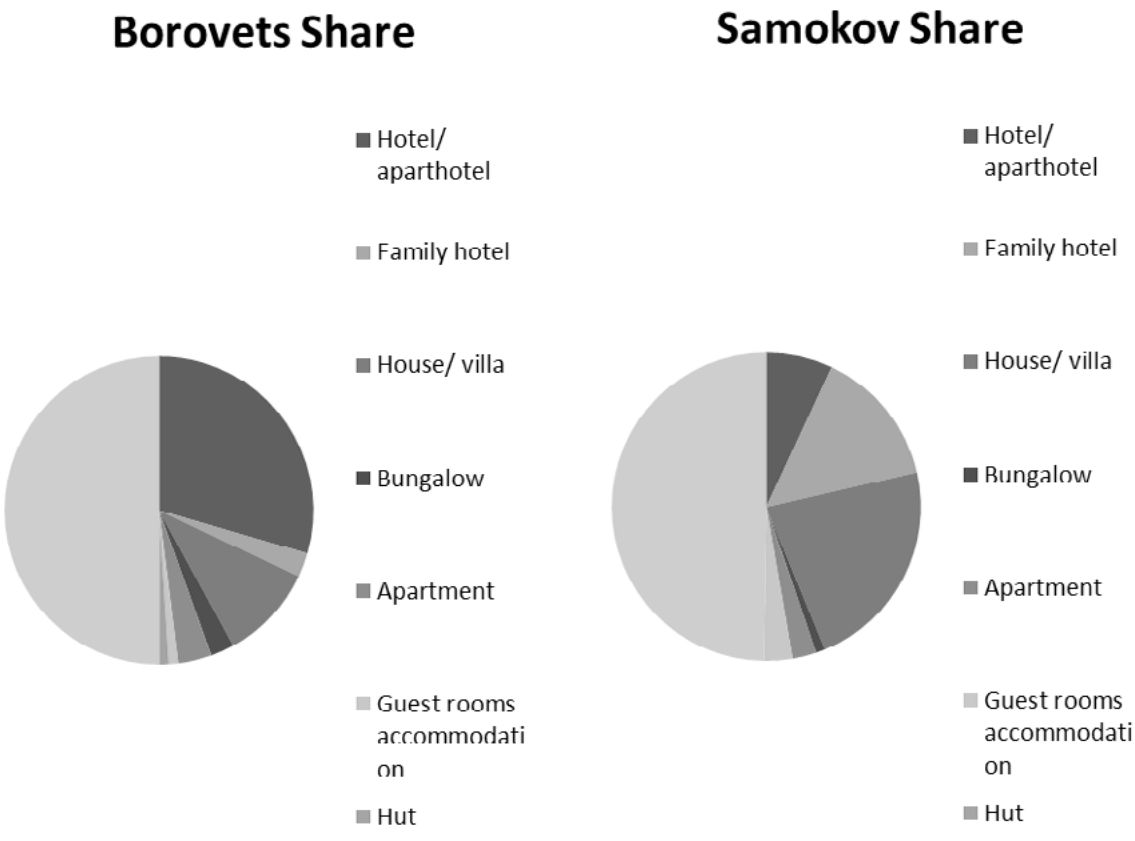
Profile of Accommodation Establishments

Accommodation establishments in the resort of Borovets are almost evenly distributed among the three groups of high, middle and low category where slightly smaller is the share of the latter - 1 and 2 stars (32%) in comparison with the rest two categories (34% each). Within the rest of the Samokov Municipality low-category accommodation establishments prevail (85%) and the shares of the other two groups are insignificant (respectively 13% are the middle-category and 2% - the high-category establishments). The results are not surprising. Borovets is a tourist resort with traditions, which for many years has been striving to attract visitors, who are generally characterized by high income. Moreover, in Borovets there are facilities for winter ski tourism while the other settlements of the Samokov municipality rely more heavily on specialized types of tourism (Figure 1).



Source: www.pochivka.bg

Figure 1. *Category / Stars of Accommodation Establishments*



Source: www.pochivka.bg

Figure 2. *Types of Accommodation Establishments*

The majority of accommodation establishments in Borovets are built especially for tourists - hotels and aparthotels (59%). In the rest of the municipality of Samokov accommodation that serves both tourist needs and residential needs of their owners as a primary or secondary homes (house, villa, family hotels, apartments, guest rooms) and are usually characterized by lower capacity than the hotels prevail (Figure 2).

Hotel Food and Beverage Services

Table 1. *Hotel Food Services*

	Restaurant	Room service	Barbecue	Summer garden	Winter garden	Tavern	Kitchen/ kitchenette	Microwave oven	Fridge
Borovets									
1-2 stars	26%	0%	47%	37%	5%	16%	68%	32%	58%
3 stars	70%	25%	20%	5%	15%	30%	55%	45%	80%
4-5 stars	95%	70%	40%	35%	15%	25%	25%	25%	45%
Total	64%	32%	36%	25%	12%	24%	49%	34%	61%
Samokov	26%	13%	57%	54%	2%	41%	62%	51%	65%

Source: www.pochivka.bg

The hotel food service that prevails in the resort of Borovets is the restaurant that is available in almost two-thirds of the accommodation establishments (64%). Often there is a refrigerator (available in 61% of the establishments) and a kitchen or a kitchenette (49%). Less frequently the establishments have barbecue (36%) and microwave oven (34%), followed by room service (32%). According to the Regulation of Categorization accommodation establishments should possess at least one food and beverage facility. Often there are facilities at accommodation establishments that allow guests to prepare meals on their own (kitchen, microwave oven and refrigerator) and therefore they try attracting guests who have a longer stay at the resort. Another reason is that those accommodations are often second homes for their proprietors. Most rarely accommodation establishments have specific food and beverage facilities such as summer garden (25%), winter garden (12%) and tavern (24%), which is probably due the fact that they already possess a restaurant. More often than average the full-service facilities restaurant (95%) and room service (70%) are available at high-category accommodations, which often are required under the Regulation and by their guests. Respectively, self-service facilities are more often than average available at middle and low-category accommodation, as the kitchen is available at 68% of low-category and at 55% of middle category ones, microwave and refrigerator - respectively at 45% and 80%.

In comparison to Borovets, accommodation establishments within the rest of the Samokov Municipality more often provide self-service facilities, such as kitchens (62% in Samokov against 49% in Borovets), fridges (65% against 61%) and microwaves (51% against 34%), as well as specific food facilities as barbecues (57% against 36%), summer gardens (54% against 25%) and taverns (41% against 24%). Meanwhile, considerably less often than accommodation establishments in Borovets, the ones in the other settlements of the Samokov Municipality possess restaurants (26% in Samokov against 64% in Borovets), even less often - room service (13% against 32%), which is suitable for hotels (mainly of high category). The rarest hotel food facility at the Municipality is a winter garden (2%) (Table 1).

All hotel beverage services are available more often in Borovets than in the rest of the Samokov Municipality. The only exception is the coffee machine, which is less common in Borovets than in the rest of the municipality (20% versus 48%).

Hotel beverage services that are most often available in Borovets are mini bars - at almost half of the accommodation establishments (46%) - and lobby bars (44%), followed by cafes - at 37%. To a lesser extent are available night bars (22%), the construction and operation costs of which are probably high and the least available is a pool bar (15%). In Borovets significantly more often than average most of the hotel beverage services are available at high-category (4 and 5 star) establishments, which include a lobby bar (85% versus 44% on average), a cafe (65% versus 37% on average), a mini bar (80% versus 46% on average), a pool bar (40% versus 15% on average) and a night bar (40% versus 15% on average) - and significantly more rarely hotel beverage services are found at low-category accommodation establishments (1 and 2 stars), including a lobby bar (5%), a cafe (5%), a mini bar (16%), a pool bar and a night bar (0%). That is due to the facts that the target guests of high-category accommodation establishments require more beverage services and the construction and operation of full-service beverage facilities require greater costs. Meanwhile, a coffee machine as a self-service device is not found in high-category accommodation establishments, but is available more often in low-category establishments (47%) (Table 2).

Table 2. *Hotel Beverage Services*

	Cafe	Lobby bar	Mini bar	Pool bar	Night bar/ club	Coffee machine
Borovets						
1-2 stars	5%	5%	16%	0%	0%	47%
3 stars	40%	40%	40%	5%	20%	15%
4-5 stars	65%	85%	80%	40%	45%	0%
Total	37%	44%	46%	15%	22%	20%
Samokov	18%	9%	18%	5%	1%	48%

Source: www.pochivka.bg

Hotel Transport Services

In Borovets more often than in the rest of the Samokov Municipality the transport services bike rental (34% versus 23%) and car rental (31% versus 5%) are offered. Almost all accommodation establishments both in Borovets (90%) and in the rest of the Samokov Municipality (80%) provide parking spaces. However, less of them offer garage services (21% in Samokov and 17% - in Borovets).

More often than average the bike and car rental services are provided by high-category accommodation establishments (respectively 55% versus 34% and 55% versus 31%), perhaps because they are required to offer a greater number of and more diverse services. Meanwhile, lower-category accommodation establishments offer those transport services to a much lesser extent (11% of them offer the car rental service and only 5% - bike rental). A garage is provided more often than average by high-category accommodation establishments (35%) (Table 3).

Table 3. *Hotel Transport Services*

	Bike rental	Rent-a-car	Parking	Garage
Borovets				
1-2 stars	5%	11%	79%	11%
3 stars	40%	25%	100%	5%
4-5 stars	55%	55%	90%	35%
Total	34%	31%	90%	17%
Samokov	23%	5%	80%	21%

Source: www.pochivka.bg

Hotel Household Services

Among guest clothes lines and laundry services more often accommodation establishments both in Borovets (63%) and in the rest of Samokov (65%) offer irons and rarely - dry cleaning (respectively 5% and 4%). High-category accommodation establishments in Borovets provide guest clothes lines and laundry services more often than average (Table 4).

Table 4. *Hotel Guest Clothes Lines and Laundry Services*

	Washing machine	Laundry	Ironing	Iron	Dry cleaning
Borovets					
1-2 stars	16%	16%	11%	47%	0%
3 stars	30%	35%	40%	75%	0%
4-5 stars	65%	75%	55%	65%	15%
Total	37%	42%	36%	63%	5%
Samokov	28%	28%	25%	65%	4%

Source: www.pochivka.bg

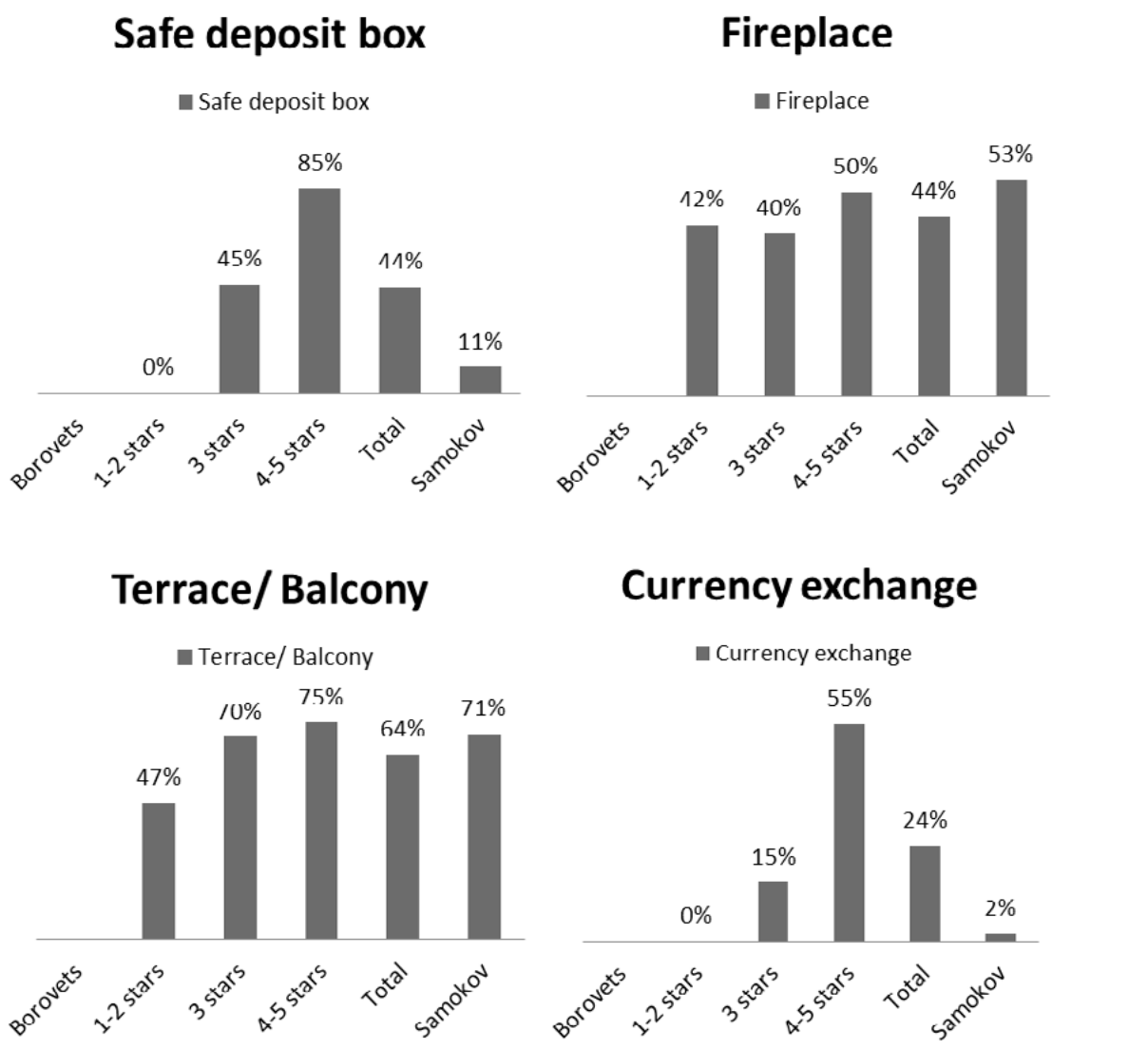
Table 5. *Hotel Guest Appearance Related Services*

	Hairdresser	Beautician	Hairdryer	Bathtub
Borovets				
1-2 stars	0%	0%	32%	26%
3 stars	0%	5%	45%	60%
4-5 stars	20%	25%	90%	80%
Total	7%	10%	56%	56%
Samokov	1%	1%	35%	23%

Source: www.pochivka.bg

Just over half of the accommodation establishments in Borovets (56%) offer the guest appearance services hairdryer and bathtub. Meanwhile, in the rest of the Samokov Municipality significantly less accommodation establishments offer guest appearance services compared to the Borovets Resort. The reason could be that cosmetics and hairdressing in the rest of the Samokov Municipality are available outside the accommodation establishments as individual service providers. To a higher degree guest appearance services are available at high-category accommodations (Table 5).

Among the amenities, safe and currency exchange are available more often in Borovets than in the rest of the Samokov Municipality. Fireplaces and terraces are available more rarely in the resort of Borovets compared to the rest of the Samokov Municipality. In Borovets all amenities are more often than average available at high-category accommodations (Figure 3).

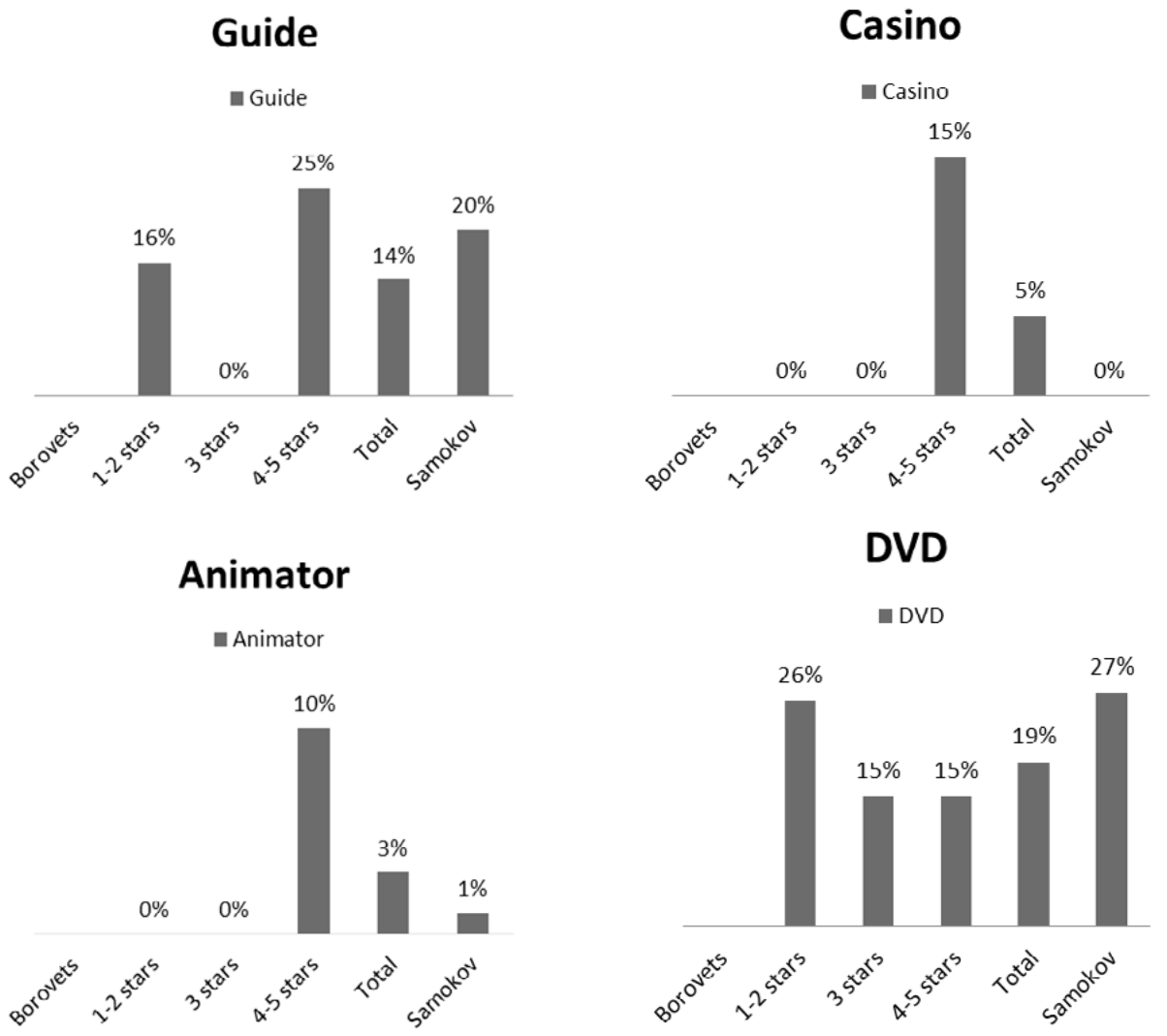


Source: www.pochivka.bg

Figure 3. *Accommodation Amenities*

Hotel Entertainment services

Both establishments in Borovets and in the rest of Samokov most often offer the entertainment service DVD (in the room) and a guide (outside the accommodation establishment). However, accommodations in Samokov (without Borovets) rely on those recreational activities to a larger extent than the ones in Borovets. In Borovets guides, casinos and animation are offered more often than average by high-category accommodations (Figure 4).



Source: www.pochivka.bg

Figure 4. *Hotel Entertainment Services*

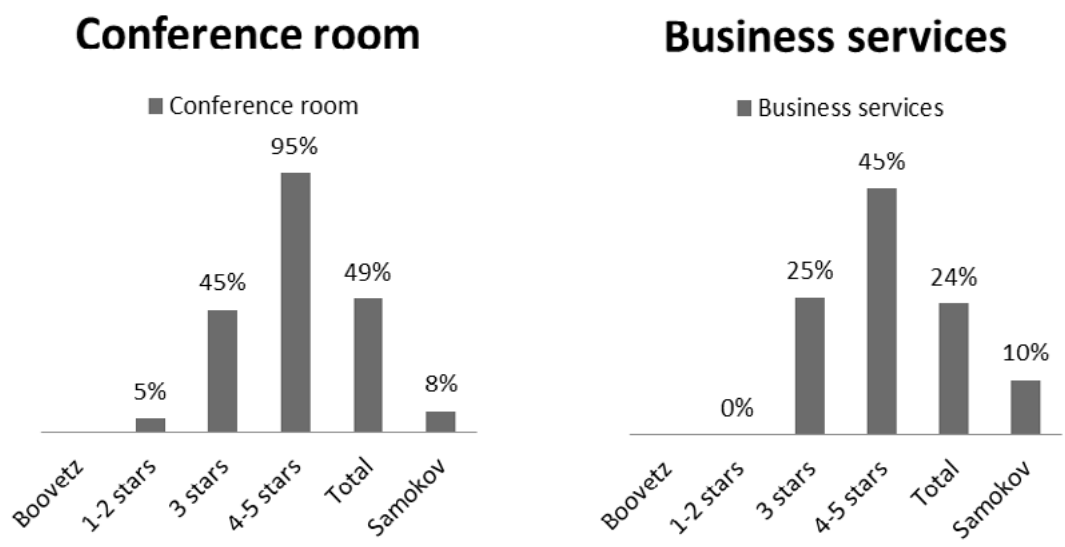
Hotel Information and Communication Services

The information and communication service that is available more often at both accommodations in Borovets and in the rest of the Samokov Municipality is television (95%). Next on the list is the service internet - offered at 76% of the accommodation establishments in Borovets and 61% - in the rest of the Samokov Municipality. The information services (radio, telephone and internet) are more often than average available at high-category accommodations (Table 6).

Table 6. *Hotel Information and Communication Services*

	Cable/ satellite TV/ TV set	Radio	Telephone	Internet/ Internet club
Borovets				
1-2 stars	95%	16%	5%	47%
3 stars	100%	15%	65%	95%
4-5 stars	90%	35%	80%	85%
Total	95%	22%	51%	76%
Samokov	95%	30%	26%	61%

Source: www.pochivka.bg



Source: www.pochivka.bg

Figure 5. *Hotel Conference and Business Services*

Conference and business services are available more often in Borovets compared to the rest of the Samokov Municipality (respectively 49% and 24% versus 8% and 10%). The reason could be that those services require significant costs and high capacity. In Borovets more often than the average conference and business services are found at high-category accommodations (Fig 5).

Hotel Sport Services

Hotel individual sports services in the Resort of Borovets significantly differ from those in the rest of the Samokov Municipality. The most common services of that type in Borovets are a fitness centre and an indoor pool (34%). A significantly small part of the accommodations there provide an outdoor pool (2%). In the rest of the Samokov Municipality the most common service is horse riding (16%), although it is available less often than in Borovets. The other - rarer services - in the rest of the Samokov Municipality are fitness (7%), an outdoor pool (5%) and an indoor pool (2%). In Borovets more often than average hotel individual sports services are available at high-category and more rarely - at low-category accommodation establishments (Table 7).

Table 7. *Hotel Sports Services - Individual Sports*

	Fitness centre	Outdoor pool	Indoor pool	Horse riding
Borovets				
1-2 stars	0%	0%	5%	11%
3 stars	25%	0%	10%	25%
4-5 stars	75%	5%	85%	35%
Total	34%	2%	34%	24%
Samokov	7%	5%	2%	16%

Source: www.pochivka.bg

Generally the conditions for practicing team sports are more favourable at the accommodations in Borovets and in the town of Samokov than in the rest of the Municipality. Each service of the kind is available more often in Borovets (provided by between 3% and 24% of the accommodations) than in the rest of Samokov (between 0% and 4%). In Borovets most often are offered billiards (24%) and table tennis (22%), followed by basketball (14%) and football (14%), a tennis court (10%) and volleyball (8%). More rarely there are provided bowling (3%) and mini golf (3%). The larger provision of hotel team sports services in Borovets than in the rest of Samokov is probably due to the high costs and high capacity that are needed. It might be assumed that the accommodation guests in Borovets who are mostly participants in ski tourism prefer the additional services to be available within the hotel complex so that after skiing they could relax and use those services there. Accommodations in the rest of the Samokov Municipality probably seek to attract participants in mountaineering, who mostly prefer outdoor activities. However, in the town of Samokov there is a sport hall with 2500 places. In Borovets to a greater than average extent all hotel team sports services are available at high- and middle-category accommodations (Table 8).

Table 8. *Hotel Sports Services - Team Sports*

	Billiards	Bowling	Mini golf	Tennis court	Table tennis	Volleyball	Basketball	Football
Borovets								
1-2 stars	0%	0%	0%	0%	0%	5%	5%	5%
3 stars	25%	0%	0%	20%	25%	5%	15%	20%
4-5 stars	45%	10%	10%	10%	40%	15%	20%	15%
Total	24%	3%	3%	10%	22%	8%	14%	14%
Samokov	4%	0%	0%	2%	4%	2%	1%	3%

Source: www.pochivka.bg

Hotel Medical, Spa and Wellness Services

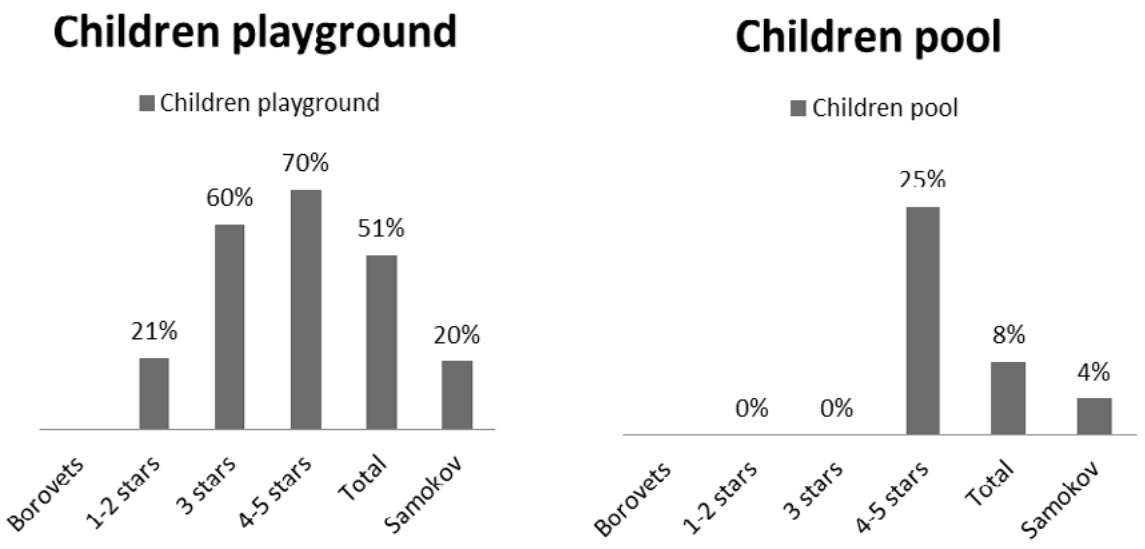
All hotel medical-, spa- and wellness services could be found more often in Borovets than in the rest of the Samokov Municipality. The reason probably is the high construction and staff costs necessary, the high capacity of the facilities and the requirements of target visitors. Accommodations in the Samokov Municipality without Borovets have more often Jacuzzi (9%) and sauna (9%), followed by massage studios (7%), more rarely a SPA centre (5%) and a steam bath (5%) and most rarely solariums (3%) and medical offices (1%). In Borovets more often is available sauna - at more than half of the accommodations (58%), followed by a SPA centre (39%) and a massage studio (39%). More rarely available are steam baths (31%) and Jacuzzi (29%), followed by a solarium (17%), medical offices (10%) and most rarely - mineral baths (2%). In Borovets all hotel medical-, spa- and wellness services are available to a significantly higher than average degree at high-category and to a lower degree - at low-category accommodations. Low-category accommodation establishments do not offer most of those services, namely a SPA centre, Jacuzzi, a solarium, a massage studio, mineral baths and a medical office (Table 9).

Table 9. *Hotel Medical-, Spa- and Wellness Services*

	SPA centre	Jacuzzi	Steam bath	Sauna	Solarium	Massage studio	Mineral baths	Medical office
Borovets								
1-2 stars	0%	0%	5%	11%	0%	0%	0%	0%
3 stars	40%	15%	10%	65%	5%	35%	0%	5%
4-5 stars	75%	70%	75%	95%	45%	80%	5%	25%
Total	39%	29%	31%	58%	17%	39%	2%	10%
Samokov	5%	9%	5%	9%	3%	7%	0%	1%

Source: www.pochivka.bg

Hotel Services for Children

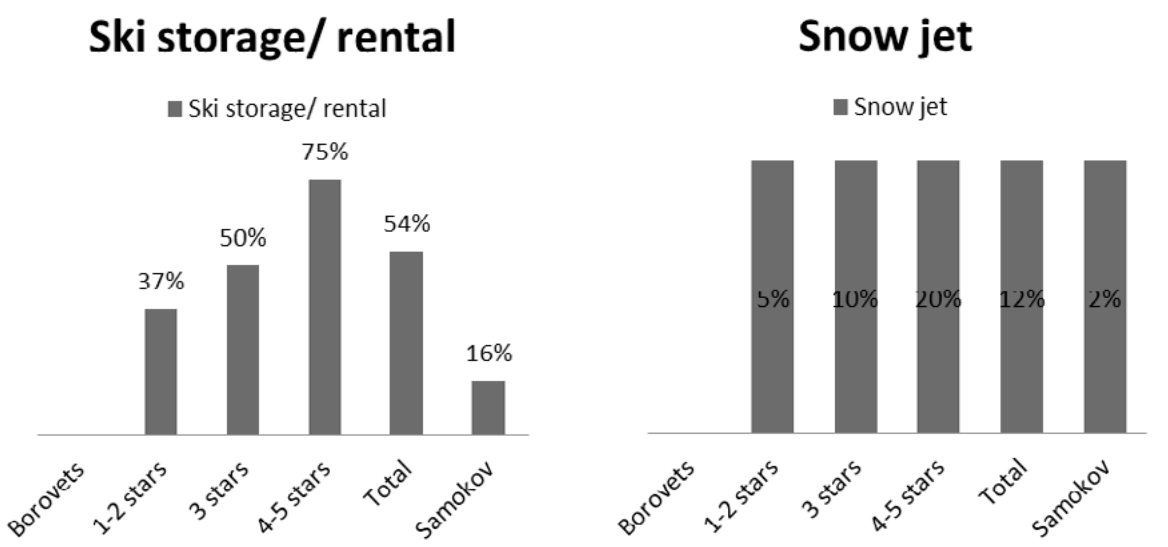


Source: www.pochivka.bg

Figure 6. *Hotel Services for Children*

Hotel services for children are available about twice as often in Borovets (and particularly at high-category accommodations) than in the rest of the Samokov Municipality. Both in Borovets and the rest of the Samokov Municipality more often are available children playgrounds than children pools (Figure 6).

Hotel Winter Sports Services



Source: www.pochivka.bg

Figure 7. *Hotel Winter Sports Services*

Winter sport practicing is the most common reason for visiting the mountain resort of Borovets. However, ski storage/ rental are available only at about half of the accommodations there (54%). Even a smaller number of the establishments provide snow jets (12%). In the rest of the Samokov Municipality where the conditions for practicing ski tourism are not so favourable hotel winter sports services are even rarer, as ski storage is offered by 16% and snow jets - hardly by 2% of the accommodations. In Borovets significantly more often than average the two services are available at high-category and more rarely - at low-category accommodation establishments (Figure 7).

DISCUSSION AND CONCLUSION

As mentioned above, Borovets enters the stage of renewal in the tourism destination development life-cycle (according to the model of Butler). In that context, among other things, the destination should offer attractions and entertainments to diversify the stays of its visitors. One way to do this is a wide range of services to be provided by the accommodation establishments.

The Regulation for Categorization from 2005 actually sets as requirements a large number of additional services to be available at accommodations. This may raise discontent in some business representatives as additional services require considerable capacity, high facility construction and maintenance costs and staff costs.

There is a discussion whether the availability of additional hotel services should be legally regulated. In this sense, on the one hand, if accommodation establishments share common additional service facilities, is it necessary for the legislature to require their presence in each one of them? Also, does the fact that the law does not require individual accommodation to provide certain additional services mean that it is not necessary their representatives to explore what visitors want to do during their stays, i.e. how to spend their time more efficiently?

However, it should be considered that the clients of accommodations require a large variety of additional services. The availability of additional services determines the quality and diversity of the experience and consequently the length of the stay, whether the guest will return and recommend the accommodation to other people.

Along with cleanliness and good maintenance, the provision of entertainments and conditions for various and interesting stays of visitors through additional hotel services is a prerequisite for more sales. When the management comprehend that an accommodation exists for its customers, the regulation or mandatory requirements for additional services would be not only unnecessary, but actually could hinder business, whose representatives would be more than anyone else aware and ready to respond to the requirements and preferences of the target customers. Some services that are required according to the regulations might be unnecessary, but perhaps many other, which are not mentioned therein, are necessary and desired by the customers of accommodations.

In this regard, accommodations are recommended to offer a great variety of additional services. If they do not provide the necessary capacity and resources, it is desirable information to be provided to the customers by representatives of the accommodations concerning the availability of additional services offered within the destination.

Alternatively, several accommodations could develop common facilities, such as sports playgrounds, guiding services, animation, a conference centre, etc. That is particularly suitable for accommodations in the Samokov Municipality without

Borovets, which usually are located in small settlements and are characterized by smaller capacity, space and size.

When planning the additional services the principles of sustainable tourism development should be considered. There are already ecological problems in the Samokov Municipality, especially in Borovets, mostly as a result of overbuilding. In this respect it is recommended that the management of the accommodations should pay greater attention to the development and provision of entertainment activities rather than to the expansion of the accommodation facilities. Thus, people seeking social contacts would be attracted to the resort. Another option is various sporting events to be organized more often in the resort. Sustainability could be achieved by more moderate and evenly distributed development across the territory of the municipality, including better development of the settlements without Borovets. Initiatives should be carried out encouraging local people to develop and provide specialised tourism products. Thus, mass ski tourism would be combined with specialised forms, leading to a more effective territorial distribution of tourism and diversified stays of the accommodations guests. Another important issue is the seasonality, especially typical for the resort of Borovets. To overcome the problem, packages for tourists could be offered, which include summer sports, mountaineering and conference tourism, organization of performances, etc. An advantage is that there is a significant number of facilities already built, so the further work should be focused on their maintenance, cleanliness and improving the image of the resort.

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HIGH QUALITY "MOUNTAIN POLYFLORA", "MOUNTAIN PRODUCT" AND THE MOUNAIN "FAMILY FARM", "KEYS" FOR SAFEGUARDING AND SUSTAINABLE DEVELOPMENT OF MOUNTAIN AGRI-FOOD ECONOMY, IN A COOPERATIVE-ASSOCIATIVE SYSTEM, FOR SOUTH-EASTERN EUROPE

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ABSTRACT

This paper intends to structure a model of sustainable development of mountain areas based on traditional bio-areas. It describes the complexity of the mountain issues, with aspect focused on economic, social, cultural, environmental and biodiversity levels, highlighting the unity of the technical and managerial actions of the factors from mountain areas, especially through the organisation of the cooperative - associative system specific to the axis *"mountain polyflora" – "family farm" - "mountain product".* This paper develops the idea of specific quality of the mountain agri-food products, with ecological and biological characteristics, which guide the proposed model towards mountain agri-modules of complementary ecological area type, with production of biologic products in so-called pilot bio-areas. The model can generate unitary international cooperation for the mountain areas and indicates the idea of making a **"Charter of Cooperation of the Eastern European Mountain Agri-Food Sector".**

Keywords: *polyflora, mountain product, family farm, cooperative, sustainability, pilot traditional bio-areas*

INTRODUCTION

Facts - Arguments

Given the growing pressure exerted by the effects of intense population growth and climate change, mankind is forced to take new and effective measures to secure at least two very necessary needs of life: food and water.

Until the last economic crisis from 2008-2012, whose effects continue to be felt without being sure that it won't happen again, the global trend targeted the farming systems based on intensive use of chemicals, big mechanization and industrial animal breeding – with strong and growing pressure for expansion of SMEs, the prerogative of multinational or national large companies focused solely on profit. Of course, the "quantitative" model of the intensive industrial agriculture located in peri-urban areas may be acceptable for providing food to large cities. However, it is necessary the shortcomings of the model to be corrected, and, on the other hand, alternatives must be found regarding the food quality, which is certainly a prerogative of mountains. Therefore, the "big agriculture" needs large spaces, requires aggregations, consumes more oil, has serious effects on the environment, the groundwater and the fertile soils and also combined with preservatives and flavour enhancers intensively used for taste improvement – it has serious negative effects on the health of the great mass of consumers.

The biggest loser in the last decades, always in danger, is family farming, which is carried out on average and smaller surfaces, with lower productivity but with advantages that cannot be ignored. Here we can mention: lower costs per unit of product; lower consumption of petroleum-based products, better quality nutritional intake of plant and animal products; little or no use of chemicals; the intense use of organic fertilizers; much less aggressive effects on the environment. From a social perspective it is particularly important because it ensures a large number of jobs in the rural areas, especially in fragile areas such as the mountains. In this way it attenuates the pressure of the migration towards urban areas, while the cities also have lost much of their capacity to absorb rural labour. This phenomenon, which in Romania has a specific gravity due to losing the vast majority of the industrial objectives able to absorb the rural labour force, has similar aspects

in other Southeastern European countries.

For example, in Romanian agriculture in the last 24 years, the policies aimed at big agriculture were continued with large farms with over 500-1,000 hectares (already too many), and with exaggerations, in some cases leading to farms with 10,000 to 40,000 hectares and even the peak of about 70,000 ha with sole owners. Moreover, these large farms receive most of the subsidies (about 50%) and the other half is divided among about 2.7 million family farms, which is a paradox.

It is obvious that where this phenomenon occurred – there is the highest level of poverty in the rural population, with high effect of emigration, such as the time after Romania joined the European Union (2007).

In this complicated global, European and national context, recently there was a novelty, a shift of paradigm that started - somewhat surprisingly, in the USA - where the press published articles with headings like "Family Farm Saves America", then being promoted at the level of UN, which proclaimed 2014 as "International Year of Family Farming". In fact, it has announced a major change of direction and perspective. There are already opinions that the system of large farms has reached the limits of its development.

This change can be easily carried out in more developed EU countries, which have agricultural structures at the level of the medium and small family farms too and where the market for such products is formed and the consumers are informed and aware.

The problems have a different aspect in the East European countries where the agricultural structures are still unconsolidated, emerging but slowly. In addition, a serious problem, at least in Romania, is found in the educational system, which for the last 70 years has been dedicated almost exclusively to the "big agriculture".

Agricultural universities have trained specialists almost exclusively for the "big agriculture" and they are too weak for the family farms. This situation needs to be changed and to be adapted, especially from the perspective of the agricultural education.

In Romania the dominant effects of large-scale agriculture were felt most pronounced in mountain areas (74,000 km^2) where there are alarming economic and social phenomena - including a dramatic decrease of the number of animals (~ 50% in cattle and more than 30 % in sheep, more than one million sheep), especially at the level of small family farms characteristic to the Romanian Carpathians, where the decrease often exceeded 70-80% or sheep breeding was even abandoned.

The causes are multiple, including the wool price collapse since 1993-1997 and a policy of subsidies applied to 50 or more sheep, while the mountain small farms traditionally had 10-20 heads (except transhumance).

There are other more dramatic consequences: by the monopolistic policies carried out by the food industries, regarding very low prices, especially for the main raw materials - milk and meat, livestock breeding was not profitable anymore and led to agricultural abandonment by the younger generations and the appearance of the phenomenon of emigration, especially after Romania joined the EU in 2007. In consequence, the aging of active farmers is more obvious, who remain without people to take over their duties and gradually more and more mountain hamlets and villages disappear, with the abandonment of valuable traditional best practices – endangering a great and important economy producing food for more than 4 million people.

The phenomenon occurs insidiously but systematically. The mountains "do not scream", are not organized and do not put "pressure" and the stakeholders, political and administrative, do not react in due time.

In the current global, European and national context there is a growth, yet unspectacular – of the interest in mountain areas, the major suppliers of drinking water, biodiversity, with a special role in absorbing carbon - and also providers of human food and habitat spaces for nearly one billion people worldwide. Of these we speak about 96 million for Europe, about 3.6 million for the Romanian Carpathians, about 3.6 million in the mountains of Bulgaria[1].

USED METHODOLOGY

A main chance for safeguarding and sustainable development of agri-food mountain economy, the "engine" of rural life of "mountain type" is found in the high quality of "mountain products" and the concurrent development of positive externalities.

These are highlighted based on the principles of mountain management and in conjunction with the methods of analysis, synthesis, comparison and statistics and a multidisciplinary approach is the recommended method.

RESULTS AND DISCUSSIONS

New opportunities; Solutions proposed; "Traditional pilot bio-areas"

The consequences of the described diagnosis are dramatically found in the decrease of the volume of organic fertilizers and in the increasingly alarming phenomenon of the natural fodder flora of the mountain pastures rapidly turning wild again (8-10 years) - a flora that was created in centuries by the mountain people in harmonious relationship with nature, through ruminant animals and organic fertilizers. The valuable mountain fodder flora was hard to obtain and once destroyed it would be very difficult and expensive to recover, if not impossible. The mountain fodder flora is strictly depending on the existence of family farms, of mountain farmers, who provide continuity for the best traditional practices and cannot be replaced by people who do not know and are not adapted to mountain conditions. Unfortunately, the European and international experience has shown that, in the mountains - where agriculture disappeared, not much was accomplished, the demographic and economic losses becoming irreversible, especially in the conditions of the XXI century.

The results of the research show an axis under which we are trying to achieve a model of sustainable development in the mountains, namely on the direction: "polyflora of mountain areas" – "family farm" – high quality "mountain product".

It is obvious that mountains cannot compete with plains, with the big agriculture there in terms of volume of production, especially for milk and meat and some vegetables. On the other hand, the family farm can provide quality, while the urban consumers, more numerous, are increasingly interested in healthy food products.

1 *According to the study - NordRegio*

But when it comes to quality – the mountains have a real chance, the big agriculture not being able to reach the quality level given by the mountain products, which is due to factors that are specific only to the mountains. We are talking about: fodder polyflora of the grasslands and hayfields, with many natural mineral salts, vitamins and the intake of many medicinal herbs; water and air - unpolluted; an extensive animal breeding system – with the animals freely moving outdoors, sweating and eliminating toxins and especially a "zero" level of use of chemicals, which in the XXI century can make the difference - by guarantees for consumers health. Mountain food products are essentially ecological and the biological quality of animal protein is high. Compared to the large agri-food production in lowland and hills, the small mountain production remains in the category "niche".

At production level there are large needs regarding the comfort and the hygiene of the animals and the adaptation of the educational system to the needs specific for the mountain agri-livestock economy is a basic requirement, knowing the technology to use organic fertilizers becoming particularly important.

REGULATION ON THE "MOUNTAIN PRODUCT"

Note that in 2012 the European Parliament and the European Council issued Regulation No.1151, which made official, for the first time, the "mountain product" as an expression of high quality (with "Euromontana", the European Association of Mountain Areas, playing a remarkable lobbying role). It also established the conditions for recognizing these products, which are: guaranteed origin from the mountain areas (PGI and PDO), the animals being fed with fodder from the mountains, processing the raw materials to be carried out in the mountains - with some exceptions, not mandatory (e.g.: the possibility of processing the raw materials also at a distance of up to 30 km from the mountains - debatable issue).

In 2014 the European Commission's Delegated Regulation (No. 665/2014) became official. It picks up the issue where it has been left and further develops it - with two important details:

- The added value to be returned to the farmers and not to the intermediaries (possibly through cooperative solution);
- the Regulation to be applied throughout the European Union.

Please note that for the mountain areas of EU's developed countries these new provisions are opportunities of completeness nature but for emerging countries with mountain areas and mountain agriculture lagging behind, such as Romania, Bulgaria, the Balkan countries joining the EU, the "mountain product" can become a "magical" safeguarding and sustainable solution - based on the use of traditional "best practices", renewable energies and in a friendly relationship with the mountain environment.

3.2. STRUCTURING THE NEW MODEL

The essence aimed at in the proposed model is the superior capitalization of the mountain products, at prices compensating the efforts of the producers, thus being able to create such an important financial source, which in turn would support the effort to make mountain agri-livestock breeding profitable again.

A solution, already well checked in the EU, is found in the stimulation of the associative-cooperative system – of western type (like in France, Italy, Spain, Switzerland, Norway, etc.). In this model one should consider some common and/or specific conditions required for the adaptation to the South-eastern European mountain area. Thus, based on the concept of modules, the mountain module can be regarded as a territorial "bioreactor" (analysis of raw materials, processed products and wastes) so that the newly acquired modular system structure to be quantified and the typology and efficiency of the modules to be determined.

The technological and social-economic model of mountain modules envisages there to be complex systems with different typology, energy autonomous (including solar and wind-based), capable of recycling rain water and used water, of turning waste and dejections into natural fertilizer, of organizing the rotation of crops to allow the earth to regenerate without chemical fertilizers;

Embodying those listed above we can structure a model in which the mountain modules can have a typology related to the basic qualities of mountain agri-food products: ORGANIC products ("no chemicals") and BIOLOGICAL products ("living food", meaning food with bioactive components). In this respect the model proposed in the paper guides the mountain agri-modules towards the territorial management of ecological zone type or ECOZONE, which can be complementary to an area well defined for obtaining biological products ("bio") or the so-called BIO-AREAS, which in the mountain areas have a traditional character, with elements of diversity.

BIO-AREAS are territorial modules with bio-economic valences for social revitalization and sustainable development of the given area, resulting in agri-food and non-food organic and biologic products, with sanogenous (health generating) capacity[1] .

In this context the proposed model is one of a mountain area with the capacity to produce agri-food products with ecological and biological qualities, with high nutritional density based on an associative-cooperative system specific to the axis "polyflora of mountain area" – "family farm" - high quality "mountain product".

The quality of mountain agri-food products is supported by the physical-chemical composition and the specific nutritional capacity. Without going into details we mention that the index of nutritional density is expressed by the natural content – balanced in macro-nutrients – meaning proteins (profile balanced in amino-acids); lipids (profile balanced in fat acids, saturated, monounsaturated, polyunsaturated); carbohydrates with quick release, slow release. The balance can also be analysed at the level of micronutrients: macro-elements (Ca, P, Mg, K, etc.) and micro-elements (Se, Zn, Cu, etc.), hydro and lipo-soluble vitamins.

Regarding the management of bio-areas, the proposed model is based on the associative-cooperative system, which aims, among others, at: cooperation of geographical indications and names of protections; food safety (PGI, PDO);

sustainable development and the role of a quality mountain agriculture; - international promotion and implementation of projects; ensuring the production and as a priority - increasing the prices of raw materials - milk and meat - , by which to sustainably improve the farmers' incomes and to fight against poverty.

As aspects specific to the associative-cooperative system in mountain areas we mention: animal husbandry, berries, fruits, distillation and some vegetables, forests and wood processing. The mission and services of the cooperative system group include several directions that provide the texture of the model: production and quality; communication and promotion; financial and legal aspects; human resources training and support employment; innovation; environment and sustainable development.

The associative-cooperative system in mountain areas has as references a series of specific aspects:

- The organization of cooperatives of producers to be done both at communes level (especially for collecting milk, meat, berries, etc.) and, especially, at inter-communes level, by "traditional bio-areas" where there is need for investment in industrial organization (dairy, meat, vegetables) able to provide value added for the final "mountain products" – meant for urban consumers who are interested, aware and convinced.

It is obvious that marketing studies will be required, especially financial support from the EC, for investments (one time), organizational efforts, a special form of credit, attractive for mountain areas and intense and continuous moral Community and national support the producers to be encouraged.

New financial sources be provided with the help of the associative-cooperative system described – through the high capitalization of the "mountain goods" – may be ensured taking into account at least two aspects:

- No middlemen – who now have a high profit margin;
- "Value added" – given by the quality and the higher sale prices (marketing studies).

The cooperative system shall be checked as being able to ensure the profit to be returned to the direct producers[2] – making the agri-livestock economy to be profitable in the mountain villages, fighting poverty and determining at least part of the people from the younger generations to give up migrating and to provide continuity.

What realistically can be proposed for the period 2015 is to be created, with intensive support, a few "traditional pilot bio-areas" through which to express the good results and the obstacles, aspects that need to be corrected when we move to the process of multiplication - Horizon 2040.

International cooperation for such a project between Romania and Bulgaria, for example, with competent Western European partners, could become interesting. In the future the model can also include Greece to the south or the countries of the Carpathian chain to the northwest, so to be able to achieve a "Charter of Cooperation of the Eastern European Mountain Agri-Food Sector". This will allow supporting small businesses and family farms in the dynamics of creation of quality jobs and adaptation of trades and skills specialised on mountain issues.

An example for the development of traditional "mountain bio-areas" can be found in the diagram of Figure 1.

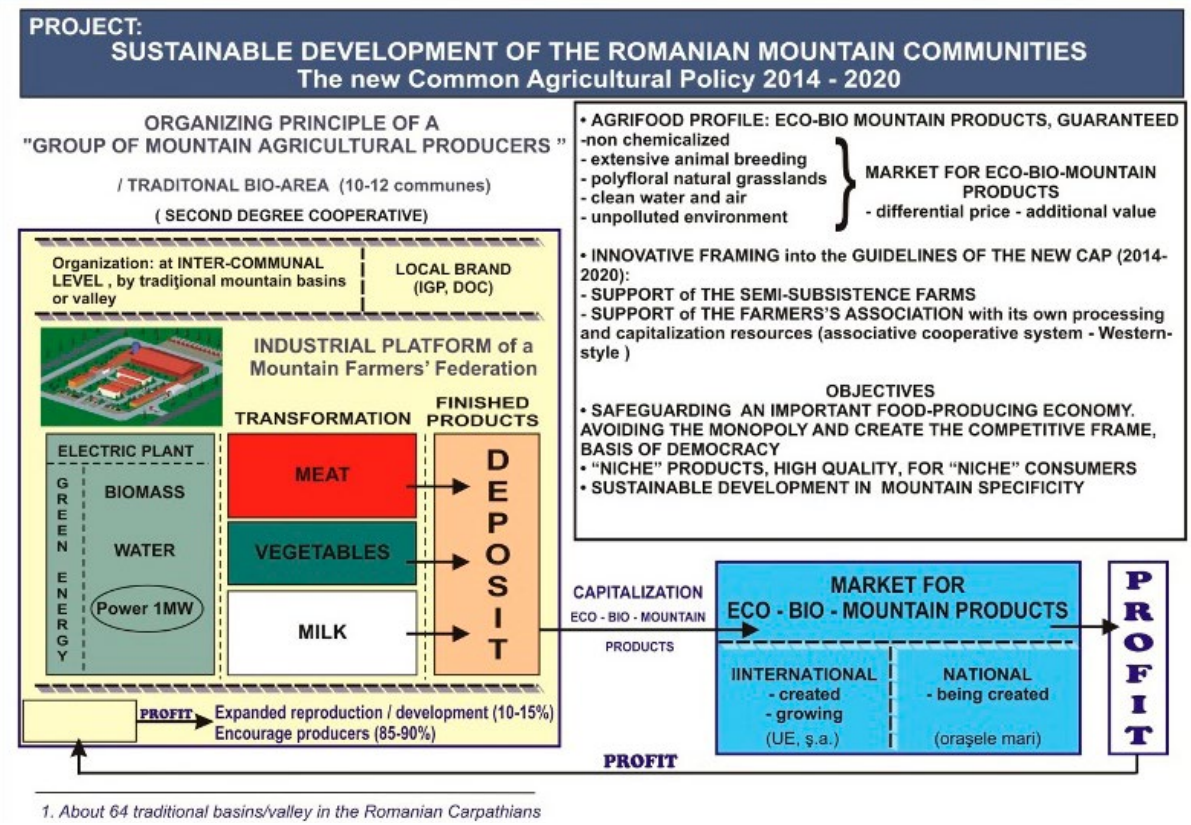

Figure 1. *The schematic model of sustainable development of local mountain communities, based on a "mountain product" and associative-cooperative organization, at the level of marketing.*

2 *According to the European Commission Delegated Regulation no. 665/2014*

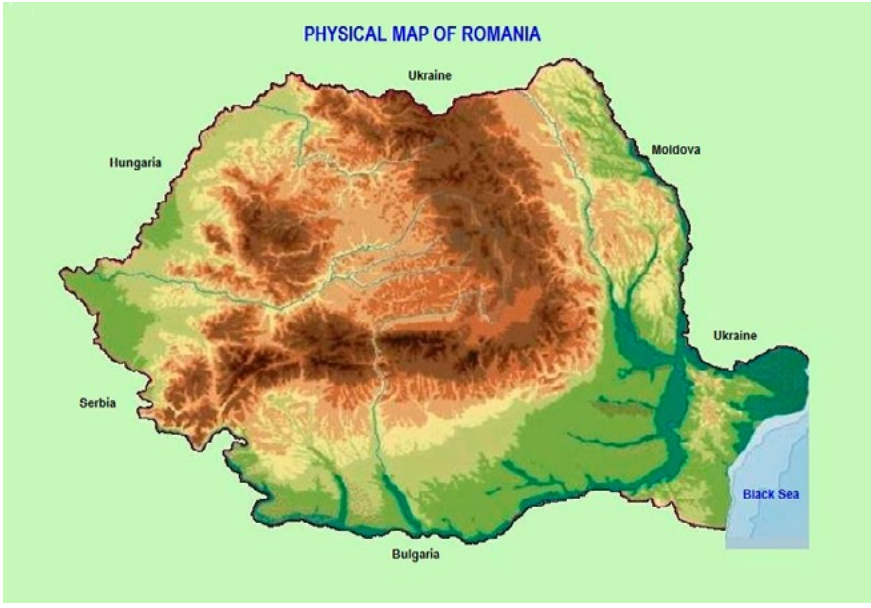

Figure 2. *Map of the Romanian Mountain Area*

CONCLUSIONS

1. The family farms organized in an associative – cooperative system (at the level of marketing) may become the guarantor of economic and social safeguarding of mountain areas. This can be done by the model of sustainable development of mountain areas, with agri-food production capacity, with ecological and biological qualities, with high nutritional density, based on the associative-cooperative system specific to the axis "polyflora of mountain area" – "family farm" - high quality "mountain product".

2. The model of mountain development is technically viewed as a mountain module like a territorial "bioreactor" (analysis of raw materials, processed products and wastes) so that the newly acquired modular system structure to be quantified biologically, technically and economically.

3. The model of mountain development is viewed from a management point of view as a cooperative system, which is the only one able to ensure the return of profit to the producers - bringing profit to mountain villages, through the absence of intermediaries and through "value added" - given by quality and higher sale prices on the domestic market, the EU market or third-party markets.

4. The basic qualities of mountain agri-food products with regard to the organic and biological characteristics, serving as guidelines for the model proposed for establishment of mountain agri-modules of ecological zone type. The management of the bio-areas shall be based on an associative-cooperative system, with the organization of cooperatives of producers, both at communes level (especially for collecting milk, meat, berries and so on.) and inter-communes level, by "traditional bio-areas", in an industrial organisation (dairy, meat, vegetables) able to provide value added for the final "mountain products".

5. The result of this model is to promote on the market the "mountain agri-food" with its excellent qualities and the creation of mountain brands. When it comes to quality, the mountains have a chance, the big agriculture not being able to reach the level of quality provided by mountain products, a quality generated entirely by elements specific to mountains: forage polyflora of grasslands and hayfields, with a mosaic of minerals, vitamins and the intake of many medicinal herbs; water and air - unpolluted; an extensive animal breeding system.

6. The countries with mountains from South-Eastern Europe can jointly support the "mountain product" that can become a "magical" solution to safeguard the mountain areas - based on the use of "best traditional practices", renewable energies and based on a friendly relationship with the mountain environment. As the food products are essentially "eco / bio", they can generate a model comprising Romania and Bulgaria and which can also include Greece to the south or the countries of the Carpathian chain to the northwest, so to be able to achieve a Charter of Cooperation of the Eastern European Mountain Agri-Food Sector.

Note: On the occasion of the eleventh "National Conference of the Romanian Mountain Forum" (FMR), dedicated to the celebration of the "International Mountains Day" - 2014 (UN), with the subject of the International Mountain Partnership (Secretariat at FAO-Rome), "Mountain agriculture - family agriculture", at the "Gheorghe Ionescu Sisesti" Academy of Agricultural and Forestry Sciences - Bucharest, we have launched the concept of "mountain product", accompanied by an exhibition of "mountain goodies", performed by five regional branches of FMR. In this environment we also publicly released the "Magazine of mountain issues" No. 1 and 2 of the new "Centre for mountain economy – CEMONT", from Vatra Dornei, specialized on scientific research (Romanian Academy / CEI).

Basic factors - for "mountain product"
(Romanian Carpathians, original photos, R. REY)

Figure 3. *Natural polyfloral hayfield - mountain Eastern Carpathians*

Figure 4. *Biodiversity. Clean mountain environment*

Figure 5. *Degraded mountain meadow – in the absence (15 years) of organic fertilizers*

Figure 6. *Sheep*

Figure 7. *Cattle*

Figure 8. *Stables, Traditional System - old*

Figure 9. *Modern stable – „Dorna" basin*

Figure 10. *Upgraded sheepfold (hygiene, comfort – small-scale tourism) Farcasa commune, Neamt county (2013)*

Quality of hay

Figure 11. *Traditional system (haystack)*

Figure 12. *Recommended system (hay barns)*

Figure 13. *Apiary*

"Mountain products" (2014)









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INNOVATION AND TOURISM – GETTING SUSTAINABILITY TROUGH GOOD PRACTICES

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ABSTRACT

Sustainable tourism is a complex mix of many elements. These elements have ecological, social, cultural and economic dimensions which together presuppose sustainability. Assuming that E*cological sustainability* means that tourism development does not cause irreversible changes in a given destination's ecosystem, *Social sustainability* refers to the ability of a community to absorb tourism without the creation of social disharmony, *Cultural sustainability* assumes that a given community is able to retain or adapt their own distinctive cultural traits against the pressure of both the so-called "tourist culture" and the "residual culture" of the visitors (Jafari, J. 1987), *Economic sustainability* refers to a level of economic gain from tourism that is sufficient to provide an appropriate income for the local community and to cover all the costs of any special measure taken to satisfy the tourists, then no destination could not achieve sustainability without being competitive.

Considering the mentioned characteristics, this paper aims to explore and establish those conditions where excellent competitiveness and sustainability indicators have been observed. The centre of attention is concentrating on the mountainous district of the Rila and Pirin mountains in Bulgaria. An attempt was made to derive guidelines for the development of sustainable and cost-effective innovative practices, pushing the country beyond the perceived status of a 'cheap' destination. The methodological tool includes the methods of observation, analysis and synthesis of parallel observations on the state. All together corresponding to the author's position that sustainable tourism must ensure tourists' needs, as well as the needs of the local community and the preservation of local resources. Achieving as a result balanced destination development with fair share of the economic benefits from tourism for all stakeholders.

Keywords: *sustainable tourism, innovation, competitiveness, economic benefits*

INTRODUCTION

Nowadays, some European countries gain their significant tourism boom due to their evidential sustainable potential. At the same time, sustainable tourism practices are responsible for the environment in which they operate. The example of France, Switzerland, Spain and England shows an enormous tourist interest, provoked by sustainable tourism product. In the same time, the environment's pace of change accelerates all over Europe whereby the effects that they endure are significantly distinguishable. The process is common in most industrialized countries and it has been accompanied by significant economic, social and political changes. In regards to that, the research work and the collected experience has made clear the necessity of restriction through the development of sustainable tourism practices, as well as of guidelines for the development of sustainable and cost-effective innovative practices.

We put the focus on Bulgaria as a tourism developing country with experience in sustainable tourism in the villages in the South-West region, the Black see region, the Rhodope mountain region and the Central Balkan region. Furthermore, pointing at those practices that provide a trend that increases community's wealth through stimulating longer tourist stay and additional consumption extra high quality services. The referred activities do not harm the environment neither influence local community's values. Considering that, the paper aims to observe and establish the given conditions of competitiveness and sustainability indicators. As evidence, we provide few examples from South-West Bulgaria and the mountainous district of the Rila and Pirin mountains.

DATA AND METHODS - OUTLINING THE GLOBAL FRAMES

The scope of the current research requires usage of diverse methods. Regarding to that, the methodological frame includes the methods of observation, analysis and synthesis of parallel conditions monitoring. Altogether, corresponding to the authors' position that sustainable tourism must satisfy touristic needs, as well as the needs of local community and preserve local resources in the meantime, achieving a result of balanced destination development with a fair share of increasing the economic profit from tourism for all stakeholders.

A look into the global picture of tourism practice reveals many examples of potential conflict between tourism

development projects and the desire to protect and preserve from violation locations, possessing picturesque landscape, as tangible and intangible heritage or habitats and areas of distribution of rare plant and animal species. The implementation of traditional tourist activities leads to a complete change in the landscape, endangers wildlife, harms the flora, and cultural monuments. Effects from tourism have been established as highly utilized by industry areas and in locations with a less developed tourism sphere. This results mainly due to the fact that tourism brings customers in locations designated as tourist destinations and simultaneously submits accompanying elements that potential tourists are accustomed to in everyday life. Negative changes stem from the established need for facilitated recreational time, even when it is organized in nature.

Deepening on the provoked issues, we witness active research by experts from national and international tourism organizations and research institutes (Marinov, 1999; Vodenska, 2002; Stankova, 2004 and others.). The World Tourism Organization specialists' attention is also drawn in this direction, observing five situational changes which have occurred as a result of tourism activities, dating far back to 1993 (Ryan, 1996). The emphasis is on observed changes of environmental performance in areas where the environment in time before tourism development was relatively well preserved. Special attention is paid to situations of negative change provoked by speculative pressure, "takeover" of territories and practices of tourism as a result of which occurs irreversible component of environmental processes. Situations, where the carrying capacity of destinations was exceeded are also identified as problematic and provoke parallel decrease in the quality of the environment. All together, they are logically related with the harmful effects inflicted by tourism on traditional values, morals and culture of local communities and provoked social tensions and conflicts.

Contrary to the negative trends stands the notion of sustainable development. Its implementation in tourism leads to positive changes with multiple effects. They have ecological, social, cultural and economic dimensions which together presuppose sustainability. Assuming that E*cological sustainability* means that tourism development does not cause irreversible changes in a given destination's ecosystem, *Social sustainability* refers to the ability of a community to absorb tourism without the creation of social disharmony, *Cultural sustainability* assumes that a given community is able to retain or adapt their own distinctive cultural traits against the pressure of both the so-called "tourist culture" and the "residual culture" of the visitors (Jafari, J. 1987), *Economic sustainability* refers to a level of economic gain from tourism that is sufficient to provide appropriate income for the local community and to cover all the costs of any special measure taken to satisfy the tourists, then no destination could not achieve sustainability without being competitive.

In search of those effects' manifestations numerous examples are established. Therefore, a comprehensive representation is difficult and even impossible in a limited volume. Therefore, the current paper explores primarily on the economic dimensions and some specific innovative practices in two Bulgarian winter resorts, situated in the Rila and Pirin mountains.

RESEARCH FINDINGS AND DISCUSSION

Contemporary trends in tourism are associated with the use of innovative technologies and products. One can find its application in all aspects of tourist services and supply. The possibility of global informational access combined with faster communication from anywhere in the world determines innovative technologies implementation in the field of tourism. From this perspective it can be claimed that modern travellers motivate their travel. Based on the accessibility and using of the latest achievements of innovative technologies implemented in the tourist industry. Now is the time to highlight the fact that this is innovative services and its results are the basis for the establishment of good practices in the area. This in turn leads to the formation of the sustainability of tourism demand and consumption.

For the purposes of this study two hotels were examined - the ***"Kempinski Hotel Grand Arena",*** situated in Bansko and the ***"Festa Winter Palace"***, located in Borovets.

"Kempinski Hotel Grand Arena" is one of the few five star hotels in Bansko - one of the most famous winter tourist centres on the Balkan Peninsula. The complex is a symbol of luxury, high quality service levels and elegant atmosphere combined with the supply of the latest achievements in the field of spa and wellness services in Bulgaria. Lastly, we ought to pay attention to the fact that the hotel introduces the latest innovative developments in the field of tourist services, transforming them to the needs of its customers.

Firstly, we can draw your attention to the fact that the hotel offers 157 rooms and suites decorated in alpine style (combination of wood and light colours) to create a cosy atmosphere. The rooms are equipped in contemporary mixture providing access to the latest developments in communication technologies. The hotel also offers an innovative service, associated with the so-called "executive" level that has direct access to the Sunset Spa and Wellness centre. Significant extra is the availability of separate rest area in all apartments, which is a purely innovative approach for the typical tourism offered in the resort.

Regarding the customer service, "Kempinski Hotel Grand Arena" pays considerable attention to the introduction of innovative products and services catering in the complex. The guests are offered themed buffets with a variety of foods from various cuisines. The objective of this innovative product is recreating specific feelings aiming at tourist's experiences encasement. Typical examples are traditional Japanese cuisine at the Sushi Bar, Teppanyaki Grill and Mediterranean delicacies offered in the refined restaurant "Come Prima". Another innovative service offered by the hotel is the availability of a professional concierge who organizes events and has as a priority the sufficient customer's service.

The innovations in the complex are implemented everywhere, the most of them can be observed in the signature and unique SPA. "Sunset SPA and Wellness Centre" provides selected tailored spa therapies. The SPA centre offers a variety of traditional and exotic massages. The "Sunset SPA and Wellness Centre" is also the only one in Bulgaria, offering products of "Ligne St Barth". Exclusively, the spa centre offers indoor and outdoor pools, indoor and outdoor Jacuzzi, an outdoor tennis court, 2 bathrooms type steam Hammam and an Aroma steam bath, 2 saunas, Finnish and bio sauna, a fitness centre, a

solarium and a unique snow room. Here is the only Alpha Sphere (multi-sensory experience that includes sound, light, heat and movement) in Bulgaria.

In addition, considering the innovative service implementation "Kempinski Hotel Grand Arena" is committed to continuous optimization. The enterprise obtains its high operational standard by constant observation on the latest and innovative achievements in tourism industry field and their timely supply. Thus the resort aims its long-term positioning on the market in the country as one of the leading tourist companies.

It's worth mentioning, that the company's innovation policy is aiming to attract customers, sustaining in the meantime relatively sustainable operations. Here is to be mentioned that Kempinski Hotels is Europe's oldest luxury hotel group, created in 1897. Inquiry on the corporate site shows that Kempinski's rich heritage of impeccable personal service and superb hospitality is complemented by the exclusivity and individuality of its properties (http://www.kempinski.com). Kempinski's portfolio comprises of 75 five-star hotels in 30 countries, each one reflecting the strength and success of the Kempinski brand without losing sight of its heritage. The portfolio includes historic landmark properties, award-winning urban lifestyle hotels, outstanding resorts, and prestigious residences. Each one imbues the quality guests have come to expect from Kempinski while embracing the cultural traditions of its location. In such conditions, innovation and tradition are combined in a successful sustainable development policy of the group, achieving recognition for it and numerous awards by the chain's hotels.

For the exclusive level of supply especially indicative is the testimony of the guests. In "Trip Advisor" can be found quite compelling comments about "Kempinski Hotel Grand Arena" in Bansko. For example, we provide a guest review: *„All started with receiving a good offer by the hotel marketing team for corporate clients. The summer image of the hotel was one of the catchy things in the offer, along with the stylishly written list of pleasures one can enjoy. We never associated Bansko with summer; however we decided to give it a try. Arriving late, our first impression of the very initial interaction with the hotel staff was impressive. We felt like 2 happy children. We left the car to be parked and were directed to the discreet reception (one of the things I have noticed and was impressed by was the fact that the reception is located intentionally at the back, to be discreet, warm and helpful in introducing you to the incredible spirit and style this hotel brings in a very tranquil and pleasant tone). Then the big surprise came, an approximately 40 square meters room in a warm village design with an incredible flower full terrace with a view to the mountain and the swimming pools. Next to the bed were left feet towels and slippers. Then the fruit basket was detailed which made me feel very welcomed. A personal note from the housekeeper followed with my name on it, wishing us a nice stay and letting us know that he'll be at our services. The best surprise was the good night poem on my night drawer!!! I fell asleep with a smile. On the next day we started with breakfast, once again impressed by the quality service provided by the representative staff. Then we were directed to the spa. We loved that it was with clean, warm water, all facilities were working properly which to me is a proof that the hotel staff complies with the 5star commitment. We were charmed by the snow room and the hammam, also by both the Jacuzzis and the pool. We experienced a feeling of warmth, politeness and detail orientation which were enough for the two of us to come back again the very next weekend and share this experience with close friends. Thanks to the management for keeping the high standard and commitment to the values. We will be happy to be your guests again, and I wish you to create this emotion to all your guests. Regards"*

It is obvious that the hotel manages to satisfy customer requirements not only during the popular winter season but respectively as well all the year round. Of course, the "Kempinski Hotel Grand Arena" in Bansko should further consider the implementation of the innovative approaches in Demand management, Destination management and site management in order to develop its sustainable operations. The result will be effective resort promotion thus encourage prolonging of the guests' stay. Our proposed recommendations shift the focus on promoting the company and Bansko as a sustainable destination and utilizing innovative tools marketing them to a diverse target markets. Combined, the listed approaches allow us to embolden community and guest participation in Bansko promotion, which installs pride and interest in tourism development among residents as well, thus creating prerequisites for awareness of the protection and preservation of local environment and culture.

"Festa Winter Palace" is one of the three five-star hotels located in the second most popular winter tourism centre in Bulgaria. The hotel is deservedly known as the "pearl" of Borovets. Being a boutique hotel, it is a symbol of sophistication in service, luxurious surroundings, combined with warm and cosy atmosphere. The unique hotel spa and wellness centre contributes for the sense of unsurpassed luxury atmosphere. Moreover, the hotel implements the latest innovative developments in the field of tourism services, transforming them and intentionally applying them for quest service improvement.

The complex has 24 rooms, 19 deluxe rooms, 11 junior suites and 12 luxury suites, 2 of which are Penthouses. All rooms are luxuriously furnished with king or queen beds, Renaissance style furniture combined with decorations in gold and blue creating the feeling of prestige and comfort. In addition, we can mention that all rooms have balconies overlooking the mountainous landscape. It is facilitated with the latest developments in communication technologies. The unique location of the hotel enhances its ability to offer extremely fast and comfortable use of all winter facilities. Contributing to the exclusive service of all winter sports fans the hotel makes itself a preferred choice.

In regards to the customer service, "Festa Winter Palace" pays considerable attention to the implementation of innovative catering, product and service amenities in the complex. The guests are offered themed buffets with food from different world regions. The objective of this innovative product placement is the establishment of a specific perception in tourists about the experiences provided by the hotel. Typical examples are the "gourmet" restaurant, and "BG" restaurant, famous for their homemade Bulgarian traditional cuisine supplement. The innovations in the complex are embedded everywhere and the SPA centre makes no exception. "Festa Winter Palace" offers to its guest an indoor pool, gym, sauna, steam bath. Original Russian bath in combination with contrast showers is just one of the innovative services at the hotel. The centre uses tailored SPA treatments, such as whirlpool bath, massages and body treatments, beauty salon and facial treatments.

Furthermore, it offers a variety of traditional and exotic massages. In the SPA and wellness area tourists can indulge to an innovative product - "Spa Capsule". All this is aimed to enhance and add value to the tourist experience provided.

Last, but not least, the advanced tourist service of "Festa Winter Palace" is bound to continuous optimization of the guests' recreational experience within the complex. The high standards of the hotel are maintained with constant observance on the latest and innovative achievements in the field of the tourism industry. Thus the complex aims its long-term positioning on the tourism market in the country as one of the leading luxurious destinations.

As it is apparent from the words of its CEO, "Festa Winter Palace" has participated in the prestigious international exhibition "Meeting Luxury": *I am pleased that our participation in the prestigious international exhibition "Meeting Luxury" has represented Bulgaria in the best possible way and has made a step towards overcoming the cliché as a "cheap destination". We have demonstrated that Bulgaria has much more to offer but just low service prices. Bulgaria can successfully implement its authentic cultural and historical heritage and unique natural resources in an attractive sustainable tourism product. And the "Festa Winter Palace" award manifested that the oldest country among the existing European countries – Bulgaria can provide a quality luxury tourist product."*[1] *(www.money.bg)*

"Festa Winter Palace" is one of hotels in Bulgaria which adds a new perspective to the tourism offering. Targeting at elite tourism segment, they are transforming Bulgaria's unique and diverse natural and cultural heritage into the main pull-factor in the tourism supply framework. As a result, they offer a high quality service at a relatively high cost, which corresponds to tourists higher purchasing expectations. According to the hotel marketing specialists, the targeted tourists are highly educated and very much involved in environmental conservation and balanced sustainable development.

Considering all the above, it can be noted that the experience of "Kempinski Hotel Grand Arena" and "Festa Winter Palace" is an innovative enclosure within the sustainable tourism practices. Of course, Bulgarian tourism, and especially the big hotels should make further efforts in order to examine and apply successful innovative and sustainable development approaches.

CONCLUSION

Evidently, in order to ensure the regions' sustainable economic development it is of vital importance to sustain the environmental cultural heritage attractions. Tourism and environment are interdependent if we take into consideration that tourism development is the major beneficiary from this long-term relationship. In our opinion, all tourism destination stakeholders ought to consider and implement operations increasing environmental awareness manifesting its protection and sustainability thus ensuring the introduction of tourism activities practices.

For Bulgaria, as a tourism destination, it is crucial to manage the negatives resulting from tourism development. What is more, tourism enterprises (as main tourist service providers) experience and efforts can be considered significant and directing in this regard. Promotion of best practices is important, as well as the establishment of successful partnerships with tour operators and additional tourist service providers, especially when their efforts are directed to simultaneous satisfaction of the tourists and local community needs, of environment protection and preservation at the same time. Embracing a wrong planning and development approach towards sustainable tourism can lead to jeopardizing the inherited environmental status and tourist resources. While meeting the new requirements concerning tourism products it is inevitable and it is part of the change needed to maintain the vitality of the tourism industry. In this context, any development through differentiation, diversification and innovation or elitism must be subordinated to the idea of sustainability, maintenance and enhancement of the quality of the tourism products within the surrounding environment.

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ROLE OF TOURISM IN THE SUSTAINABLE DEVELOPMENT OF MOUNTAIN REGIONS IN GEORGIA

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ABSTRACT

The article is dedicated to the importance of sustainable development of mountain regions and in this respect to demonstrate a wide variety of possibilities of tourism development (of the resources in the example of Georgia).

Given the fact, that the interest in mountain areas of international and domestic tourists is quite high, the right development of tourism in the mountainous regions stipulates the economic development, as this will be clearly seen in the article.

The mountain sides are situated in different regions of the country, as shown below, and that is why their sustainable development is important for the development of these country regions, and also in the field of poverty reduction and prevention. It is important for Small and Medium Enterprise development, too, which is a recurring theme of the United Nations Assembly. The article highlights also the benefits of regional development programs.

It is demonstrated how the mountain regions are distinguished, due to their geographical specifics, with diverse tourism resources: Natural Resources (in the form of Eco Systems, Wildlife, Protected Areas and Preserves), Cultural Resources (in the form of a variety of cultural heritage, including the sites protected by UNSCO), resort SPA resources and mountain skiing opportunities.

The article shows how important the increasing awareness is this direction is for the development of the country and for supporting European Integration.

INTRODUCTION

Georgia is located on the European continent, in the extreme south – east part, at the crossroads of Western Asia and Eastern Europe.

It is known that tropical and temperate climate zones go along the border between the watersheds of the Caucasus mountain range, which is why Georgia is located in the subtropical climate zone in the far northeast.

Almost all types of subtropical zone climates are formed in Georgia - damp subtropical, moderately damp, moderately dry and dry-continental.

This stems from the tropical and temperate climate zones on the border of the natural barriers - Caucasus and the Southern Highlands and the influence of the Black Sea.

Today, in the period of global warmth, the whole world strives to maintain mountain vitality by practicing mountain sustainability policy.

In Georgia, at the end of the nineteenth century, in the modern stage of development of society, the issue of development of the mountain regions became very important. This was closely related to economic, ecological and social problems. It became very obvious that the mountain regions legged behind the plain. There were numerous reasons; especially the inadequate policy, that had caused certain difficulties for these regions. The country in general exercised social, economic and ecological unified vision and policy, where the specificity of the mountains was not taken into account. In addition, there were losses from natural disasters, living in mountain regions had become unbearable, and the demographic situation escalated.

Consequently, different policy was implemented for the mountain regions, not only because mountains are the most beautiful parts of our country but mainly because the mountain regions offer opportunities and potential of vital significance. The mountains contain enormous water supply (in the form of glaciers). There is plenty of water, vast grassland spaces, forest areas, ecologically clean food products, ores and mineral waters, all the conditions required for the development of tourism and recreational facilities, in short, all that people need for survival.

Considering the Alpine convention, the Law on Social-Economic and Cultural Development of Mountain Regions was adopted in 1999 in Georgia. The aim of the law was the social-economic development of the mountainous regions to be ensured providing suspension of the natural migration of residents, revival of the abandoned and semi- abandoned villages and communities, rational use of the local resources, development of industry, employment, attracting investments, keeping safe the unique landscapes and ecosystems and their protection from harmful exposure, putting into order road construction, rational use of the natural resources, design and construction of industrial facilities, improvement of the living conditions for the residents of the mountainous regions.

The law set as tasks: development prospects of mountain tourism, development of traditional local crafts, development of small and medium businesses and industry, development of agricultural production, various tax benefits, providing before school, basic and secondary education, economic stimulation of large families, free health care services, etc. Unfortunately the law was not implemented completely, however in recent years a variety of important projects in mountainous regions have been implemented. Today, active work is going on for effective legislative regulation of sustainable development in mountain regions with an aim, at least, preventing of migration, the deficit in drinkable water, the decrease of biodiversity in the recreational areas, also maximal fostering, use of those opportunities and potential that mountainous regions can bring to mountainous regions and to the economy of the country as a whole. Apart from that, it is important that each country should implement also a policy of its own in this direction contributing for the ecological prosperity of the planet

in general and support the coexistence and friendship between the nations.

I think that tourism is the best way for sustainable development of mountainous areas by defining a correct policy. In this regard the mountainous regions of Georgia also have numerous resources. Tourism is one of the important ways of economic, ecological and social stability of the mountainous regions. When we talk about the tourism resources of the mountainous regions of Georgia, we have in view nature reserves, protected areas, a variety of eco-systems, natural sites, heritage sites, UNESCO protected areas, SPA resorts and ski resorts, i.e. almost everything that is of interest for tourists traveling to Georgia.

The law of Georgia on social-economic and cultural development of mountainous areas defines that according to hypsometric data high mountainous areas are considered to be residential areas situated at 1500 meters above sea level and higher, but considering other various parameters (mountain slopes and plain slopes inclinations, natural environment, ethnographic and economical features, scarcity of agricultural land, demographic capacity, exacerbated migration processes, risk of losing empty areas from economic perspective) the lowest limit decreases to 1000 meters above sea level for the areas on the south slope of the Caucasus mountains and in the mountains of Adjara-Guria (in exceptional cases to 800 meters above sea level), while in the mountainous areas of South Georgia it remains 1500 meters above sea level.

RESEARCH FINDINGS

According to a desk research, Georgia covers a territory of 69,700 square kilometres (26,911 sq. mi). And, if we consider the requirements stated above, minimum ca. 60% of the territory of Georgia is covered by mountain regions, i.e. a total area of about 42000 square meters.

There are 14 state reserves, 10 national parks, 4 natural monuments, 18 managed reserves, 2 protected landscapes and 6 planned protected areas in Georgia.

6 state reserves and 6 national parks in mountainous regions are located at an altitude of 1000 meters above sea level on a total area of approximately 535,750 hectares.

State Reserves:

1. The Batsara State Nature reserve is located at an altitude of 700-2,000 meters above sea level. It covers an area of 270 ha.
2. The Borjomi – Kharagauli National Park is located at an altitude of 400-2642 meters above sea level. The total area is 85,083 ha, which is more than 1% of the territory of Georgia.
3. he Tusheti Nature Reserve is located at an altitude of 1650-4493 meters above sea level and the total area amounts to 896 square meters.
4. The Kintrishi Protected Areas are located in the Adjara Autonomous Republic (the Kobuleti Municipality) covering a total area of 13,893 ha. It is located at an altitude of 300-2,500 meters above sea level.
5. The Lagodekhi State Reserve is located at an altitude of 590-3500 meters above sea level on a total area of 19749 ha.
6. The Ritsa Reserve covers a total area of 13.893 ha at an altitude of 928 meters above sea level.

National Parks:

1. The Algeti National Park is located at an altitude of 1,100-1,950 m above sea level. It covers a total area of 6.822 ha.
2. The Borjomi – Kharagauli National Park is located at an altitude of 400-2642 meters above sea level. The total area amounts to 85,083 ha, which is more than 1% of the territory of Georgia.
3. The Tusheti Nature Reserve is located at an altitude of 1650-4493 meters above sea level and the total area amounts to 896 square meters.
4. The Kazbegi National Park - Kazbegi NP total area is 9.030 ha. It is located at an altitude of 1,400meters above sea level.
5. The Javakheti Nationl Park. The highest point of Javakheti is Mount Great Abuli with a height of 3,300 meters above sea level. The Javakheti upland is the coldest place with settlements. It is characterized by dry continental climate, while the average annual temperature is quite low. In winter the Javakheti lakes freeze for a long time. Its total area amounts to 14,200 ha.
6. The Mtirala National Park, covering a total area of 15698.8 ha. It is located at an altitude of 1.381 meters above sea level.

Currently in Georgia there are 103 resorts and 182 resort places. Of these resorts 30 resorts and 71 resort zones are located in mountain regions.

The most famous mineral water resorts Borjomi and Sairme which are quite popular in the world are located in the mountain areas.

A resource of particular importance for the mountainous regions are the ski resorts, accordingly Georgia's ski resorts Gudauri, Bakuriani, and the ski resorts of Goderdzi and Svaneti.

On the World Heritage List of Monuments in Georgia the highest settlement area in Europe Svaneti is particularly distinctive. The entire mountainous region is a UNESCO world heritage site.

In the list of UNESCO cultural heritage is the world's fifth best trail known Mta-Tusheti.

Also Pirikita Khevsureti is considered in the list of UNESCO, and Mutso and Shatili which are known as village-museums.

According to the World Travel and Tourism Council estimates for 2013, the sector's direct contribution to whole GDP as a whole amounted to 2.2 trillion dollars (2.9% of the GDP) and promoted 101 million jobs.

A comparison of the growth rates for the last five years shows that the international revenues in Georgia have grown

faster than in the rest of the world.

As for the remaining tourist objects, due to the fact that more than half of the territory of Georgia is covered by mountains, accordingly more than half of the tourist facilities are located in a mountainous region.

Given the fact that Georgia is a small country, the majority of tourists still come to mountainous regions. The statistics apply to all figures and the growth of the mountainous areas and therefore we can say that:

In recent years in Georgia there has been a significant increase in the number of international entries. In 2013 their number in the mountainous regions reached 2,500,000 (an increase of 22%). The highest growth rate was observed in 2012 (an increase of 57%).

According to the report of the World Tourism Organization "UNWTO World Tourism Barometer" (December, 2013), the amount of the international income in Georgia was recognized as the highest index in Europe. For example, in 2013 the income from foreign tourism in Georgia amounted to 1.72 billion dollars (an increase of 22%).

Foreign visitor's plural expenses have great impact on the balance of payment of Georgia. Approximately 58% of the revenues from service export come from Tourism. For the mountainous region 58% of the revenues from service export come from Tourism too.

The number of people employed in the tourism sector in the fourth quarter of 2013 amounted to 168.8 thousand. From them about 30% were in the mountainous regions.

Tourist infrastructure development is one of the priorities of the government. Across the country new information centres and infrastructure appear.

In recent years large-scale infrastructure projects implemented by the State have caused the increase of the tourists' motivation to visit the mountain regions. The offered diversity also gives opportunity to make choices. This can be seen taking for an example of one of the most popular resorts Gudauri. For the purpose of expansion of the resort territory, in 2011 started the construction of a new Gudauri. A Gondola Ski Lift on the area of New Gudauri was built. The construction of hotels and internal roads was also started. The ski runs were cleared from stones. Rehabilitation of 41 Buildings was carried out, feature lights were installed. In order the travel to Gudauri to be more comfortable, the road of Kobi-Gudauri was rehabilitated in 2013.

Near the Ski lifts electronic information displays were installed.

On the first ski tracks a snow making device was installed, which would provide Gudauri with permanent snow.

Nowadays, in Gudauri there are:

- *23 Hotels with 556 rooms and 1293 beds*
- *2 Apart hotels with 44 rooms and 118 beds*
- *6 Hostels with 21 rooms and 107 beds*
- *4 Family Hotels with 31 rooms and 33 beds*
- *7 Residential Estates with 1454 beds*
- *1 Cottage with 3 rooms and 5 beds.*

Nowadays, in Gudauri are offered 33 accommodations with 653 rooms and 3005 beds.

DISCUSSION

This is one of the lists where important infrastructure projects and investments were implemented. This is one of the best examples in the mountainous areas of our country of how natural resources are used as tourism resources, of how investments are attracted and infrastructural projects implemented through the use of tourism resources. All this stipulates hosting numerous tourists in these regions, which serves as a guarantee for the creation of new jobs, for providing support for the development of small and medium size businesses, for the return of residents to the villages and settlements, for ensuring their welfare and economic stability in general. And the existence of this kind of local tourist epicentres (Gudauri, Bakuriani, Ushguli, Borjomi, Kazbegi) stimulates turning various tourist resources in the surrounding areas into tourist products, stimulates the diversification of the tourist resources and tourist products. This is a sort of an irreversible process and chain that can be spread to all the mountainous areas stemming from the diverse natural and cultural resources. In this process of development it is important to take into account everything to support the ecosystems. This is when a long-term positive result is achieved.

CONCLUSIONS

Statistical figures show that the above-mentioned resources and sustainable development of mountain regions are important not only for our country, I think, but for the region and for Europe, too.

The interest in mountain regions both of the international and domestic tourists is quite high. Right development of tourism in the mountainous regions stipulates the economic development.

Given the fact that in mountainous regions the standard of living is relatively low, sustainable development is important for the regional development of the countries, for the development of small and medium enterprises and for poverty reduction in the regions. It is a recurring theme of the United Nations General Assembly.

On one hand, it is important to think of the contribution to sustainable development on the continent of Europe with clean, high tourism potential of cultural resources in mountainous regions, and on the other hand, it is important to create opportunities and a standard (in this case concerning the mountainous regions) that Georgia would be considered as one of the tourist destinations of the common European space.

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STUDY CONCERNING GASTRO TOURISM TYPOLOGY IN RELATION TO THE BIODIVERSITY OF NATURAL RESOURCES FROM THE ROMANIAN CARPATHIAN MOUNTAINS

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ABSTRACT

The paper analyses the food problem in the mountain zone of the Romanian Carpathians as a vital problem and, along with history, an important limitative element in relation to the quality of life of this habitat inhabitants. The life manner and style in relation to the existing biodiversity with the types of elements and culinary preparations is analysed, in order to find solutions to increase the mountain zone attractiveness. Subject to analysis are also the gastronomic types of the mountain zone that may be met at present in the Romanian Carpathians which combine modern gastronomy from agritourist boarding houses with ethno gastronomy and retro gastronomy influences, or even with specific forms of gastronomy in mountain climbing, as well as usual gastronomy of mountain local rural communities.

In the context of labour force migration from the mountain zone, together with climate changes, a strong bio-economic lack of balance is registered, and the study tries to find solutions the mountain zone attractiveness all over the habitat of the Romanian Carpathians to be increased through the capitalization of the (still existing) biodiversity used to produce high quality food that may be the basis for the development of professional gastro tourism. But the attractiveness is different on the various mountain massifs, inducing original models of mountain gastro-tourism attractiveness for every identified mountain zone.

Keywords: *agritourism, gastrotourism, mountain biodiversity, mountain massifs, the Romanian Carpathians*

INTRODUCTION

The mountain issue is more and more preoccupying, especially in the countries with large surfaces of high altitude. In this context it is known that over half of the Carpathian Mountains are to be found on Romania's territory. Here are still to be found „wild" habitats rich in forests and pastures (example 220.000 ha of virgin forest). The Romanian Carpathians shelter over half of the European big carnivores. With valuable genetic bases that the mountain has, Romania is maybe among the few countries in Europe that still own a biodiversity with such properties.

But unfortunately all these are in danger, as consequence to offence and defective management in many situations. That is why, concerning agri-food production, water quality, forestry, mountain ecosystems and biodiversity, there are many technical-scientific and managerial warnings on behalf of the Romanian scientists (Hera, 2013; Rey, 2014; Bogdan A.T. et al., 2014; Jelev and Jelev Viorica, 2014; Gruia, 2014 and others).

Biodiversity and, generally, natural resources are in danger, having important socio-economic repercussions for the mountain zone. More than that, under the context of labour force migration, together with climate changes, there is registered strong bio-economic lack of balance. Without entering into details, among the lack of balance elements with irreversible potential, we mention: - non-ecologic hydro-electric power stations (instead of only a reservoir, there are built adductions in pipelines on rivers that destroy the aquatic and shore biodiversity); - massive and uncontrolled deforestations; - poaching (including vulnerable species) and others.

In this context, the present study has as an *objective* to find solutions as to increase the mountain zone attractiveness over the whole habitat of the Romanian Carpathians by capitalizing the (still existing) biodiversity used to produce high quality food, that may be the base of gastro-tourism professional development.

The mountain and its people have the right to coexist. The sociologic system, the economic system and the one of the natural environment are interdependent (Hänsel, 1998). But the attractiveness is different on mountain massifs, that induces models of mountain original **gastronomic tourism** or **gastro-touristic** attractiveness, per mountain zones. The complexity of mountain life must be decoded for a possible coherent and sustainable development.

WORK METHOD

In order to analyse gastro-tourism in relation to biodiversity and territory products we apply an *eco-bio-geo-economic analysis* (Bogdan, A.T. şi col., 2014). Being a synthesis work methodology, it has the possibility to approach in a coherent and equilibrated manner the interconnections of the mountain zone complexity. On the other hand, it may sustain the idea of ecosystem and integronic modulation, completing the work method with taking into consideration the Ecoemergent Integronic Theory (Gruia,R, 2010) and the modulation concept (Gruia,R, 2010). There is analysed the multiple integration with the synchronic and syncretic dynamics, having synergic effects that induce emergence, which indicates the phenomenon of integronics of complex systems.

In the paper we are taking into consideration mountain ecosystems and Environment-Economic Systems (EES) specific to this habitat.

The approach method is completed with the systemisation and synthesis of the data that circumscribe a well parameterised and a parameterized **module** of a territory from an ecosystem, or of a habitat with several similar interconnected ecosystems.

In this approach, the work method may be applied to the analyses of the mountain massifs in their whole and, implicitly, to the concrete ***food - tourism*** relation, more precisely between the natural resources biodiversity of a given habitat and the gastronomic tourism specific to that territory.

RESULTS AND DISCUSSIONS

The eco-bio-geo-economic analyses makes also possible a structuring concerning gastro-tourism, i.e. in a field with extremely divers opinions, some of the pertinent, others fed by vanity or an exaggerated local patriotism. We consider that an element that may be an ordering landmark of this issue is the **mountain massif**.

The hypothesis from which we start is that the gastronomic specificity of each main mountain massif from the Romanian Carpathians, once defined and then identified concerning its specificity and originality, may constitute the starting bases towards culinary creativity and innovation. All these aiming to more and more differentiate mountain massifs from a gastronomic perspective, in the idea to increase the zone attractiveness.

It is known that a mountain massif is that relief unit formed of a group of mountains or hills, gathered around a peak (Ghinea, D., 2000). Without any pretension linked to geographic sciences, but from a **geo-gastronomic perspective,** we consider that the „macro-modulation" of the Romanian Carpathians in all of its three branches (The Oriental, Southern and Western Carpathians) renders evident 10 main habitats, with a certain culinary specific, based on biodiversity, on cultural diversity and on the products of the respective territory, all of these being in accordance with **10 main mountain massifs** (Figure1,2 și3), around which a specific gastro-tourism may be structured based on the secondary massifs of the zone. We are therefore speaking of a certain similitude of the food manner, of the zone biodiversity and of the mountain food specific to a certain habitat. A first step of structuring on mountain massifs would group their components as follows: 1.***The Rodna Massif***, with the components of the Oaș, Gutăi, Țibleș, Bârgău, Maramureș and Obcinele mountains; 2.***The Călimani Massif***, with the components of the Gurghiu, Harghita, Ciuc, Giurgeu and the afferent depressions with the mountain components; 3. ***The Ceahlău Massif***, with the components of the Bistrița, Stânișoara, Tarcău, Goșmanu, Nemira, Vrancea mountains; 4. ***The Ciucaș Massif*** with the components of the Penteleu, Siriul, Baiul, Bârsa, Perșani mountains, with the Brașov depression with the mountain components; 5. ***The Bucegi Massif***, with the components of the Piatra Craiului mountains, of the Prahova Valley and of the Curvature Sub Carpathians; 6. ***The Făgăraș Massif***, with the components of the Cozia, Frunți, Ghițu mountains, the Câmpulung Depression in the south and the Făgăraș Depression in the north with the mountain components; 7. ***The Parâng Massif,*** with the components of the Sureanu, Cindrel, Lotru mountains with the mountain components and part of the Getic Sub Carpathians; 8. ***The Retezat Massif***, with the components of the Tarcu, Vîlcan, Mehedinți, Cerna mountains, with afferent plateaus and depressions; 9. ***The Banatic Massif***, with the components of the Semenic, Anina, Dognecea, Locvei, Almăjul, Poiana Ruscă mountains with mountain components and afferent depressions; 10. ***The Bihor Massif***, with the components of the Plopiș, Meseș, Pădurea Craiului, Vlădeasa, Codru-Moma, Muntele Mare, Zarand, Metaliferi, Trascău mountains with the mountain components and the afferent depressions.

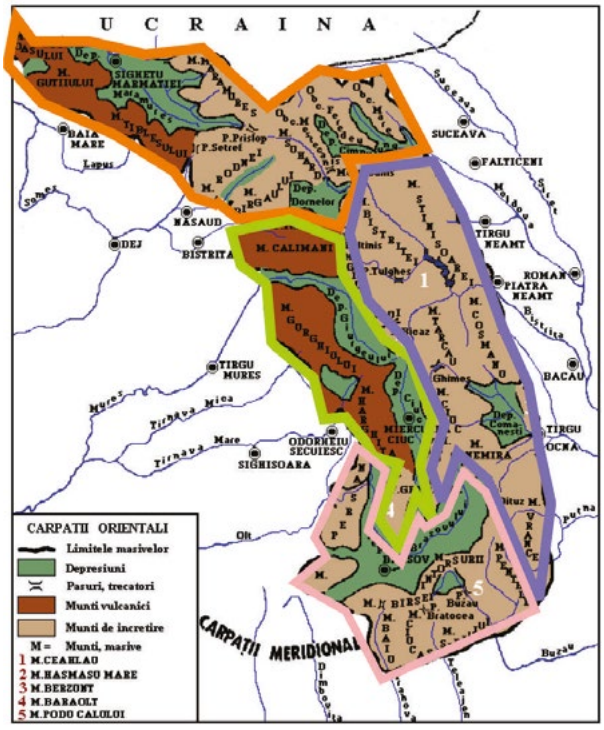

Figure 1. *The main mountain massifs from the Oriental Carpathians: I.- The Rodna Massif; II.- The Călimani Massif; III.- The Ceahlău Massif; IV.- The Ciucaș Massif; The marks (1),(2),(3),(4) and (5) are examples of „secondary" massifs*

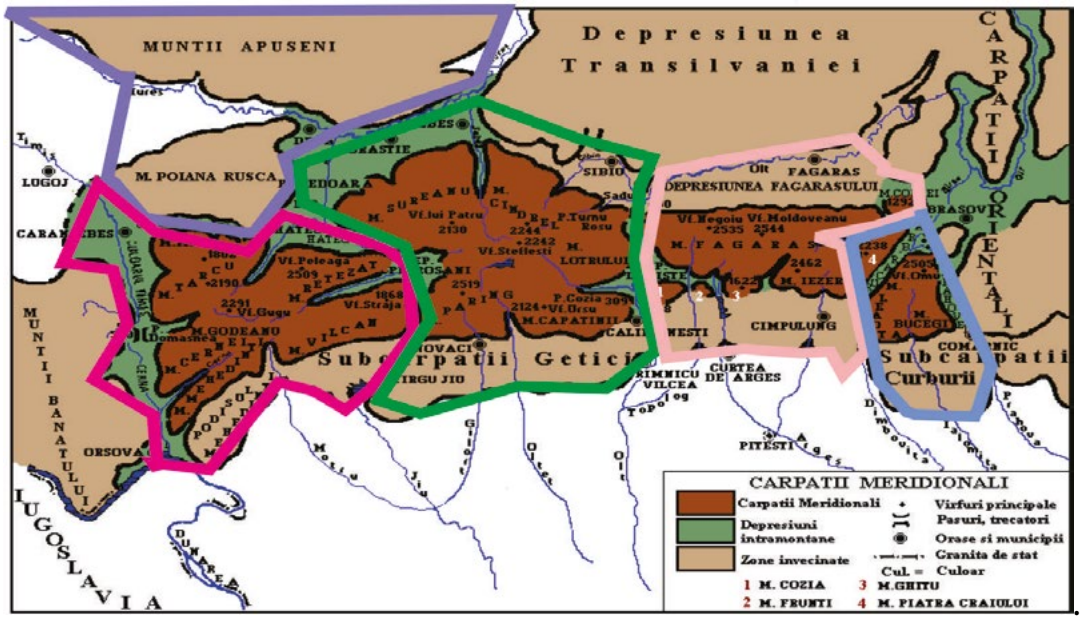

Figure2. *The main mountain massifs from the Meridional Carpathians: V.- The Bucegi Massif; VI.- The Făgăraș Massif; VII.- The Parâng Massif; VIII.- The Retezat Massif; The marks (1),(2),(3) and (4) are examples of „secondary" massifs.*

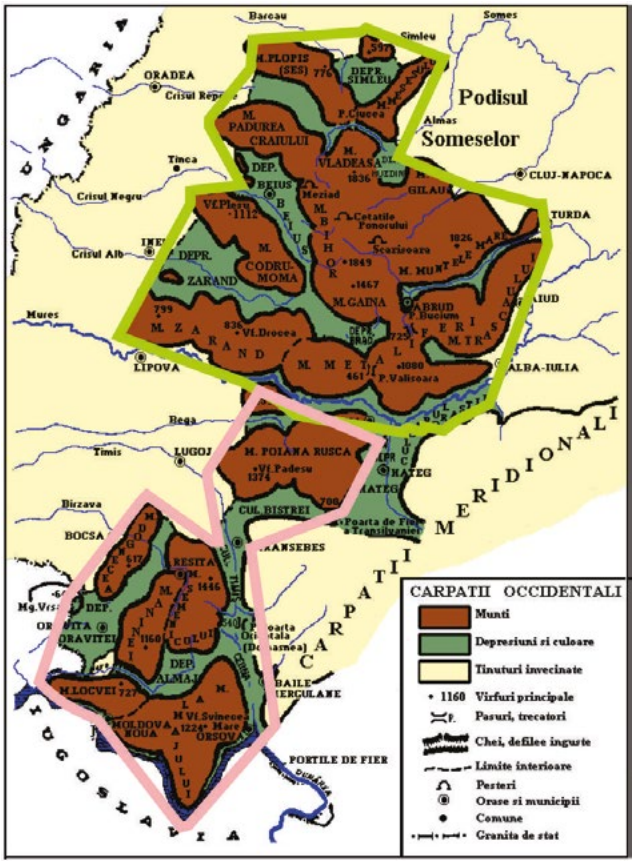

Figure3. *Mountain massifs from the Western Carpathians: IX.- The Banatic Massif; X.- The Bihor Massif.*

As common elements that must be improved in all the mountain massifs from the Romanian Carpathians there are aspects linked to the mobility infrastructure – terrestrial and airy in relation to the connectivity infrastructure. Also, from the perspective of the agro-food production, there are to be found, in all considered mountain modules, the same managerial forms of the economic units: (1). Subsistence household – where in fact the products are not marketed; (2). Family farm – that markets products (therefore performance and quality are imposed) and, consequently, incomes result, with the possibility of a level towards middle class and with the possibility to develop fragile zones, as the mountain ones are; it represents the source of mountain food products of the territory; (3). Agricultural enterprise – including integrated forms

(very performing ones, in this case especially on the quality principle), by applying certain intensively industrial systems and by regularly situating them in peri mountain and peri urban zones, especially in the depressions of the mountain massifs

Therefore we find a typological diversity of food products, which, at attentive analyses, put into evidence the specific and the originality in relation to the mountain massif. From here, the next step is the **capitalization through tourism** of these products, with accent on the culinary specificity of each mountain massif from the Romanian Carpathians.

As for tourism, especially with applications at mountain tourism, two main models are to be distinguished: *concentrated tourism* and *diffuse tourism* (5-e Biennale Européene de la Montagne, oct. 2013, Bresse, France), the characteristics of which we are shortly described in table 1.

MODELS OF MOUNTAIN TOURISM

Table 1.

The old model of CONCENTRATED TOURISM	The new model of DIFFUSE TOURISM
• concentrated tourism taking place in large integrated resorts, where the core of the mountain attractiveness is represented by strong resorts, with residential attractiveness and, respectively, attractiveness through original resources, specific to the territory (it is known by the phrase: „the territory makes the resort, or the resort makes the territory"?)	• diffuse tourism is characterized by diversified resorts with multiform practices on the identity of the cultural and natural heritage of the given territory, especially in function of the mountain massif; it is based on: biodiversity / cultural diversity / on the local socio-economic and administrative network / on inter communitarian projects / on models that differ in function of altitude /on adaptation in relation to seasonality / on development of infrastructure, especially air transportation (airports, zonal heliports); this model of tourism demands for a direction to the tourist villages, also to the mountain resorts.

It is certain that the application of these models is in relation to concrete situations of the given zone. In the present case, we mean the 10 mountain massifs from the Romanian Carpathians. Practically in every massif there is a specific mountain rural world, a local capitalization, but also the construction of a collective imaginary – new traditions, then new economic units with attractiveness potential etc. Economically, we speak about mountain agriculture revitalization for the future, this one having also as a result the coherent and qualitative construction of the ***mountain gastro tourism.***

BIODIVERSITY AND MOUNTAIN GASTRO TOURISM

More concretely, **biodiversity** means life variety correlated to the environment one. As it is known, including in the Carpathian Mountains (Schneeberger and Lange, 1998; Scharr, 2005; Brändli and Dowhanytsch, 2003) there are different levels of reporting ordered: - genetic (intra specific) diversity; - specific (or taxonomic) diversity; - ecologic diversity (it also includes, besides the previous concepts, the diversity of habitats and environment elements, sometimes specified as "ecosystem diversity"); - ethno-socio-cultural diversity (attribute of a human society integrated in the environment). The complex methodology of the eco-bio-geo-economic type makes possible a structural and functional analysis of the mountain massifs from the Romanian Carpathians, with the fixation of common elements and of specific ones.

In this context, although the relation between gastronomy and tourism is real, there are very few studies in the specialty literature that especially address gastronomy in relation to tourism. As stated by the specialist Long (1998), the term of „culinary tourism" represents the idea „to experiment other cultures through food and, implicitly, through wine". Literature defines *„culinaria"* and *„gastronomic tourism"* as a „trip to look for, to enjoy prepared food and drinks… and a unique and memorable gastronomic experience" (Gruia,R., 2012, etc.).

In tourism industry, the same way as the destination image, culture and gastronomy have more and more gained ground. In this context, one of the public nutrition functions at tourism destinations is to ensure the same experience and feelings the individuals think they should have when they travel. It has been lately observed that an even larger number of touristic destinations are frequented by tourists, including due to unique gastronomy that the habitat offers. There are destinations generally known as being *holidays, with culinary preparations and wine ones.*

Gastronomy has its origins in all big and classical civilizations. Nevertheless, in the context of hospitality and tourism, gastronomy represents in fact a new study area. The perceptive sensors play a major psychological part in appreciating culinary preparations. The consumption of culinary preparations and drinks, especially when dining in town, is an agreeable sensorial experience, if the pleasure element or „feel-good"- element as a result of the food consumption at a certain destination – is a marketing instrument that should not be underestimated. That is why it may be argued that tourists are interested in what they feel at a tourist destination and in what that destination offers, attentively selecting that special treatment and/or culinary preparations that may fulfil a desire, a personal appetite (Roman, 2001).

From gastronomic perspective, a cuisine with a certain specific along the Romanian Carpathian arch, but also towards its *outside,* or *inside* is observed. As a general observation, in the Romanian Carpathians **4 large culinary groups** are met: *„Moldavian"* mountain cuisine, *„Muntenian"* mountain cuisine, *„Transylvanian"* mountain cuisine and *„Banat"* mountain cuisine (Roman, 2001; Gruia, Bogdan, Rey, Tobă, 2014).

A more profound analysis reveals the fact that the territory specific, respectively biodiversity and local community traditions hallmark these large groups, resulting in a ***sub zoning***, which emphasizes culinary creativity and lays stress on local products from each mountain massif. This aspect represents the link element with mountain tourism (we are in fact speaking about gastro-tourism) and leads to the increase of the mountain zone attractiveness, which also induces the idea of alpine tourist tracks in the Carpathians (Kargel, 1976).

Thus appears a work hypothesis linked to the manner to put forward the ***mountain gastronomic specific in relation to***

the mountain massif. As for the Romanian Carpathians, this aspect may be achieved through the organization of **gastro-tourist tracks** at the level of every mountain massif (presented in figures 1, 2 and 3).

The gastronomic heritage of the mountain habitat, with its basic characteristics, is synthesized in table 2.

ELEMENTS OF GASTRO-TOURISM SPECIFICITY IN THE CARPATHIAN MOUNTAINS FROM ROMANIA

Table 2.

SPECIFICATION	DESCRIPTION
Directions of gastro-tourist development	• Mountain gastro tourism – fold tourism / mountain animal breeding tourism /mountain retro gastronomy tourism / mountain ethno gastronomy tourism / mountrain ethno pharmacology tourism / honey tourism / mountain haggard tourism and others
Social elements	• Mountain attractiveness as food direction, following the idea "from crotch to fork" : mountain agriculture and animal breeding /small food industry – innovation local products /mountain gastro-tourism = complex social impact (sustaining the youth / women's emancipation / association-cooperation-creation of a collaborative worlds / etc.
Education	• Professional formation on the line of public food and tourism / formation in jobs specific to the mountain and to the field etc.
Economic trend	• Mountain gastro-tourism – induces economic development /qualitative mountain feedstock / food products and preparations of the local territory
Mountain leisure	• Recreation – component of the Carpathian patrimonial identity / leisure forms specific to the mountain zone.
Drinks in the mountain zone	• Generally there is achieved the circuit of palinca / horinca / plum brandy from different fruit and, complementarily, (especially in the pre-mountain zone) – wine tourism / beer tourism / and others
Elements of food in the mountains as country brand	• Fold - through gastro tourism it may be functional all over the year / the discovery of own origin – in the mountains: as a shepherd people / moving of flocks / Carpathian cheese; • Culture of bees – another country brand.

It may be observed, from the table, that the organization of gastro-tourist tracks at the level of every mountain massif leads to the image of specific brands for each main massif.

GASTRO-TOURISM DIFFERENTIATED BY MOUNTAIN MASSIFS

A massif, as it has already been shown, is a relief formation characterized by an ever reduced fragmentation, therefore a mountain unit most possibly delimited by limitrophe zones, which impresses by its solidity.

Unlike other mountain chains, the Carpathians, respectively the Romanian Carpathians, do not multi functionally differ in function from mountain massifs (for example as the French Alps), but rather in administrative-territorial mountain sub groups (Schwarz, 1995; Pop, 2006; e-bibl.-1). Though, as it has been specified, along the Carpathian chain 10 main mountain massifs may be differentiated, to which a series of secondary mountain massifs are added, but also with local importance, especially from socio-economic and cultural perspective, including gastronomic culture. We are **exemplifying** with mountain culinary preparations from the Romanian Carpathians made of traditional raw materials from the mountain zone (sheep, cow or goat meat, milk, cream, cheese, poultry meat, eggs and vegetables specific to high altitudes), paying respect to old recipes, traditional for every mountain massif (described in another paper - Gruia, R. et al, 2014), preserving archaic names (which are written in italic format) (table 3).

CULINARY PREPARATIONS *SPECIFIC* TO EVERY MOUNTAIN MASSIF OF THE ROMANIAN CARPATHIANS

Table 3.

No	MAIN MOUNTAIN MASSIFS OF THE ROMANIAN CARPATHIANS		ROMANIAN CUISINE INFLUENCES AND COMPLEMENTARITY IN THE MOUNTAIN ZONE	SPECIFIC OF THE CARPATHIAN MOUNTAIN CUISINE	
				CULINARY PREPARATIONS SPECIFIC FOR THE TERRITORY FROM THE 10 MOUNTAIN MASSIFS*	CULINARY PREPARATIONS COMMON FOR THE 10 MOUNTAIN MASSIFS
1	Mountain massifs from the Oriental Carpathians	Rodna massif	Transylvanian cuisine (the inside of the Carpathian Arch)	„Balmoș de Bucovina" „Heiț" „Clepezeu" „Topchit"	25 Frequently made culinary preparations* (*) Mămăliga vârtoasă (ciobănească) / Mămăligă cu lapte / Căpățână de miel la ceaun / Sloi de oaie / Cocârță (sau gătejele) / Oaie la tuci (ciobănească) / Zărbușca (năcreala sau serbușca) / Găluște cu urdă / Pastrama (de munte) / Borândău / Spuzeală / Tocană de mămăligă cu varză / Scofală / Meșniță Mămăliguță cu brânză și smântână / Papă / Șușoi / Tocană de mămăligă cu jumeri / Puricei / Tocană de mămăligă cu carne / Bulz / Păpăraie / Ciumperci / Urdă cu mărar / Bujenița
		Călimani massif		„Clepezeu"	
		Ceahlăul massif	Moldavian cuisine (outside the Carpathian Arch)	„Scoacă" „Ciorbă de păsat"	
		Ciucaș massif	Mountain Transylvanian cuisine	„Mămăligă pe păturI" „Balmoș"	
2	Mountain massifs from the Meridional Carpathians	Bucegi massif	Combination between Transylvania and Muntenia cuisine	„Balmoș"	
		Făgăraș massif	Transylvanian cuisine (inside the Carpathian Arch) + Muntenia cuisine (outside the Carpathian Arch)	„Rotogoale de berbec" „Mămăligă pe păturI" „Balmoș" „Oaie de munte" (grilled mountain sheep meat)	
		Parâng massif		„Ciorbă de păsat" „Căpățână de oaie"	
		Retezat massif		„Căpățână de oaie" „Balmoș de Gorj"	
3	Mountain massifs from the Western Carpathians	Banat massif	Banat mountain cuisine	„Geandra"	
		Bihor massif	Transylvania mountain cuisine	„Zară moață" „Boți"	

*) *archaic names of some traditional Romanian dishes, untranslatable in English*

It is to be observed, from table 3, that mountain gastronomy common for the whole Romanian Carpathian habitat combined with culinary products specific to certain zones may generate the constitution of extremely attractive tourist tracks, especially also combined with eco-tourism (that exposes the biodiversity). Virtually, over economically feasible distances and with original cuisines on the mountain massifs of the Carpathian Arch, **10 mountain gastro-touristic groups** may be individualized, while mentioning the concomitantly developed mountain linking roads. What has to be underlined is the fact that, in order to achieve the realisation of such tracks, extremely attractive and profitable for the respective mountain massifs, it is absolutely necessary for the administrative-territorial units to pull together (including through the cluster system) to form a good infrastructure network that may link different habitats of the Carpathian mountain massif.

There will be thus consolidated, through gastronomic culture, the gastronomy unity in diversity as a millenary civilization of the Romanian Carpathian Mountains. The tradition and cultural unity concerning gastronomy, i.e. ***ethno gastronomic heritage*** is, in our opinion, an argument of the continuity of the Romanian population on these heaths in a weltered millenary history. At the same time it constitutes a cultural, but also a technical lode, concerning the feeding manner, which has a serious potential for the development of mountain gastro-tourism, as a solution for the increase of the mountain zone attractiveness.

CONCLUSIONS

1. From geo-gastronomic perspective, the Romanian Carpathian „macro-modulation" distinguishes 10 main mountain massifs with an important potential as culinary originality, based on biodiversity, on cultural diversity and on specific products of the respective territory. Economically speaking, we refer to mountain agriculture revitalization for the future, this one having as a result the quality of food processing, and finally finding all these in culinary products that sustain **professional mountain gastro tourism**.

2. Collecting data concerning historical dishes (retro gastronomy) or traditional ones (ethno gastronomy), as well as creativity and present innovation, represent the solution through which the ***mountain gastronomic specific*** in relation with the mountain massif is put forward. All over the Carpathian chain (in the 10 massifs) there have appeared, along the centuries, a lot of similar culinary preparations (preliminary identification of 25 culinary preparations). On the other hand,

there are also certain local products, that lead towards an original gastronomy (preliminary identification: 1...4 preparations per every mountain massif). But these specific and traditional culinary preparations are little known by tourists.

3. To organize ***tourist tracks*** based on knowing the gastronomic biodiversity and traditionalism, at the level of every massif, leads to obtaining "territory products" and to imagining certain *gastronomic brands* for the respective areal, which represents one of the important modalities of increasing the activity of the mountain zone in Romania.

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THE CHALLENGES OF MOUNTAIN BIKING TOURISM DEVELOPMENT IN THE MOUNTAIN REGIONS OF EASTERN EUROPE WITH A CASE STUDY OF THE SKI RESORT POHORJE IN SLOVENIA

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ABSTRACT

Mountain biking has become a major sport and recreational pursuit worldwide providing significant benefits for the destinations. Due to the lack of knowledge and an inappropriate approach it is poorly developed in Eastern Europe. Based on case studies from destinations that have developed mountain bike tourism, with an emphasis on the Ski Resort Pohorje in Slovenia, this study can serve as a guide line for the development of mountain biking tourism across Eastern Europe and wider.

Keywords: *Mountain bike tourism, Bike Park, Tourism development*

INTRODUCTION

Mountain biking, as a recreational activity we know today, originates from the late 70s of the 20th century (Lofft et al., 2008; Parks Canada). In the last decade, its popularity has rapidly increased (Koepke, 2005) and it has become one of the most popular adventure activities that can be, depending on the type and terrain where they are performed, classified as soft or hard adventure activities (Parks Canada, 2010; Taylor, 2013; Prideaux, 2009).

One of the main motives for mountain biking is the exploration of new, unique destinations, and that is why mountain biking encourages travelling (Tourism British Columbia, 2010). Consequently mountain biking has been transformed from a local sport activity into a lucrative tourism product that represents an opportunity for the development of local communities and destinations (Western Canada Mountain Bike Tourism Association, 2007). Along with the increasing popularity and demand for active holidays, the number of destinations that offer mountain biking tourism products has increased in the last decade (Lofft et al., 2008). As a result, mountain bikers largely contribute to the income of destinations that develop mountain biking tourism, especially if they are located in the proximity of bigger urban centers (Koepke, 2005). While mountain biking tourism is well developed in North America, Western Europe and some other areas, it is on average poorly developed in Eastern Europe.

The purpose of this paper is to investigate the factors that prevent further development of the bike parks and to propose guidelines for successful development of mountain biking tourism in Eastern Europe and broader. It consists of two parts. The first part analyses relevant literature and defines mountain biking, while the second part is based on a case study of the Ski Resort Maribor. On the basis of literature review and findings of the case study, general guidelines for the development of mountain biking tourism in Eastern Europe and wider are proposed.

1.1 Definition of mountain biking tourism

Mountain biking tourism is not precisely defined, however we can start from the definition of cycling tourism, which is based on the visit of a destination that lasts at least 24 hours and also includes cycling activities (Faulks, Ritchie, & Fluker, 2007). Furthermore we can define mountain biking tourism as a travel outside the residency or country that does not last less than 24 hours or one night, with mountain biking as the main travel motive (Tourism Tasmania, 2008).

Mountain biking tourism represents a novel tourism product in many destinations. Its development is compromised by the lack of knowledge and experience in that field. Mountain bikers have different specific culture, values, needs and requirements than the majority of other visitors. That is why destinations should adapt their offer to this segment of visitors. As many destinations have not managed to make such adaptations, they have not been able to develop successful mountain biking tourism products.

Destinations pursuing the development of mountain biking tourism are predominately ski resorts that strive to manage seasonality and expand their summer season operations, as well as various rural regions. 12% of the ski resorts in British Columbia, Canada, offered the transportation of mountain bikes on their lift infrastructure in 1991, while in 2000 the number of resorts with such services has increased up to 65 % (Parks Canada, 2010).

The problems that destinations face while developing mountain biking tourism are multi-layered and vary from unsuitable infrastructure and lack of adequate services to unsuitable communication and marketing. In the last few years the awareness of the need for appropriate infrastructure – namely mountain bike specific trails and parks – is increasing, however destinations often lack providing of infrastructure and services such as safe bike storage, bike wash, bike repair shops, etc. (Tourism British Columbia, 2010). Not every destination has natural and other resources to become a mountain biking destination; however it can expand and upgrade its existing offer with mountain biking tourism products (Lofft et al., 2008).

1.2 Mountain biking tourism around the world

Mountain biking tourism has emerged as a result of motivation and desire of mountain bikers to explore new terrains and later also to participate in competitions, camps, festivals and as a consequence of inclusion of mountain biking into other tourism products (Koepke, 2005). The research among mountain bikers reveals that 80% of mountain bikers have been on at least one mountain biking trip that lasted more than one night (Green, 2003). Many destinations around the world have successfully implemented mountain biking into their tourism offer and have consequently attracted many mountain bikers along with the benefits and advantages they brought with them. Statistics show that mountain bikers in comparison to other tourists spent more time in a destination, spend more money and are engaged in many different activities (Keefe, 2002).

Mountain biking tourism is mostly developed in the USA, Canada and in the UK. Scotland, for example, annually attracts more than 1.3 million mountain bikers that spent more than £ 199 million (Tourism Intelligence Scotland, 2013). Mountain bikers from the UK that have visited Wales in 2006 and 2007 have spent more than £ 24 million (Visit Wales, 2012).

The development of mountain biking tourism in the USA varies by states and on regional level. For example, the mountain bikers that have visited Teton County in 2010 have spent more than $ 18 million (American Trails, 2014). Mountain bikers in the Chequamegon area, North Wisconsin, have spent more than $ 11.7 million in 1997 (Sumathi & Berard, 1997). The research conducted in 1996 revealed that mountain biking annually contributes between $ 8.4 and $ 8.8 million to the economy of Moab, Utah (Fix & Loomis, 1996). Mountain bikers contribute around $ 25 million to the economy of the Fruita region, Colorado (LeCarner, 2011).

In Canada, mountain biking is most developed in British Columbia. Non-residential mountain bikers that have visited the Sea to Sky trail system between the 1st of July and the 15th of September 2006 have spent more than $ 10 million (Tourism British Columbia, 2009). Visitors of Bike Park Whistler have spent more than $ 34.3 million between the 4th July and the 17th of September 2006 (Western Canada Mountain Bike Tourism Association, 2006).

In Germany, a country with more than 3.5 million mountain bikers (Koepke, 2005), more than 20 million citizens have included cycling into their leisure activities (Tausan, 2010). 11.8% of people that have visited Switzerland in 2010 participated in mountain biking, while 68% of these visitors participated in hiking (Tourism Switzerland 2011). The statistics show that mountain biking tourism is also well developed in Europe, however it cannot yet compare with hiking.

The development of mountain biking tourism products requires clear vision and cooperation of a variety of stakeholders from inside and outside the local community (Lofft et al., 2008; Cai, 2002). The benefits of such cooperation are evident from the example of the regional mountain biking center 7 Stanes in Scotland and many others. These destinations have succeeded to develop profitable mountain biking tourism products on behalf of a strong cooperation among stakeholders on local and regional level (Lofft et al., 2008).

DATA AND METHODS

The research methodology used in this paper is a combination of case study analysis supported by a collection of primary data and reviews or secondary data. The case study approach has been selected to ensure a deeper understanding of the development of mountain biking tourism in Eastern Europe. Since a case study analysis is an ongoing process, it helps identify both problems and solutions. The case study focuses on the Ski Resort Maribor, Slovenia, with its Bike Park Pohorje, one of the most successful bike parks in Europe and reveals many limitations and opportunities that destinations in Eastern Europe have to face when developing mountain biking tourism. The research process has been divided into two phases. In the first phase I have reviewed relevant literature that investigates mountain biking tourism and all accessible information in the Ski Resort Maribor and Bike Park Pohorje. In the second phase, I have collected primary data by interviewing the management of the park. Data were collected via in-depth interviews with 2 members of the Park management, between the 2nd and 17th of December 2014. A questionnaire included pre-coded questions about the current Park operations, factors that prevent further development of this tourism products and elements of the offer that need to be improved in order to make mountain biking tourism more successful. Respondents were invited to participate in the research personally and received the questionnaire via e-mail before the interviews were conducted. The process followed a convenience sampling approach.

The purpose of the study is to investigate the factors that prevent further development of the Park and propose general guidelines for successful development of mountain biking tourism in Eastern Europe. The aim is to reveal that the development of mountain biking tourism is a complex process that requires a serious approach. As literature and practices from other tourism products covering each of the suggested steps already exist, the guidelines do not reveal in-depth details.

1.1 The case study

Mountain biking tourism in Eastern Europe is, apart from some exceptions, not well developed. However a few destinations that have successfully developed this type of tourism have proven that such tourism products also have enormous potential in Eastern Europe. Most of these destinations are located in the Czech Republic, Slovakia and in Slovenia.

This case study focuses on the development of mountain biking tourism in the Ski Resort Maribor, located on the outskirts of the second largest Slovenian city, Maribor. The Park is located in the proximity of the second largest Austrian city, Graz, the capital of Croatia, Zagreb, and not far away from the capital of Hungary, Budapest. The Park was founded more than 14 years ago as a result of milder and shorter winters that have forced a ski resort famous for the organization of the women's World Cup ski race Golden Fox to develop a variety of summer-oriented tourism products. One of these products is the bike park. The Park is easily accessible due to the nearby highway, along with a variety of public transportation

options. The Park boasts with a modern cable car with its bottom station being located in the city. The Bike Park Pohorje is renowned around the world for hosting a few World Cups and European Cup downhill races.

The Park has become part of the Gravity Card consortium that connects 12 European bike parks with a single season ticket. Among the members of the consortium there are some of the most renowned European bike parks, such as Saalbach Hinterglem or Leogang that invest tremendous resources into their development as well as some other parks located in Switzerland, Slovakia, Germany, the Czech Republic and Slovenia (Bike Park Pohorje). Even though the park has only three official tracks and other parks in the consortium have significantly more resources available, it still manages to sell the most Gravity Cards and attract most Gravity Card holders (more than 5.000), while the number of all visitors exceeded 16.000 in 2014 (Bike Park Pohorje, 2014).

RESEARCH FINDINGS

The main disadvantage of the Park is the lack of trails, especially lack of trails that are suitable for less skilled mountain bikers. As it is vital for a resort such as Pohorje to focus on a selected segment of mountain bikers, it is also vital to focus on a segment that attracts enough participants to make such a product profitable. Lack of trails does not only limit the visitors to expert riders but also make the park less attractive for long-term riding, which results in a small percentage of overnight stays. The management of the park is aware of the situation; however, due to the strict environmental legislation, numerous landowners and limited resources, further expansion of trails is limited in the short term. Furthermore erosion causes frequent damages on existing trails, as they are not built in a sustainable manner. Consequently, trail maintenance requires a lot of resources that could be otherwise used elsewhere. The trails in the park are designed and constructed by local mountain bikers, who have developed them according to their skill level and needs. The trail infrastructure is consequently focused on experienced mountain bikers that participate in downhill, freeride or enduro disciplines. Apart from official tracks in the Park, there are also many hiking paths in the park area where it is illegal and prohibited to ride. However many park visitors are using them anyway. That causes a lot of conflicts between mountain bikers, hikers and other users of these paths. Less experienced mountain bikers or participants in some more popular or widespread disciplines such as cross country cannot find appropriate and legal infrastructure in this destination. As a consequence, the focus on experienced bikers and gravity-oriented disciplines also bears the fact that park visitors are predominantly male, while women, who are becoming an important segment, are being neglected. The bike park has managed to implement some of the vital infrastructure and services such as bike rental, bike shop and workshop, bike wash, mountain-biker-friendly accommodation etc. However, such infrastructure is only limited to the close park area, so the tourism industry in the broader area does not benefit from mountain biking. As a consequence, a majority of stakeholders are not engaged in the development and expansion of mountain biking tourism as they are not motivated and do not see any benefits. Not only other stakeholders, but also the ski resort management dedicate limited resources to the bike park development and operations, even though park visitors represent almost half of all resort visitors in the summer season. Even though the park has limited infrastructure and level of services, it also manages to attract quite a few mountain bikers due to its marketing efforts that are based on good knowledge of the mountain bike culture and compelling to mountain bikers. The majority of marketing and communication activities are online based, however numerous events, races and other competitions along with sponsoring of local riders, creates emotional connections with existing visitors as well as with the entire mountain bike community. For example the park is well renowned around the world for the organization of several World Cup downhill races as well as for the organization of the European downhill series IXS Cup. Furthermore, the park has partnered with one of the leading mountain bike manufacturers Specialized, which does not only provide rental bikes but is actively engaged in the co-branding efforts of the park. An important element for the success of the bike park is the fact that it actively cooperates with other mountain biking destinations via Gravity Card. Such cooperation does not only attract additional guests and make the purchase of a season ticket more appealing, but also creates benefits in the field of joint marketing and promotion.

DISCUSSION

Mountain biking tourism in Maribor strongly correlates with the bike park, operated by the ski resort. As there are only a few stakeholders included and which have benefits, the expansion of mountain biking tourism is facing its limits. In order to revitalize and to further develop it, a clear vision and strategy for the development of mountain biking tourism that includes all relevant stakeholders, should be developed (Lofft et al., 2008; Cai, 2002). However, it is not enough to include only stakeholders, it is necessary to motivate them to actively support and participate in the development of mountain biking tourism. Only with the engagement and strong support of key stakeholders, mountain biking tourism in Maribor has further development potential. Even though the focus of the ski resort on gravity-oriented segment of mountain bikers is logical, as it is quite easy to charge the usage of the park, broad support from various stakeholders is needed to develop products for other segments of mountain bikers such as cross-country or all-mountain. These segments have higher participation rates (Parks Canada, 2010), however the benefits are spread among numerous stakeholders and are difficult to evaluate as the users of trail systems are usually not charged for the usage of the trail systems. With the development of products for these segments, the benefits will be distributed among a larger base of stakeholders who will become interested to adapt their existing offer to the requirements and needs of mountain bikers. Since trail riding does not only provides economic benefits but also environmental and social benefits (Tourism British Columbia, 2010), it is also important that the municipality and even the government are strongly engaged. The ski resort will be able to retain its focus on gravity oriented disciplines, while the wider base of stakeholders will benefit from the development of the trail system for other mountain biking styles. Trails are a main motive for the visitation of certain destinations for mountain bikers (Tourism British Columbia, 2010) and that is why the existing trail system on Pohorje should be reconsidered, redesigned and revitalized in

order to keep attracting and satisfying mountain bikers. The existing trails are based on the unique characteristics of the terrain, with the renowned World Cup downhill track as its signature trail. Even though trails reveal unique characteristics of the landscape, they are not well connected with cultural and historical elements of the destination. Regardless of the fact that gravity-oriented mountain bikers are more focused on trails than on cultural heritage, the emphasis of it would make the destination image unique and increase its appeal (Cai, 2002), especially when the offer will also expand on other mountain biking disciplines. As the competition among mountain biking destinations is rapidly increasing, it is vital for the future success of the park not only to develop functional benefits but to create emotional connections with its visitors and the entire mountain biking community. The easiest way to establish such connections is to develop and maintain a strong brand that is based on the values common to mountain bikers (Ekinci, 2003; Morgan, Pritchard, & Pride, 2011). The Park management that is actively participating in mountain biking relies on their own observations regarding the strengths and weaknesses of the park rather than on the analysis of satisfaction of park visitors. The analysis of the satisfaction among Park visitors and analysis of the park's image will reveal additional elements that will support further improvements which will increase the satisfaction rate and draw new visitors (European Travel Commission, & United Nations World Tourism Organization, 2009).

The current success of the park strongly depends on its favorable location and climate that enables a long season. However, in comparison with some other Eastern European destinations that are developing mountain biking tourism, the park stands out by an in-depth understanding of the mountain biking culture that enables them to successfully address and communicate with the mountain biking community. A part of such communication is also the organization of world class events and races that have largely contributed to the current image of the park. The limitations that the Park faces on the way to further improvements are similar to other destinations in Eastern Europe; however it is necessary to stress out the strict environmental legislation in Slovenia along with fragmented land ownership that further limits the development of mountain bike specific trails.

Based on the insight gained from the reviewed literature and case study, I propose the following guidelines for the development of mountain biking tourism:

- Good insight and knowledge on mountain bikers, their culture, values, needs and requirements.

  Mountain bikers have in comparison with traditional guests a slightly different culture, share different values and have different needs and requirements. Many destinations neglect that fact and treat those as other visitors, which results in dissatisfied mountain bikers. As the destination management usually has very week knowledge on mountain bikers, it is essential that it gains that insight through a market research. Only then they will be able to design and develop successful mountain biking tourism products.

- Mountain biking tourism based on genuineness of the destination.

  Even though every destination is unique by itself, competitors may replicate or even improve many of its features, especially the design of trails. That is why the destinations should focus their offer on genuine characteristics of its natural and cultural environment. These attributes will also help destinations to create a strong backbone for its brand and enable them to tell a distinctive story.

- Selection of a target segment of mountain bikers.

  Mountain bikers are not a homogenous group but are divided into several segments that usually correlate with disciplines. Each segment has unique needs and requirements. Only well-established destinations can afford to support the development of widespread mountain biking tourism products for different segments of mountain bikers. Smaller destinations with less resources or landscape limitations should on the other hand select the segment of mountain bikers that fits best to the attributes they can offer. Only then the destination will be able to fulfill the expectations of the mountain bikers and outperform the competition.

- Use of a strategic approach.

  Strategic and long-term planning is essential for a successful development of mountain biking tourism. Development of mountain biking tourism requires years to develop and is very complex as it includes a variety of stakeholders with heterogeneous interests and motives. Consequently, a clear vision and goal-driven strategic approach is essential.

- Engagement of the local community and stakeholders.

  Cooperation with the local community and other stakeholders is an essential part for a mountain biking destination to become successful. Involving stakeholders and motivating them to participate in the development of mountain biking tourism will lead to their wide support and advocacy which will result in the creation of a unique atmosphere and experience.

- Development of well-planned and maintained signature trails.

  Trails are still the most important feature that drives mountain bikers to a certain destination. An epic or iconic trail or trail network can consequently define a destination. That is why destinations should focus on the development of a unique, well planned and maintained trail system that will reveal the personality of a destination instead of developing kilometers of poorly developed trails.

- Adapt existing offers and develop mountain bike specific services.

  Mountain bikers have specific needs and expectations, and destinations should recognize and exceed them. Apart from the development of mountain biking specific services and additional infrastructure, destinations should also consider the adaptation of their existing offer, from bike-friendly public transport to bike-friendly accommodation with secure bike storage.

- Develop a strong brand.

  A brand is one of the most powerful tools that destinations can use to attract mountain bikers. Brands will help

destinations to create emotional connections with visitors, differentiate the destination from the competition and occupy a unique position in the hearts and minds of visitors. Consequently, brands cannot be copied and at the same time build loyalty and awareness.

- Adapt marketing and communications strategy.

In order to successfully engage the mountain bike community, destinations should base their communications and marketing activities on the values and culture of mountain bikers. Depending on the target segment, destinations should determine the right communication channels. Social media seems to perform well in any segment, however destinations should be creative and also use the events, co-branding efforts and brand ambassadors.

- Monitor and analyze satisfaction.

Development of mountain biking tourism is a continuous process that is repeated again and again. Consequently, destinations should regularly monitor the visitors' satisfaction, spot their needs and requirements and try to fulfill them. Furthermore, a good insight in visitors will enable destinations to predict new trends and adapt their offer early enough.

- Cooperation with other destinations.

Mountain bikers are adventure seekers and bikes enable them to travel long distances. Consequently, some mountain bikers, especially the ones that are not gravity-oriented, migrate frequently from one destination to another during their vacation. That is why cooperation with other mountain biking destinations on regional, national or even multinational level is beneficial and increases the destination's appeal.

CONCLUSIONS

Based on data from Canada, USA, UK and the abovementioned Ski Resort Maribor case, it is evident that destinations in Eastern Europe can benefit from mountain biking tourism. Even though not all destinations can develop broad mountain biking tourism products, they can at least enrich their existing offer. The number of mountain bikers in Western Europe has achieved critical mass, while the number of domestic mountain bikers is rapidly increasing. Destinations in Eastern Europe are often motivated to develop mountain biking tourism when seeing benefits that some destinations from the West have from such type of tourism. The main problem is that they expect to achieve similar benefits in a very short term, without much investment. Many destinations in Eastern Europe are not aware of the specificities of this segment, do not have a clear vision for the development and do not target them in the right manner. Other factors that limit further development such as legislation, inappropriate trail systems, organic approach etc., are quite the same as in Western destinations; however destinations in the East overcome them with more difficulties due to the lack of knowledge, experience and motivation. Destinations that are developing mountain biking tourism, not only in Eastern Europe but also in the West could benefit from the guidelines proposed in this study. Bike Park Pohorje, whose success is primarily based on its location and reputation as a host of World Cup downhill races, follows the proposed guidelines to a certain extent, however there are still many elements that can be further improved, of course not without facing limitations such as restrictive environmental legislation and others. In comparison to other Eastern European bike parks or trail systems, the park, apart from favorable location and organization of high-end events, differs from the majority due to the good insight into the mountain biking culture, which helps them to successfully communicate and attract them. However, as the competition in the field of mountain biking tourism is becoming fierce and is also evolving in Eastern Europe, the Bike Park Pohorje could not rely on the good image from the past, but should actively refine and improve its offer. Even though the development of mountain biking tourism in Eastern Europe is facing many limitations at the moment, the current trends in tourism and the rapidly increasing number of mountain bikers will contribute to a further development of this type of tourism, however not without overcoming the before mentioned limitations and challenges.

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THE ROLE OF ARCHITECTURAL HERITAGE IN THE REGIONAL DEVELOPMENT OF MOUNTAINOUS AREAS EVIDENCE FROM EPIRUS, GREECE

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ABSTRACT

Tourism is a key factor in regional development of mountain areas. Many mountain regions worldwide depend on tourist activity for their socio-economic prosperity. Greece is a well-known tourist destination; its mountain regions represent an important pole of attraction, mainly for domestic tourists. Among other reasons, people travel to Greek mountains attracted by their cultural environment. In this frame, local architecture is a key-element of local development. Greek mountain regions lie in transition between traditional economy and contemporary challenges. Tourism emerges as a promising path for peripheral regions such as mountainous. The ability of building environment to affect people's feelings and choices places it at the core interest of tourism research especially when a vulnerable resource, such as architectural heritage is involved. Rapid growth of cultural tourism underlines the importance of architectural heritage in the field.

The aim of this paper is to examine the role of architectural heritage in the tourist profile of Greek mountains and thus, leads to certain conclusions and policy recommendations for sustainable local development. In this direction, two mountain regions were examined; the town of Metsovo and the village of Sirako, both located in Pindos, Epirus, Greece. A cultural economics method, namely the Contingent Valuation Method (CVM), was applied for the economic dimension of the architectural heritage to be examined. Research results show that tourists are indeed attracted by local architecture, do travel to admire it and state dissatisfaction at its decay. A decline in traditional architectural physiognomy will lead to a reduction in future tourist activity. Architectural heritage is proved to have important economic and developmental value. This value depends on its quality level; the better preserved the architecture, the higher its value is. The level of connection to a place appears to affect the value of the architectural heritage; the more connected to a place the tourists are, the higher the value. The building environment appears to influence certain elements that differentiate the kind of tourists each place attracts; it seems that each settlement attracts its own tourists. Architectural heritage is proved of high importance to local development. Its protection plays a decisive role for the tourist profile of the two areas. In reverse, an area can create the tourist profile it wishes to attract, through the utilization of its building environment. In this frame, building heritage appears to hold a key-role in regional development of mountain areas.

Keywords: *tourism, mountain areas, regional development, cultural economics.*

INTRODUCTION

Tourism is one of the strongest sectors of the world economy with a 5% growth in 2013 (UNWTO, 2013). If properly managed, in order social and environmental negative effects to be avoided, tourism can support sustainable development and be a growth engine especially for underdeveloped regions. Mountains are key tourism destinations as they attract 15% - 20% of global tourism (Ariza C. et al, 2013). Some of the earliest forms of tourism developed in the mountain areas of the Alps (Debarbieux B., 2014).

Attractiveness of the destination is one, among others, factor for mountain tourism development (Debarbieux B., 2014). Places of important cultural heritage hold intrinsic value for people and constitute attractive destinations. In this frame, their protection is essential (ICOMOS, 1999). Throsby (2009) mentions that tourism can be vital for the protection of cultural heritage and at the same time a threat to its existence. The building environment bears significant cultural values; buildings and settlements are more than just materials and places. They carry symbolic values, meanings, memories and the feeling of belonging to a place, to a community, vital for human beings (Butterworth, 2000; Jacobs, 1995).

Rural/vernacular architecture is among the most threatened types of sites mainly because of its materials, its character and its location. Loss of traditional building skills, abandonment of settlements and lack of legal protection are among the main reasons for which this kind of heritage is at risk, in addition to tourism-related issues (ICOMOS, 2002).

Greek mountains hold significant part of the national architectural heritage. At the same time they are at a critical development borderline; largely drained from a firm population mass able to support and generate economic activities of the primary or secondary section, tourism has emerged as a panacea in most cases. Thus, the building environment, mainly comprised of traditional settlements of the 18th century, represents an implicit source of development. Issues of architectural heritage management emerge regarding its best utilization and its protection from ruin and the consequences of mass tourism.

Architectural heritage management raises issues relating to its social and economic dimensions. Cultural economics methods have been successfully applied for the last forty years in examining the socio-economic aspects of cultural

heritage. Since cultural goods are, mainly, non-market goods their value is constantly underestimated. Several techniques reveal and estimate these passive-values. The Contingent Valuation Method is a most effective one when it comes to cultural heritage goods. Revealing the socio-economic values of architectural heritage will enable better understanding of its developmental potentials. Examining individuals' preferences and choices regarding the cultural goods in question will shed light on vital issues able to establish a sustainable tourism development policy frame.

The aim of this paper is to examine the role of architectural heritage in the tourism activity of Greek mountains and thus, provide a policy frame for sustainable development. The Contingent Valuation Method was applied in three surveys addressed to visitors. Two mountain settlements in Pindos, Epirus served for case studies. The rest of the paper is organized as follows. Section 2 summarizes the literature on CVM valuation and describes the data and the methods used in the survey along with a brief description of the case study areas. Section 3 presents the survey's findings followed by their discussion presentation in section 4. Conclusions are discussed in the final section (5).

DATA AND METHODS

Cultural economics are widely applied in the evaluation of a variety of cultural goods. Among the different methods used the Contingent Valuation Method is very common because of its ability to estimate the non-use values of cultural goods. Architectural heritage holds non-use values; existence, option and bequest values. Indeed, it is because of these values that it plays a special role in national tradition and in the history of each country. The fact that it can also generate tourism brings to light its development dimension as well.

The Contingent Valuation Method is a non-market technique widely applied since the 1970s (Davis, 1974; Carson et al, 1994; Noonan, 2003). It is based on the revealed preferences of individuals who are asked to state either their willingness to pay (WTP) money or their willingness to accept (WTA) compensation for a suggested change in the level of provision of a cultural good. Individuals state their maximum monetary value to a hypothetical scenario market created for the non-market good. CVM has been recommended by several organizations: The World Bank, OECD, UNEP, FAO (Santagata and Singorelo, 2000). CV studies cover a wide range of cultural goods and services; thus being a flexible and necessary tool (Epstein, 2003).

In view of examining the role of architectural heritage in tourism in the mountain areas of Greece, CVM was applied in two settlements; Metsovo and Sirako. Three CV surveys were applied from 2008 to 2011. They were addressed to the visitors of both settlements and were conducted though face-to-face interviews with questionnaires. In all of the three surveys the visitors' willingness to pay for the protection and enhancement of the local architectural heritage was examined. Visitors were randomly chosen while being in the settlements, i.e. in cafes, shops, on walking paths, etc. Data were collected throughout a period of several months, mainly, during weekends and holidays. The first study was applied in 2008 in Metsovo, the second one in 2010 in Metsovo and the third in 2010-2011 in Sirako. In total, 911 valid questionnaires were collected. The number of the questionnaires was in proportion to the annual number of tourists at each place, provided that a 95% level of confidence and 5.5% - 6.5% mean margin of error were obtained for each sample. Based on local data (the municipalities of each settlement and local tourist stakeholders), Metsovo was visited by almost 300,000 tourists in 2008 and 150,000 in 2010 while Sirako was estimated to have had 10,000 visitors at an annual base (Giannakopoulou et al, 2011; Giannakopoulou and Kaliampakos, 2011).

In view of examining the core question of the research, certain relationships between tourists' preferences and local architecture characteristics had to be examined. In this direction six variables were examined: the choice of the settlement as an exclusive destination, the duration of the stay, the observation of implicit architectural decay, the importance of the preservation of the local architectural heritage, the reasons for a visit recommendation and the positive WTP justification. Relative questions provided information on certain visitors' preferences before, during and after their visit to each place. It was important to reveal what was the general motivation behind the tourists' choice of visiting, their willingness to recommend it, and the way local building environment affected certain views and preferences. Demographic data were also collected and analysed. A WTP question was applied with a hypothetical scenario identical to all surveys. Visitors were asked whether they would be willing to give money to an institution responsible for the preservation of local architecture. Certain following exploratory questions examined the reasons behind a *yes* or a *no* answer. Further, the different values deriving from each justification were examined.

2.1 The case study region: Metsovo and Sirako

Metsovo and Sirako are both located at an altitude of 1.150 m, in the mountain range of Pindos, in the Prefecture of Epirus. Their origins date back to the 15th century. Their long historic traditions share many cultural similarities; they are both Vlach settlements. Being among the most developed mountain regions during the 17th and the 18th century, they followed very different development patterns since the mid-20th century. Metsovo was never abandoned, holding permanent habitation until today with a population of almost 2 500 people (2011 Census, National Statistic Service). Sirako was depopulated in the 1970s and left deserted for almost 20 years, when some inhabitants began to return in the 1990s, reconstruct their houses and stay in the village during holidays. Nowadays, almost 300 families have returned and Sirako holds a semi-permanent habitation that extends to 3-4 months during the year. As a result, the two regions are characterized by a very different level of preservation of their local architectural heritage. Metsovo has undergone a severe loss of its architectural physiognomy. Old and new structures coexist, but lack of planning has resulted in a wide architectural degradation in many parts of the town. In Sirako, on the contrary, time seems to have frozen; the traditional building environment has been altered slightly, since reconstruction work was made in accordance to local tradition. Thus, Sirako is one of the best preserved traditional settlements in Greece (Giannakopoulou, 2012).

RESEARCH FINDINGS

The main results from the statistical analysis are presented in this section. Comparing the first two surveys (in 2008 and 2010) an equal dispersion among male and female visitors was noted. The majority of these visitors, in both surveys, held a degree of higher education, while a rather high percentage had a job (65%) or a steady income (10%). Also, a young age profile of visitors was revealed; almost 60%-70% in both surveys were at an age between 20-40 years old. What is interesting is the income profile. In 2008, almost 40% of the visitors were of high average income (higher than 30.000 € annually). In 2010, the percentage of higher income visitors (>40.000 €) was lower and, at the same time, the percentage of lower income visitors (<10.000 €) was higher ($z=3.57>1.96$, $a=0.05$). The results were quite similar in the Sirako survey. No male or female dominance was revealed, while almost half of the visitors were young. Also, the majority of the visitors had a higher education profile, while more than 70% were employed and more than 10% had a permanent income. In addition, almost 50% of the visitors had an annual income higher than 30.000 €.

In order to examine the motivation to travel and the travel patterns visitors were asked whether the settlement was their exclusive travel destination, about the duration of their stay and the means of their journey. Sirako wasn't the only place in the area that visitors were traveling to for the majority of them (67.5%). Metsovo, on the other hand, was an exclusive travel destination for the 57.7% of its visitors in 2008 and for the 63% of them in 2010. The vast majority of visitors in Metsovo travelled with their own car (85% in 2008 and 75% in 2010). In Sirako, visitors also arrived mainly by car (70%). Almost half of Metsovo's visitors spend maximum one day in the town or stayed just a few hours. A percentage of 20%, on average, stayed one night and almost 25% of the visitors stayed for two or more nights. In Sirako, 42% of the visitors stayed for more than one night in the village, while 45% left on the same day.

Information on what was mainly the reason behind the choice of visiting the settlement and the main reasons for which someone would recommend it was also examined. In the case of Sirako visitors were attracted by three main reasons (either they already knew from a previous visit or had heard or read about); natural landscape and isolation (24%), local vernacular architecture (22%) and general beauty of the place deriving from the combination of natural and manmade environment (21%). In the case of Metsovo, in 2008, most visitors (35%) stated that they would recommend it because of its local architectural environment and 24% because of the combination of natural and building environment. In 2010, in comparison to the 2008 survey, 28% of the visitors would recommend it for its architecture ($z=2.05 > 1.96$, $a=0.05$) and 10% for the combination of nature and architecture. Also, there were a small percentage of visitors, in 2010, which would discourage someone from a future visit because of local architectural decay. Such percentage did not exist in the previous survey. Visitors in Sirako chose to travel to the village mainly because some of their friends recommended it (45%), because they had a friend or relative descended from the village (10%) or because they found out about it through internet (15%). Sirako doesn't hold the fame of Metsovo but, as it was revealed, it has the best advertisement; a mouth to mouth recommendation. Visitors chose Sirako as their travel destination attracted mainly by three elements; natural environment (37%), local architectural heritage (36,5%) and local history and tradition (15%). After having been in the village, visitors would mainly recommend it for three reasons; natural environment and isolation (24%), architectural heritage (22%) and general beauty deriving from the combination of natural and manmade environment (21%).

The importance of the preservation of local architectural heritage was examined through questioning the visitors on their opinion: *do you consider it important for local architectural tradition to be protected and why?* In Sirako, 60% of the visitors stated it was important because *it is part of cultural heritage, tradition and history*. Also, 38% of the visitors stated it should be protected because *it represents an important tourist attraction*. In Metsovo, in 2008, 41% of the visitors combined the preservation's importance with the ability of architectural heritage to attract tourism, while 57% with the cultural heritage dimension. In the 2010 survey, the corresponding percentages were 43% and 47.5%. The differences were not statistically significant, while there was a statistically significant increase ($z=3.82>1.96$, $a=0.050$) in the percentage of visitors who stated that *architectural preservation wasn't important because other elements of the settlement were able to attract tourism*.

The core question of the CVM scenario raised a 44% of positive WTP in the case of Sirako and 41% and 38.5% ($z=0.65<1.96$ $a=0.05$) in the case of Metsovo (2008 and 2010, correspondingly). Examining the reasons for payment some interesting results came in light. In Sirako 12% of the visitors would pay because of the tourist attraction value of local architecture. The majority (54%) would pay because of its cultural heritage value and a 32% because of its natural environment value. In Metsovo (2008) 11.5% of the visitors would pay considering local architecture as a pole of attraction, while 55% would pay because of its cultural value and 27% due to its environmental value. The same percentages are differentiated in the 2010 survey: in 23% ($z=3.86>1.96$ $a=0.05$), in 46% and 16% correspondingly. The results are presented in a Table.

DISCUSSION

Both settlements are tourism destinations. However, Metsovo appears to be a very popular one (200.000 visitors, on average, annually is considered very a high number for a Greek mountainous town). Sirako, on the other hand, has been rather recently included among the country's tourist areas. Besides, the few tourist facilities in the village didn't exist fifteen years ago. However, despite of the large numbers of visitors, Metsovo is revealed to hold mainly one-day tourism and, indeed, most visitors spend a few hours for food, coffee and short walks around the central part of the town. On the contrary, more than half of Sirako's visitors (55%) stay for at least one night at the village.

In the case of Metsovo (2008), comparative analysis between the variables "departure of journey" and "the place as an exclusive destination" (chi-square= 66.120, df=5, p-value=0.000 in 2008 and chi-square=59.885, df=5, p-value=0.000 in 2010) as well as the variables "departure of journey" and "duration of stay" (chi-square= 33.605, df=4, p-value=0.000 in 2008 and chi-square=61.040, df=4, p-value=0.000 in 2010) showed that the more far away the departure of the journey, the longer the stay and the higher the exclusivity rate is. Visitors arriving from short distances (less than 200 km) spend a day

or two in the town. Furthermore, for more than 65% of long distance visitors Metsovo doesn't represent an exclusive travel destination. The city of Ioannina and the region of Zagori are among the supplemental selected destinations.

Comparative analysis (Metsovo 2008) between the variables "age" and "architectural decay" (chi-square=9.167, df=2, p-value=0.010) revealed that it is the younger visitors mostly pointing out that new constructions and use of new materials in old and new buildings are the main reasons leading to important degradation of the local architectural character of the settlement. The fact that older people observe a lower level of decay has to be attributed to the hardships and the poverty attached to living conditions in such villages in the past. To them, new building constructions represent convenience, while young visitors, searching for traditional settlements as attractive destinations (in contrast to the urban environment of their everyday life) are more critical. In addition, it was revealed that the variables "educational level" and "gender" didn't have any influence on individuals' preferences regarding the local architectural decay. A very interesting result came to light from comparative analysis between the variables "level of architectural decay" and "frequency of visits" (chi-square=15.976, df=4, p-value=0.003). The more often someone visits the settlement, the more he/she observes the loss of local architectural physiognomy. In addition, in the 2010 survey there was a small, yet statistically significant ($z=2.00>1.96$ $a=0.05$), increase in the percentage of visitors who stated a higher level of architectural degradation, in comparison to 2008. The existing deterioration in the local building environment didn't escape visitors' observation.

Statistical correlation was applied in order the parameters affecting WTP to be examined. Positive WTP justification proved to be related to the variable "educational level" (Metsovo, 2008) (chi-square=9.577, df=3, p-value=0.023). More specifically, the higher the level of education of an individual, the more he/she combined his/her positive WTP with the value of local architecture as a pole of attraction and as part of the protection of the local natural environment. Among visitors who stated positive WTP recognizing the use-values of local architecture, almost 80% were of high educational level. It was revealed that the most educated visitors recognize the developmental dimension deriving from the protection of the specific cultural good. These visitors recognize, also, the environmental value of the good. Also, positive WTP (Metsovo 2010) proved to be strongly related to the variable "frequency of future visits" (chi-square=10.607, df=2, p-value=0.005). More specifically, visitors who intended to visit the settlement again in the near future stated positive WTP at higher percentages. From the visitors who didn't intend to visit Metsovo again, almost 78% stated zero WTP. In Sirako, positive WTP was found to be related to the variable "departure of journey" (chi-square=6.309, df=2, p-value=0.043). Visitors coming from shorter distances (less than 100 km) were more willing to pay for the preservation of the good. The finding reveals the good's characteristic of locality.

Logistic regression analysis and linear regression analysis were also applied in order the parameters affecting the WTP amount to be examined. It was revealed that the higher the level of architectural decay an individual pointed out, the higher the probability was (1.5 times higher) to state positive WTP (ExpB=1.590). In addition, it was revealed that the more positive a visitor was concerning the local architecture to be preserved, as well as the higher the level of exclusivity of the settlement as a travel destination, the higher amount of money the visitor was willing to pay (b=0.720 and b=0.476 correspondingly). Visitors who travelled exclusively to Metsovo and those who were in favour of the preservation of the local architectural tradition were willing to pay more money, in comparison to others, in order for the good to be protected. Considering that Metsovo holds higher levels of exclusivity, mainly, among short distance travellers it is concluded that it is people from a surrounding area (most of whom may be related to the town) cared most for local architecture's protection. Additionally, it was showed that WTP was affected by the individual's opinion regarding the local architecture's level of decay (ExpB = 1.778). This means that an individual who was of the opinion that local architecture is highly degraded was less probable (almost half probability) to pay for its preservation, in comparison to another who thought the architectural decay was lower or didn't exist (provided that all other parameters remain stable).

Both WTP and WTP amount were not related to the "income" variable in the 2008 survey. In the 2010 survey, however, although WTP remained unchanged, the amount of money individuals were willing to pay was strongly affected by income (b=0.359). The average mean WTP amount was drastically reduced (62%). This is a reduction that derives, among other parameters, from income reduction and from a tight attitude emerging from the general socio-economic frame, at the time[1]. It is shown that, although visitors are positive concerning the preservation of the architectural heritage an income decrease puts certain restrictions on the amount of money they are willing to pay. Comparing the mean amount of money visitors were willing to pay it was revealed that in Sirako it was significantly higher (comparing the two surveys that took place in 2010 and 2010-2011). The two surveys were applied in similar socio-economic conditions and indeed in Sirako the general economic frame was even harsher. Yet, visitors were willing to pay almost a three times higher average amount of money for the preservation of the good. The finding reflects the important value that an architecturally well-preserved settlement bears. It reflects the visitors' willingness to pay for an important cultural good to be protected even in difficult economic conditions.

CONCLUSIONS

Tourism is of vital importance for the development of many mountain regions in Greece. At the same time it can be threatening for the local natural and cultural environment. Architectural heritage represents one of the most important characteristics of mountain regions. However, due to a variety of reasons, it is threatened by decay. In order to examine the economic and social dimensions of architectural heritage and its role in the tourism development of mountain regions CVM surveys were applied in two settlements; Metsovo and Sirako, both located in Pindos, Epirus.

The findings highlight some key issues regarding the relationship between visitors' preferences and the local building heritage. Preserved traditional environments hold high cultural value that is reflected in important economic value. Vernacular architecture attracts visitors and thus, it can play a decisive role in local development. However, visitors'

1 In 2009, Greece entered in a period of economic crisis. Sudden monetary cuts and unexpected taxes created a socio-economic frame of uncertainty and fear. Unavoidably, this led to more restricted economic choices, which is reflected in the survey's results.

preferences and choices are determined by the level of quality of the building environment. The better preserved it is, the more caring for its further protection the tourists are. A very well preserved traditional settlement evokes positive feelings and the visitors are willing to pay for its future enhancement. On the contrary, visitors are prone to turn their back to architecturally degraded settlements once they don't satisfy them. Use-values of architectural heritage hold important part of its economic value for tourists. Willingness to pay derives, at a certain level, from the ability of architecture to function as a tourism pole, while high percentages of visitors stated zero WTP in view of not indenting to visit the place again. Architectural heritage is considered as an economic investment. Visitors were willing to pay double money because of its developmental dimension, when degradation was already observed. In other words, in a period of crisis, higher percentage of visitors justifies money expenditure on heritage protection provided that this can generate reciprocal monetary benefits. Although the level of education doesn't affect several preferences regarding architectural heritage (the reasons for which have to be searched in the educational system), it provides a measure on whether visitors understand the developmental role of architecture. In addition, it's of certain interest that younger generations stand more critically before the various elements resulting in the deterioration of building heritage. Although a popular destination, Metsovo basically attracts one-day visitors in contrast to Sirako that seems to have earned its visitors interest. To their satisfaction it actually owes its reputation. The building environment is among the basic reasons for which someone would recommend the two settlements. Yet, evident decay in Metsovo already discourages a small percentage of visitors and is an alarming issue for future policy.

Sirako doesn't bear destination exclusivity; most of its visitors spend some days exploring the surrounding area, while Metsovo seems to be mostly a place for a short duration stay. The environmental value of the local heritage evoked higher percentages of WTP in Sirako, which reveals a more intense caring for the natural environment. It seems that the different physiognomy of each place attracts visitors with different preferences.

For sustainable mountainous development preservation of the local architectural heritage is essential as it plays an important role. Protection, enhancement and proper utilization of traditional buildings can create unique environments of high quality able to attract and maintain tourism.

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TOURISM AND TRAVEL INDUSTRY AS A FACTOR OF ECONOMIC DEVELOPMENT IN THE CANTON OF SARAJEVO

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ABSTRACT

This paper analyses various natural and social attractiveness, the level of tourist valorisation and different travelling motives in the Canton of Sarajevo. Among all landforms, mountains have the biggest tourist importance, especially mountains that are vertically and horizontally stratified, and the mountains that are near lowland settlements. Medium-high Mountains dominate in the Canton of Sarajevo. They are fold, massive, plateau (erosion), fault-block and volcanic. A complex of tourist facilities should be built for the development of mountain and recreational tourism in the city, on the river Miljacka and in the surrounding mountains: Igman, Bjelašnica and Jahorina. Modern economic processes are increasingly eliminating the traditional socio-economic relations and destroying the antagonistic relations between developed and underdeveloped areas in the Canton of Sarajevo. The tourist valorisation of tourism development is based on the attractiveness of certain motives in the Canton of Sarajevo.

Keywords: *mountains, tourism, resources, economic development, the Canton of Sarajevo*

INTRODUCTION

Through its natural and anthropogenic resources, tourism affects almost all sectors of the national economy in the Canton of Sarajevo. For all these reasons, this paper seeks to emphasize the need for more significant investments into the development of tourism, which is at present at a very low level of development in the Canton of Sarajevo. The tradition of tourism development in the Canton of Sarajevo is longer than a century, and favourable natural-geographic and socio-geographic factors make a framework for its development. Recent developments of economic relations are revising our understanding of development of tourism as an important economic activity in the Canton of Sarajevo. This means that tourism goes beyond the scope of "industry" and becomes an important factor of socio-economic development. Its further development in the Canton of Sarajevo, formation of new products and opening of new tourist spots are the result of previous experience and new desires of the tourists. (Nurković, R., 2006)

The last ten years highlight the dynamic development of tertiary activities, among which tourism plays a substantial role. Today tourism is one of the most profitable and largest industries in the Canton of Sarajevo. The transition in Bosnia and Herzegovina, or restructuring processes of the economy and society as a whole, are taking place very intensely, but also under very difficult and special conditions. After the transition from a real socialist to a market system, Bosnia and Herzegovina started using its significant geographical and anthropogenic resources for tourism development. (Gosar, A., 2005).

Today, there is an increasing number of educated people, new technologies, computerization, robotics as well as location factors that enable a better standard of living, which also means an increase in income while also shortening working hours. This is best seen in developed countries (Nurković, R., 2006). It must not be forgotten, however, that tourists in large numbers from many countries of Europe and the world visit the Canton of Sarajevo, especially the mountains, the rivers and the city of Sarajevo. An overview of tourism resources in the Canton of Sarajevo shows that most of the tourist areas and attractions have been very little evaluated so far. The attraction of high mountains: Bjelašnica, Igman, Vlašić, and others, is reflected in the newly built and renovated tourist facilities. The share of tourists who visit these sites is about 30%, while the share of tourists visiting the historical heritage of Sarajevo is about 60%.

WORKING METHODS AND DATA SOURCES

The methodological approach is imperatively suited to the purpose of work, thus tourism and production have a strong impact on the local and rural development in the Canton of Sarajevo. Research has covered the local and rural development areas in the Canton of Sarajevo. In assessing the economic contribution of tourism development, quantitative methods ranging from stochastic to deterministic are almost exclusively used.

In the research of market potential, analytical methods for determining the tendencies and the interdependence of phenomena, conditions and opportunities were used, i.e. limiting factors of market development. Standard desk research methods were applied with the use of secondary data, including also the data of companies engaged in tourism in the Canton of Sarajevo. Historical and normative methods were also used, which are common for ecological research. As a basic method of collecting primary data sources, test methods were used, i.e. in-depth interviews, where the main instrument was a reminder for an interview.

TOURIST VALORISATION OF MOUNTAINS IN THE CANTON OF SARAJEVO

The Canton of Sarajevo is dominated by medium-high mountains. They are fold, massive, plateau (erosion), fault-block and volcanic. They are rich in minerals, geothermal water sources, large forest areas, hunting grounds, and grounds for mountaineering and winter sports. The International Winter Olympics, held in Sarajevo in 1984, were an ideal base for the affirmation of winter mountain tourism in Bosnia and Herzegovina and the region. For nature lovers who do not practice winter sports, the other seasons are more interesting because they can enjoy the green wooded expanses surrounded by quietness and harmony of sounds and colours that bring spiritual peace in the Olympic Mountains Bjelašnica, Trebević, Igman and Jahorina near the famous historical city of Sarajevo (Table 1).

Regarding the variety of natural and social attractiveness, the level of tourist valorisation and different motives for travelling, there are few cities in Europe that have varied natural potential for tourism development like Sarajevo. Most foreign tourists who first have visited Sarajevo return again to this city because one needs to visit a lot of new places and many old monuments, and enjoy the hospitality of people in the city and villages in the Canton of Sarajevo. Natural tourism values and numerous cultural and historical monuments, from archaeological sites to modern achievements, are well researched and presented in different ways to foreign tourists. (Pepeonik, Z, 1995)

The Canton of Sarajevo offers significant tourist attractions, various accommodation facilities, restaurants with national gastronomic specialties. The Canton of Sarajevo offers tourists many mountains, valleys, rivers, and geothermal springs. The biggest tourist values of the Canton of Sarajevo are mountains and rivers. This fact allows an equal development of almost all known types of tourism, irrespective of the season, the demand and the financial abilities of the tourists. (Nurković, R. 2009)

Trebević (1630 m) is a mountain known as the "lungs of the city of Sarajevo". It is a centre of mass excursion tourism in Sarajevo. The city is connected to this picnic site by an asphalt road and a cable car (currently out of order), with a capacity of 1440 passengers per hour and the trip takes only 12 minutes. In this popular resort, due to its ideal configuration that has allowed the construction of a combined track for bobsleigh and sledging where the competitions in these disciplines were held during the Winter Olympic Games in Sarajevo in 1984. (Agency for Statistics of Bosnia and Herzegovina, 2013)

Table 1: *Overview of technical characteristics of the sports grounds in the Olympic Mountains in Sarajevo*

Mountain	Sport facility	Start	Finish	Longest jump	Average slope	Track length
Igman	Ski jump	1 280 m	1.150 m	92 m	1.50º	70 m
		1 340 m	1.150 m	112 m	0.51º	90 m
Trebević	Bobsleigh track	1 108.5 m	1.237 m	-	10.20º	1.300 m
	Sledging - men	1 111.95 m	1.363 m	-	10.20º	1.210 m
	Sledging - women	1 082.45 m	1.363 m	-	10.20º	993 m
Jahorina	Downhill	1 871 m	1.326 m	-	29%	2.041 m
	Giant slalom	1 665 m	1.326 m	-	28%	1.332 m
	Slalom	1 840 m	1.629 m	-	35%	551 m
Bjelašnica	Downhill	2 067 m	1.237 m	-	28%	2.994 m
	Giant slalom	1 745 m	1.363 m	-	36%	1.122 m
	Slalom	1 572 m	1.363 m	-	40%	553 m

Source: Agency for Statistics of Bosnia and Herzegovina, 2013

Igman (1502 m) is a mountain that rises next to the Sarajevo plain. It is connected to Sarajevo by road via Hadžići and Krupac. For the Winter Olympics in 1984, on Veliko Polje, there were built trails for biathlon with a shooting range (which is one of the most modern shooting ranges of this kind in the world), cross-country skiing trails and training trails with a length of nearly 60 km that are equipped with complete infrastructure and supporting facilities. On Malo Polje two ski jumps of 70 and 90 meters were built according to the project by constructor Janez Gorišek, the world-known constructor of ski jumps, whose stands by landing hill can accommodate 25 000 spectators. The seventy-meter ski jump is coated with plastics so that it can be used for trainings and competitions throughout the year.

Jahorina (1918 m) is a mountain of a large mountain massif about 30 km long and up to 15 km wide. It is located east of Sarajevo and it has slopes where the snow cover stays even till the end of May. On its slopes about 25 kilometres of competition trails were built where the competition in Alpine skiing for women was held during the Winter Olympics in 1984 and the contestants were offered cable cars, three with one seat and two with two seats, as well as four ski lifts. The first international competition held on Jahorina was a competition for "The Jahorina Cup" in 1953 and in 1955 the Student World Championship was held there. In 1975 the competition for "The Jahorina Cup" was included in the calendar of the European Cup. The first competition for women in Jahorina was held within the competition for the World Cup for downhill skiers in 1983 allowing women to definitely take over this ski resort.

Bjelašnica (2067 m) is a mountain massif which is under a snow cover for more than half a year. On the ideal slopes of this mountain a total of 8345 meters of ski-runs for giant slalom and slalom were built on an area of 692,280 m^2. Along the trails there are two-seat and three-seat cable cars as well as three ski lifts.

Bjelašnica became available to skiers at the beginning of the preparations for the 1984 Winter Olympics. Until then this mountain was inaccessible and available only to mountaineers and lumberjacks. In the season of 1981 and 1982, Bjelašnica

opened its gates for the first time to skiers of the world. The former state championship in Alpine disciplines for men was held first on this mountain followed by the slalom and giant slalom competition for the European Cup. A year later, the world's best downhill skiers competed on this mountain in the competition for the World Cup.

For the Bjelašnica Mountain we can say that it does not meet the current needs of tourists in terms of accommodation when compared to the natural predispositions that offer great opportunities for tourism development. The reasons for this are the last events of the war that destroyed the existing infrastructure. Pre-war needs were being satisfied by the four-star hotel Smuk, then the Press Centre building which was converted into a hotel after the Olympics, and the Igman hotel. The Marsaliako Hotel settles today's needs for accommodation and it works with only 20% of its pre-war capacity. The Marshall Hotel on Bjelašnica is 23 km away from Sarajevo, at an altitude of 1273 m. It has 70 rooms with bathroom, a mini bar, TV and telephone. For hunting lovers, there are all kinds of wildlife on the mountains of the Canton of Sarajevo, such as deer, rabbits, grouse, marten, but also bears, wolves, foxes, wild boars etc. Popular hunting grounds which foreign tourists and hunting lovers like to visit are the mountains around Sarajevo. It should be added that there are also other opportunities for the tourists who come to the Canton of Sarajevo for hunting purposes.

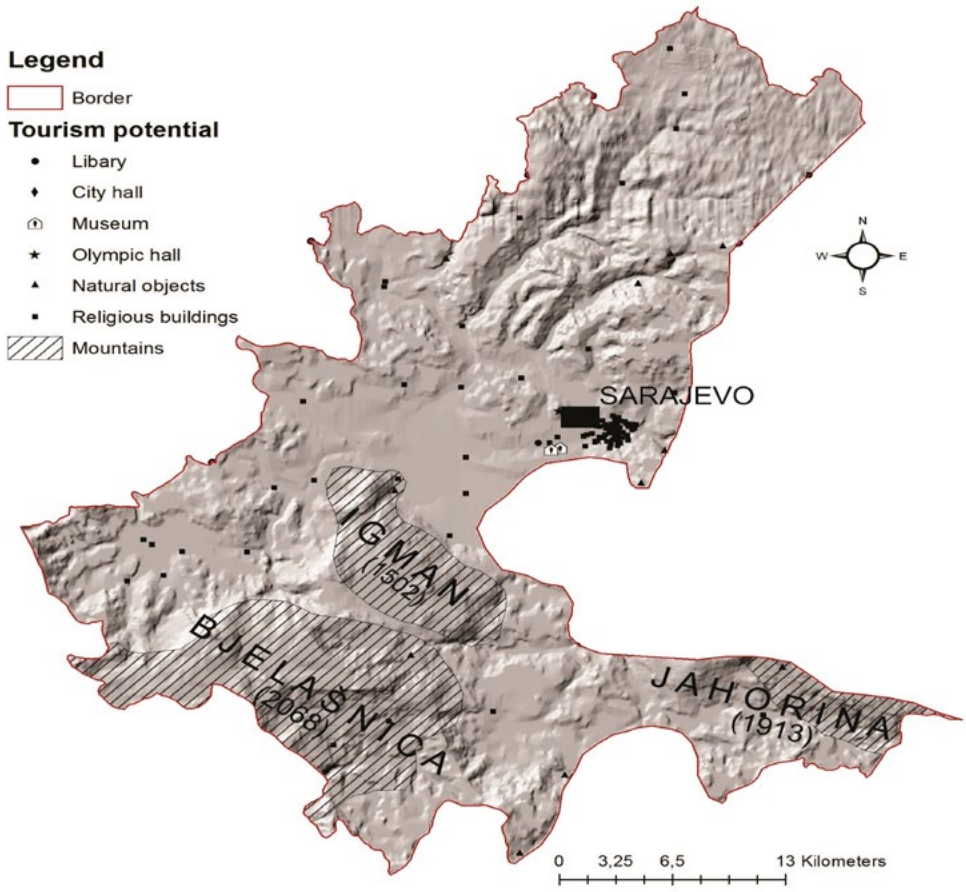

Figure 1: *Tourism potentials of the Canton of Sarajevo*
Author: R. Nurković

We are about to get you to know the remote mountain villages and meet the people for whom hunting and production of healthy food is a traditional way of life. Bosnia and Herzegovina is a mountainous country with an average height of 545 m, which indicates a comfort climate, which is characterized by sedative and stimulating effect on the human body and is therefore very important. The special quality of the natural attractiveness of Bosnia and Herzegovina is in the landscape environments in which one can often see a variety of hydrographic contents on a relatively small area, such as lakes, rivers with waterfalls, clear streams, fish ponds and springs.

Rivers in the Canton of Sarajevo are not big due to the peculiarities of the relief. Due to the terrain through which the rivers flow, each of them represents a special tourist attraction. They offer various possibilities for sports, fishing and other recreational activities. For fishing enthusiasts the Canton of Sarajevo provides exceptional and diverse possibilities for pleasure. The rivers are rich in fish, and small and big game in the mountains are a special attraction.

CULTURAL HERITAGES IN THE CANTON OF SARAJEVO

The cultural heritage of the Canton of Sarajevo is diverse and unique. It reflects a diversity that began after the meeting of the Slavic immigrants' culture with the culture of the local population. These cultures pervaded each other in a historical symbiosis, blended with old Bosnian customs but are also retained in their original form to this day despite the strong and

often violent impact of other more advanced civilizations. (Nurković, R, 2012) In recent years in the Canton of Sarajevo there has been a renewal of cultural values, facilities and manifestations, some of which by its tradition and artistic value are cultural events of world importance. In the Canton of Sarajevo there are ideal conditions for religious tourism, i.e. for pilgrimage of the three most massive religions: Islam, Orthodox and Catholic. The territory of the present-day Sarajevo was and still is a crossroads of major roads, from prehistoric times to the present day. People who moved through them had left numerous traces of spiritual and material culture. Archaeological sites, cultural and historical monuments, the specifics of folklore, national cuisine and other anthropogenic tourism values represent a significant part of the tourism potential in the Canton of Sarajevo.

TOURIST TRAFFIC OF FOREIGN AND DOMESTIC TOURISTS IN THE CANTON OF SARAJEVO

Based on some researches, we can say that in the Canton of Sarajevo throughout the year there is a high frequency of tourists both domestic and foreign. Analysis of the tourist traffic in the Canton of Sarajevo is based on the number of accommodation facilities, the number of tourists and overnight stays (Table 2 and Figure 2). From the table and graph of the number of tourists and overnight stays in the Canton of Sarajevo from 2007 to 2014 (January-May), we can see an increase in both the number of tourists and the overnight stays in the Canton of Sarajevo. (Nurković, R, 2012)

The lowest tourist traffic (in the analysed period) was realized in 2008 and it was 166 304 tourists and 324 249 overnight stays. The number of tourists and overnight stays recorded an increase up until 2007; a slight decrease was recorded in 2008 in the number of tourists and overnight stays that could be the impact of the Global economic crisis of that period. After that period an increase in tourist arrivals was recorded. In 2011 Sarajevo was visited by 205 766 tourists, which is 35 297 tourists more when compared to the previous year. (Agency for Statistics of Bosnia and Herzegovina, 2008-2013)

Unofficial data obtained by various non-governmental institutions (USAID, etc.), however, show about a twice greater number of tourists visiting Sarajevo of which a large number were never recorded and that is one of the major problems of tourism both in the canton and in the country. According to the data available concerning the number of tourists from January to July 2012 that number is 152 567 tourists while the number of overnight stays for the same period is 288 187. In the Canton of Sarajevo in 2013 the tourist traffic recorded an increase in the number of tourist arrivals by 17.9% (302 570) and an increase in the number of overnight stays by 18.0% (595 637). Since 1997 when the official statistics for the tourist movement in the Canton of Sarajevo started to be kept, the year 2013 has been the record year in number of tourist arrivals and overnight stays.

Domestic tourists recorded an increase in the number of arrivals by 1.0% (49 045) and a decrease in the number of overnight stays by 1.7% (84 065). An increase in the number of arrivals of foreign tourists by 21.8% (253 525) was recorded and an increase of the number of overnight stays by 22.0% (511 572). In the structure of foreign tourist arrivals, the most arrivals were realized by tourists from Turkey (17.3%), Croatia (16.7%), Slovenia (7.0%), Serbia (4.9%) and Germany (3.7%). In the structure of foreign tourist overnight stays in 2013 the most overnight stays were realized by tourists from Turkey (16.8%), Croatia (14.8%), Kuwait (5.8%), Slovenia (5.7%) and Serbia (4, 6%).

Table 2: *The number of tourists and overnight stays in the Canton of Sarajevo for the period of 2007-2014*

Year	Number of tourists	Number of overnight stays
2007	167 490	332 259
2008	166 304	324 249
2009	167 490	324 677
2010	170 469	324 249
2011	205 766	385 433
2012	258 773	453 433
2013	302 570	595 637
2014	306 018	603 895

Source: Agency for Statistics of the Federation Bosnia and Herzegovina, 2007-2014

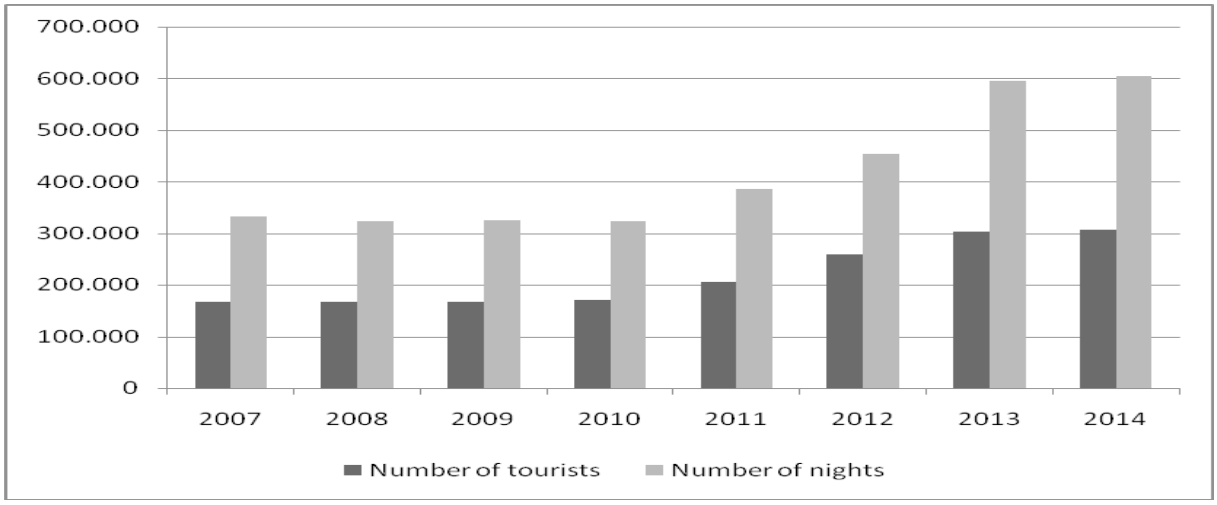

Fig 2: *Number of tourists and number of nights in the Canton of Sarajevo, 2007-2014*

CONCLUSION

The Canton of Sarajevo is rich in tourist attractions and is characterized by numerous contrasts, which at first sight appear to exclude each other, however, harmoniously complement each other. The Canton of Sarajevo is dominated by medium-high mountains. They are fold, massive, plateau (erosion), fault-block and volcanic. They are rich in minerals, geothermal water springs, large forest complexes, hunting grounds, mountaineering terrains and possibilities for winter sports. The 1984 Winter Olympics held in Sarajevo were an ideal base for affirmation of winter mountain tourism in Bosnia and Herzegovina and the region. For nature lovers who are not keen on winter sports the other seasons are more interesting because they can enjoy then the green wooded expanses surrounded by quietness and harmony of sounds and colours that bring spiritual peace in the Olympic mountains Bjelašnica, Trebević, Igman and Jahorina near the famous historical city of Sarajevo.

The cultural heritage of the Canton of Sarajevo is diverse and unique. It reflects a diversity that began after the meeting of the Slavic immigrants' culture with the culture of the local population. These cultures pervaded each other in a historical symbiosis, blended with old Bosnian customs but are also retained in their original form to this day despite the strong and often violent impact of other more advanced civilizations. There are great opportunities for foreign tourists whose curiosity is not limited to sunbathing, swimming, hunting and fishing only. They can also explore the cultural heritage of the Canton of Sarajevo. The people of this country are curious, friendly and modest, they have always been helpful and willing to welcome guests and offer them everything they have along with safety and atmosphere that can rarely be encountered elsewhere in the world.

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TOURISM AS A SEGMENT OF SPATIAL PLANNING OF STARA PLANINA

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ABSTRACT

Untouched nature makes the Stara Planina Mountain one of the most beautiful mountains in the eastern part of Serbia, and one of its most valuable tourist areas and protected nature parks. Stara Planina possesses natural and anthropogenic potential for tourism development which is recognized by tourism experts. Development of mountain tourism on the Stara Planina Mountain created the first mega project in Serbian tourism conducted according to international competition standards. It raised arguments for attracting investments, but also for the international and local promotion of the area. The development of tourism by building hotels, resorts, amusement parks, ski resorts, and other elements inevitably affects the transformation of the space that adapts to the needs of tourists. The aim of this paper is to emphasize the importance of spatial planning for the development of tourism in Stara Planina, as well as to highlight the impact that tourism and its development have on its territory.

Keywords: *Stara planina, spatial planning, tourism, sustainable development*

INTRODUCTION

Space and environment are immanent to the concept of tourism and, vice versa, the concept of tourism is unthinkable without the components of the area and the environment. With its planetary spreading, tourism over time has begun to produce visible negative traces on space and the environment, no matter how "harmless" it seemed initially compared to other "aggressive" activities, such as the industry, for example. Accordingly, the reaction of analysts and experts, and the negative effects of tourism development gradually gained a more critical tone. An a series of international conferences held during the last twenty years, a consensus has been reached on the need to adopt a new approach to spatial planning of tourism, which, on the one hand, would facilitate the development of these activities, and, on the other hand, will expand the space for tourist movements in the future (Jovičić and Ivanović, 2006; Popović *et al.*, 2012; Stefanović and Azemović, 2012).

The area of the Stara Planina Mountain, under the proposal of the Institute for Nature Conservation of Serbia, Government Regulation of the Republic of Serbia, was placed under protection as a nature park in 1997 (Regulation for the protection of Nature Park Stara Planina, The Official Gazette of the Republic of Serbia, 1997, 58). Serbia's strategic documents designated Stara Planina as a priority area for tourism development. Controlled development of certain forms of tourism and economic sustainability involves implementation of projects of building the tourist, leisure and transport infrastructure, with limited capacity, to prevent over-exploitation of tourism. Tourism development in the Stara Planina Mountain has to rely on three main pillars: economy, ecology and social environment (Staju, 2008).

The adoption of the Spatial Plan of the Republic of Serbia in 2010 marked Stara Planina as a tourist centre of the first category that is to be built. This is particularly true of the Babin Zub area (Spatial Plan of the Republic of Serbia, 2010). However, significant limiting factors for the development of tourism, such as an inadequate traffic connection between many parts of the mountain, the lack of tourism tradition, highlighted migration of the rural population, the general stagnancy of the mountain area, etc. (Stanković, 1994). This did not prevent Stara Planina to be interpolated as a potential tourist region.

Oversized and poorly designed tourist inbound is the basis of the negative effects on the environment, therefore, the impact that tourism and its development have on the area of Stara Planina will be pointed out in the paper. Furthermore, the indicators of environmental protection will be presented to emphasize the importance of spatial planning for the development of tourism in the mountain.

The research methodology involves representation of spatial planning documents governing the area of the Stara

Planina Mountain, with special emphasis on the analysis of the space through the Spatial Plan of the Republic of Serbia, the Spatial Plan of the nature park and the tourist region of Stara Planina, the Plan for tourism development on Stara Planina - Master plan, which stresses the importance of spatial planning for the development of tourism on the mountain. The methods used in the preparation of the paper include cabinet research, review of laws and regulatory requirements, the spatial planning documents, field research and personal observations.

SPATIAL PLANNING IN FUNCTION OF TOURISM DEVELOPMENT

Considering that interactions between the environment and tourism are becoming increasingly complex and contradictory, it is clear that the use and protection of space as a fundamental tourism resource in the context of sustainable economic development becomes more and more important. To prevent conflicts between tourism and space, it is necessary to integrate tourism planning in a unique process of spatial planning of attractive tourist areas. Although urban planning is an achievement of the second half of the twentieth century, the roots of this activity should be sought in the organized activities of the first civilizations that have left clear traces of organization and administration of the large territories that they controlled (Đorđević and Daković, 2007).

Today, urban planning in tourism is an integral form of planning that involves social and economic aspects, becoming a necessity and practice in the world, which was pointed out by a number of researches of the World Tourism Organization (Čomić, 1990). Due to the intensive development of mass tourism and a growing number of countries and regions that are involved in tourism development, it is practically impossible to leave the physical development and in general, the development of tourism to chance, to what some negative experiences warn, in different countries and regions where there has been a proliferation of uncontrolled tourism and environmental degradation (Čomić, 1988). The negative impacts of tourism on the environment were observed after noticing the positive ones, thus at the very beginning of the development of tourism they weren't considered adequately important (Stanković and Pavlović, 2006).

Spatial planning of tourism is a part of the overall planning of certain territorial entities. It is started by determining the number, value and distribution of natural and anthropogenic tourist values that have a corresponding contractive zone and the recognition of the domestic and international tourism market (Čomić, 1990). Spatial planning is a conscious and planned activity, which aims at choosing the optimal composition of facilities in a given area based on the valuation carried out, in the function of pre-determined volumes of demand, supply potential and socioeconomic goals of society (Dredge, 1999; Jovičić and Ivanović 2006; Piha, 1982).

Given the important economic and social functions of tourism, as well as its ability to intensify other economic sectors (agricultural and economic potential of various types of services, transportation, etc.) in the spatial plan of certain areas, it is necessary to do an accurate valuation of the tourism values and potentials. Everything mentioned is important to conclude to what extent and on what places tourism can represent a development asset of the entire economy of the planned areas (Šećerov, 2008).

A quality of space and surrounding tourist areas is an integral part of selling the travel services despite the fact that they are not the property of any economic organization, but belong to society as a whole. It follows that the obligation of the tourism industry (in its own interest, and in order to compensate to society the rewards that may arise from the selling of space), is to undertake everything possible, so as to preserve the basic qualities of space and environment, and so that the construction of hotels fits into the surroundings in the best possible way (Gašparević, 1977).

OVERVIEW OF PLANNING DOCUMENTS OF STARA PLANINA

Spatial planning of tourism is an integral part of overall development plans. The goals and objectives are complementary to the efforts of the development of the country as a whole. In this sense, the spatial planning process has a number of tasks such as determining the number, value and distribution of natural and anthropogenic tourist values (Stanković, 2006; Stanković, 2007), the definition of tourism products, the portfolio of tourism products and their relationship to a unique offer, which is the basis of vision for tourism development.

Planning documents consist of spatial and urban plans. Spatial plans are: Regional Spatial Plan, Plan of the local government and Spatial plan of special purpose areas. Stara Planina regionally belongs to the Eastern Serbia and administratively covers the territory of four municipalities: Zaječar (9.958 ha), Knjaževac (57.968 ha), Pirot (63.194 ha) and Dimitrovgrad (11,099 ha).

Table 1. *Spatial plans of the territory of the municipalities of Dimitrovgrad, Pirot, Zaječar and Knjaževac*

Year	Type of Plan	Title	Area covered by the plan (km^2)
Dimitrovgrad			
2011	Spatial plan of the local government	Spatial Plan of the municipality of Dimitrovgrad	483
2010	Spatial plan of special purpose areas (SPSPA)	SPSPA of the Nature Park and tourist region Stara Planina	1549.1
2010	Spatial plan of special purpose areas	SPSPA of the infrastructure of the corridor Niš-Bulgarian border	998.41
Pirot			
2010	Spatial plan of special purpose areas	SPSPA of the Nature Park and tourist region Stara Planina	1549.1
2010	Spatial plan of special purpose areas	SPSPA of the infrastructure of the corridor Niš-Bulgarian border	998.41

Zaječar			
2012	Regional Spatial Plan	Regional Spatial Plan of Timočka Krajina	7130
2011	Spatial plan of the local government	Spatial Plan of the city of Zaječar	1069
2010	Spatial plan of special purpose areas	SPSPA of the archaeological site Romulijana-Gamzigrad	50.99
2010	Spatial plan of special purpose areas	SPSPA of the Nature Park and tourist region Stara Planina	1549.1
Knjaževac			
2012	Regional Spatial Plan	Regional Spatial Plan of Timočka Krajina	7130
2010	Spatial plan of special purpose areas	SPSPA of the Nature Park and tourist region Stara Planina	1549.1
2010	Spatial plan of special purpose areas	SPSPA of the basin of the „Bovan" water accumulation	633.29

In addition to these spatial plans, for Stara Planina of particular importance are the Spatial Plan of the Republic of Serbia, the Spatial Plan of the nature park and the tourist region of Stara Planina and the Plan for tourism development in Stara Planina with pre-investment study, physical and technical characteristics of the ski area.

The Spatial Plan of the Republic of Serbia is a document which sets out long-term fundamentals of the organization, development, use and protection of the territory of the Republic of Serbia in order to harmonize economic and social development of the natural, environmental and cultural resources and constraints on its territory. According to the Law on Spatial Planning of the Republic of Serbia from 2010 to 2020, the Republic of Serbia has a variety of resources for sustainable mountain development, of which only a part is activated.

In the strategic priorities for the development and protection of high mountain areas until 2014, Stara Planina counts as well with the following activities: the creation of tourist centres and resorts in the municipalities of Pirot, Knjaževac with the launch of the tourism development and utility equipment in sub-mountain villages, promoting agriculture and other complementary activities, the development of cross-border cooperation with Bulgaria and improving protecting and maintaining the status of the Nature Park. This law puts the Stara Planina in high mountainous areas of national importance. The Spatial Plan treats Stara Planina as an area of natural resources and the main natural tourism potentials in the strategic framework for sustainable development of the Republic of Serbia.

The Spatial Plan of the nature park and the tourist region of Stara Planina is a document which covers a total surface area of approximately 1.542 km^2 and includes the municipalities of Dimitrovgrad and Pirot (Pirot district), the City of Zaječar and the municipality of Knjaževac (Timok district) in the most eastern part of Serbia on the state border of the Republic of Serbia to the Republic of Bulgaria.

The Spatial Plan determines differentiated regimes of protection, utilization and management of the zones established to protect the nature park. In the Nature Park area with a first level protection regime (42 km^2) is prohibited the use of natural resources and other forms of usage and activity other than scientific research, education and limited organized presentation. In the area of protection regime level II (197 km^2) are established limits and controlled use of natural resources, and the use of construction. In the area with protection regime level III (905 km^2) is established a regime with selective controlled management of the natural resources, construction and use of space and activities in the area, under the condition of maintaining a high quality environment, biological and landscape diversity. It is an agricultural-forest and habitation zone.

In addition to environmental protection, the Plan deals with the protection and improvement of environmental quality and protection of immovable cultural property. Furthermore, it presents the Stara Planina area as suitable for the development of agricultural products and a proposal of activities for the improvement of organizational, technological and socioeconomic aspects of agricultural development is made. A Tourism Program was also presented by the Spatial Plan, as well as organization and development of tourist areas and the rules of construction, development, protection and exploitation tourism areas in Stara Planina.

Master plan of Stara Planina (Tourism development plan in Stara Planina with the pre-investment study, physical and technical characteristics of the ski centre, 2007)

The project is structured in such a way that in addition to the elaboration of a conceptual physical master plan it proposes a comprehensive business plan to make possible the negotiation process with potential investors to be started. The project focused on the execution of the following key tasks:

- General situational analysis of the terms of this project, including an analysis of local preferences and interests;
- Market analysis and benchmarking project;
- Physical evaluation of the areas included with an assessment of the technical possibilities of the proposed installation of ski slopes and lifts;
- The technical concept of a comprehensive central vacation / accommodation resort;
- The final draft of the physical master plan that includes a skiing infrastructure and a proposal for a central vacation / accommodation resort;
- Marketing strategy and product development proposal;
- Business plan for the project, and
- Final report on the project and the suggested management model and implementation plan.

According to this plan document, key competitive advantages of the tourism development project on Stara Planina are: expanse of untouched mountain in the form of a plateau and with different elevations suitable for skiing; masterly views with huge possibilities for development of tourism infrastructure; abundance of water and flora; diversified structure of attractions and good configuration of the broader area of the mountain; the name of Stara Planina is internationally recognized mountain brand that Serbia and Bulgaria share; size of the project and its priority status in the Tourism Development Strategy of Serbia.

Key competitive constraints of the project of development of tourism on Stara Planina are the following. Serbia is not recognized as a tourist destination and there are no quality standards in the tourism industry; poor economic situation of the region and mostly elderly people; insufficient and limited expertise of local staff in tourism and hospitality; insufficient protection and maintenance of natural and cultural attractions and resources, lack of potential drivers for new tourism development.

A Program for the development of mountain tourism in the Stara Planina area (based on the Master Plan, 2007) was prepared for the area of 192 km^2 in the municipality of Knjaževac and Pirot. In this area a tourist resort was planned (compact complex of tourist offer with centralized accommodation and direct contact with the tourist infrastructure) capacity of 22 861 beds (in the locality of Jabučko ravnište 18 576 beds and in the locality of Leskovo 4 285 beds), mostly in the municipality of Knjaževac and to a lesser extent in the municipality of Pirot. In the function of this accommodation and day-trippers skiers is planned an alpine ski resort with a total capacity of 26 835 skiers, out on the territory of Knjaževac 21 895 skiers (sector Jabučko ravnište – Golema reka) and the municipality of Pirot 4,940 skiers (sector Jabučko ravnište – Topli Do).

DISCUSION

For the Government of Serbia, tourism is one of the priority areas of further socioeconomic development (Orlović-Lovren *et al.,* 2013). The state's decision to invest in the project in the Stara Planina Mountain created good preconditions for tourism and economic development in the Southeast of Serbia. Stara Planina possesses cover a very wide range of existing resources and attractions that can be touristically commercialized. In addition to existing activities (alpine skiing, walking in the snow, hiking, walking and mountain biking) could be developed also Nordic skiing, ski bike, tubing, skating, kayaking, horseback riding, jeep tours, hunting, fishing, golf, tennis, etc. Thermal and mineral springs are used for bathing and for medical purposes; however, bids may be extended to wellness and SPA treatments, hydrotherapy, sauna, yoga, fitness programs, weight loss programs, and so on. Besides the wine roads that are of local interest, in this area could also be organized cheese routes, visits to wine cellars, households with traditional cuisine in the function of secondary products.

Intensification of development of tourism in the Stara Planina region, i.e. of tourism with complementary activities, contributes to initiation of dynamic economic development, work engagement of the population, the attractiveness of the region for housing, reducing the negative demographic processes and raising the living standards of local people while providing the conditions for addressing other developmental problems.

The fact is that this process will significantly degrade the available natural resources, although tourism within the priorities insists on the preservation and promotion of natural and cultural heritage, i.e. on the wise management of space, which is a prerequisite for sustainable development. The collision between the environment and planned activities that may significantly compromise its quality leads to a mismatch that will be increasingly expressed on this mountain in its further development (Bošković and Milenković, 2012).

The planning criteria and options for the implementation of commercial content of mountain tourism in the mountainous area of the Nature Park and the tourist region of Stara Planina are: achieving high standards of tourist offer in the area; organizing activities for specific aspects of an environmental, ethnological and architectural offer in space; preference for dispersed tourist accommodation; to raise the standards of existing and the construction of new buildings of high standards for tourist accommodation; construction of new buildings of high standards for sport and recreation, public services and services; realizing the rational utilization of tourism facilities on an annual basis; traffic and functional association of the tourist offer of mountain zones with the emitting area and with the tourist offer of sub-alpine tourist area as well as education of all stakeholders on sustainable development, protection and use of the nature park, and the tourist region; i.e. raising awareness both in local residents and visitors about tourism development and other resources and values of the Spatial Plan areas.

Indicators of the environmental conditions in the Stara Planina Mountain show the percentage of land on which building is permitted, but has not been realized, as well as the percentage change in the construction area for the next five years. Of the total area of Stara Planina (1.542 km^2) agricultural land covers 841 km^2, forests and forest land 613 km^2 and 89 km^2 - other land.

Planned changes in the balance of the use of space by 2022 will mostly affect agricultural land which will be reduced by 79 km^2 (9.3%), amounting to 762 km^2 or 49.4% of the area of Stara Planina. For the purposes of tourism development will be earmarked 3 km^2 of agricultural land, while a 76 km^2 area will be afforested, in order to stop the erosion, protect a drainage area of water accumulation "Zavoj" and local sources, and enhance biodiversity, not only in the higher mountain areas, but also in the vicinity of villages on the land of the lowest production and economic potential.

Other land (construction land, the area under water accumulation "Zavoj", watercourses, barren land) will increase from 89 km^2 to 92km^2 (3.5%), amounting to about 5.9% of the total area of Stara Planina. In terms of percentage of land awaiting development of tourist facilities in accordance with the plan documents, the area of Stara Planina is situated in a favourable position with the planned percentage of 3.5% (sustainable state).

Another indicator of the environmental conditions is a change of use of agricultural land for a period of five years. Experience shows that any transformation of agricultural land to other uses during the five years to the extent greater than 2% is worrying and that it is necessary to slow down these trends by taking certain measures (Petrović *et al*., 2012). In the

case of the Stara Planina Mountain the present indicator (measured by the percentage tourism facilities to be increased) in the period from 2006 until 2022 is 3.08%. Because it is a fifteen-year period, indicated increasing of tourist facilities at the expense of reduction of agricultural land is acceptable.

Tourism development of Stara Planina should be a conscious and planned activity in order to be indeed environmentally and socially acceptable. However, it is not uncommon that in practice it is not so. In the process of transforming, the initial space may be subject to both positive and negative effects, most often combined.

Improving the aesthetic quality of space can be seen as a positive change that has brought and will bring the further development of tourism in the Stara Planina area. Furthermore, the development of this field has led to investment in infrastructure, especially road construction. The spatial plan is considering formation of a circular traffic ring road in the Nature Park and a tourist region with radial connections, with the introduction of electric rail and gondola transport and organization of public transport systems. On the other hand, it is inevitable that tourism has a negative effect on the area in which it is developed, especially degradation of the landscape and the environment by building roads and tourist facilities (Staju, 2008). It is a fact that big cable cars cannot be "environmentally" built, but rather leave behind destruction of the space primarily because they are built in parts of the mountains where asphalted roads and roads for large trucks have not existed.

By building area is being polluted, too by moving, staying and activities of the tourists themselves. Tourism development, supporting construction, arrangement and equipment, inevitably occupy a growing new area at the expense of agricultural and natural areas in the Stara Planina, which will tend to increase (Stankov *et al.,* 2011). It is questionable whether it will be in accordance with the spatial plan in the future.

Air pollution is linked primarily to automobile exhaust fumes, because most tourists will use cars to come to this mountain. Inevitable is also the degradation of the flora and fauna because of the behaviour of tourists that are prone to uncontrolled collection of wild and field fruits, breaking branches, tearing up of the roots of certain plants, etc.

The process of transforming the Toplodolska River into the Zavoj Lake is a clear degradation of these natural resources that is proposed by the spatial plan.

Due to the lack of snow during the ski season ski management use guns to produce snow. Manufactured snow is different from the natural by physical and chemical properties because of adding additives such are snowflakes, power pack and Snomax. Produced snow causes mutation and loss of flora on mountain slopes where ski trails are constructed (Patthey *et al.*, 2008). Spraying ski trails and roads with various chemicals destroys not only the biological but also the pedological cover.

CONCLUSION

Given the expected growth and development rate that should be achieved in the future, tourism in the area of the Stara Planina Mountain must be carefully and responsibly planned and guided, to ensure the sustainability of the tourism business, as well as a controlled, efficient and transparent use and management of the available natural tourism resources.

The development of tourism in the area of Stara Planina has not yet come to the point that would cause serious environmental and sociocultural disruption. Indicators of the environment at this time meet the criteria of the European Union, which means that it belongs to the green zone, which is considered as sustainable development. Future development should also strive to this goal because it is the only thing that allows the preservation of the primary resources upon which the tourism development, that is the environment, is based.

With the construction of ski lifts and ski runs as well as accommodation and other infrastructure, the Stara Planina area could quickly become one of the largest and most important ski centres in Serbia. Stara Planina should be devised and imposed to the market, as the centre of mountain tourism accessible to tourists in summer and winter, with the development of tourism products that will prevent degradation of nature outside acceptable, environmental limits.

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DEVELOPING SUSTAINABLE TOURISM IN THE NATIONAL PARK GALICICA

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ABSTRACT

Contemporary tourism development shows a shift of tourism demand towards highly specialized and sustainable tourism forms. This arises from the expanding environmental awareness among tourists and providers of tourism services during the last decade. Tourism destinations become more and more oriented towards attracting tourists who pursuit services and products of higher quality. On the other hand, destinations tend to facilitate the protection of natural and cultural tourism resources from excessive exploitation and devastation that arises from the saturation during a concentrated and relatively short tourism season. That can only be achieved through diverting the strategic developmental directions of tourism from the traditional "mass-tourism" forms towards new and more sustainable types of tourism. Such an example is the region of the National Park "Galicica" in the Ohrid area in the Republic of Macedonia. This region represents the most developed tourism region in the country with numerous quality natural and cultural resources concentrated on a relatively small area as well as the highest number of registered tourists' visits. Therefore, a real threat exists from the tourists that visit the region themselves, as well as the actions from the tourism offer to satisfy their needs. One of these tourism types that are based on sustainable development and that show great potential for development in this region represents geo-tourism. This type of tourism can be a great opportunity for developing a quality tourism brand.

Keywords: *Sustainable tourism, tourism development, geotourism, national parks, geo-parks*.

INTRODUCTION

Geo-tourism is a relatively modern form of tourism which exhibits significant potential for development in the future. It represents a segment of tourism which had significant development around the world in recent years. Initial researches on geo-tourism as well as the first definitions derive from the UK but from day to day the field of research is expanding in other regions of the world and it gains international character by the scientific community. The term itself began to be used in the early 90's of the XX century, but the beginnings of the practical application can even be seen as early as the XVII century. It can be said that people from ancient times have visited the so called "geological wonders", such as mountains, caves, volcanoes, fossils, canyons and so on. It should be noted that only in recent years a market for this type of tourism has begun to develop with its own specific and contemporary features. That all was based on changes in the scientific interpretation, protection of the geological heritage as well as on combining entertainment and education. The resource basis of geo-tourism includes a set or combination of geo - locations, museums, scientific and professional literature and artistic expression. Defining geo-tourism has started also relatively recently and still is subject to redefining and improvements. Furthermore, due to the different positions on the emergence and historical development of geo-tourism, as well as the different views on its theoretical framework and its benefits, there are misunderstandings about the importance of its resource basis by various existing and potential stakeholders where it is being developed.

It can be said that geo-tourism represents a niche type of tourism that arose from the tourists' needs who became more interested in recreational activities and to visit more quality, standardized destinations that use their natural and anthropogenic resources in a sustainable way, where the awareness about the natural and anthropogenic heritage deepens through contemporary forms of interpretation. Such destinations represent the created geo - parks around the world with the support of UNESCO. Geo-tourism is a segment of nature - based tourism or recreational tourism which currently is booming and where the main development basis is geodiversity. A new niche tourism type has been created with its specifications and features that not only is in line with the trends of modern tourism development, but also creates its own trends. Thus, geo - parks are some kind of pioneering forms of destinations that incorporate geo-tourism and are positive examples for successful local and sustainable development.

In order to successfully develop geo-tourism primarily there must exist also awareness about the geological heritage. Geological processes that have greater scientific and educational significance can be combined with aesthetic / monumental values which can become geo - locations with excellent tourism potential. Through the implementation and development of geo-tourism certain knowledge about geodiversity, geoconservation is being stimulated as well as their use in sustainable development. It is important to mention that geo-tourism has different values than geodiversity. The main goal is to differentiate and to enrich the tourism offer. Thus, a location that has a rich geological heritage should also have natural and anthropogenic (biotic and abiotic) values and approaches. Of course a good interpretation and additional services (accommodation, food services, recreational activities, events, etc.) should also exist in order to meet the needs of the geo-tourists.

Geo-tourists however, should also be defined if the idea to develop geo-tourism in a location and properly to direct the tourism offer persists. Determining the market segment which is interested in visits of the geo – parks is a necessity.

Although geo-tourism is about a niche tourism type with specific interest of the consumers, the market segment is a broad category that ranges from students who are interested in the educational importance of geological and geomorphologic values of given areas, to scientists performing research activities to improve geo-conservation, and to groups of tourists who do not have to have a broad knowledge of the issues to visit these locations.

From the above mentioned it can be concluded that there is a connection with eco-tourism. It is a result of the increased interest in eco-tourism activities and cultural tourism of tourists in recent years. Certain common elements are present in both approaches. It is important to note that geo-tourism is not only the sum of tourism activities related to geological, geomorphologic and soil phenomena and processes, but in a broader sense it also includes anthropogenic and biotic values in a sustainable way. Namely, geo-tourism can be defined as a combination of tourism products, services and infrastructure in a given location with the aim to promote geological and geomorphologic heritage in combination with other elements of the natural and cultural heritage (archaeology, ecology, historical - cultural sites, etc.).[1]

Sustainable tourism as one of the dominant dimensions contains the protection of space. The Ohrid region and especially the National Park Galicica represent such spatial units. These are spatial units with significant anthropogenic and natural values. The protection of the entire area is a complicated activity. In this sense, providing protection involves securing funds from various sources. In certain areas for this function funds are being taken from the state budget. The self-sustaining development of protected areas, such as the National Park Galicica is bound also to the resources of the meliorate zone. This means that forests, pastures as well as breeding of rare, aromatic and medicinal plants can be a solid source of income. However, this complicates the situation with the sustainable use of natural resources. Tourism, in this sense appears as an adequate source of income funds for the local population, but also in a wider context. Diverting tourism activities with the aim for a larger use of other resources (abiotic) will provide relief in this direction and reducing the risk for their destruction.

DATA AND METHODS

Within this paper the need for defining the term geo-tourism as a modern phenomenon appeared which itself has occurred only recently in the tourism science as well as the scientific public. The existence of various definitions related to geo-tourism imposes the need to detect a sublimated approach where the advantages and disadvantages of groups of definitions are being reviewed. The approaches towards geo-tourism on the European and American continent greatly vary. Both cases refer to a type of sustainable tourism or modern and niche type of tourism, and because the area of the National Park Galicica in the Republic of Macedonia is being considered we strongly think that a more acceptable model is the one accepted in Europe, or by the European network of geo-parks. The criteria of the European geo-parks are specific and require adherence to certain rules.

From the above mentioned it can be concluded that also the need arises for determining of whether the National Park Galicica meets the preconditions for a possible declaring it as a geo-park and development of geo-tourism on its territory or the closer environment. Consequently, an inventory and tourist valorisation is required as of the geological and geomorphologic features and phenomena that the examined area has, as well as of the other existent resources of natural and anthropogenic origin, which is rare and quite rich on a global level.

In addition to that, the opinions and attitudes of tourists (domestic and foreign) who have visited the region are also considered. The studies related to the views of tourists about the natural and anthropogenic values in the Ohrid region, especially in the National Park Galicica, which we believe is particularly important because of the presence of significant geological, geomorphologic and soil resources, were conducted within the Strategy for the development of sustainable tourism or, more precisely within the Management Plan for the National Park Galicica - since 2011. These studies were conducted by the Faculty of Tourism and Hospitality – Ohrid, especially related to the data collection and processing. The questionnaires covered a population of 470 people in the regions of the municipalities of Ohrid and Resen, as well as 830 respondents (residents and tourists) in the National Park Galicica. In the interest of this paper only questions are covered that we consider as relevant to the addressed issue of geo-tourism development in this region.

DEFINING GEO-TOURISM AND GEO-PARKS

The idea for proclaiming geo - parks appeared for the first time in 1999 when the relations between the people and the geology were recognized as well as the potentials for economic development; when whole landscape areas were promoted opposed to small geological sites; and when they were managed in a holistic manner in order to protect and promote the natural values. The concept was modelled according to the Man and Biosphere Program by UNESCO, which highlighted the links and relations between conservation and development, adding links and relations of science, education and sustainable development. Geo-localities in geo-parks must have scientific significance, as well as to have educational potential and aesthetic value. The interest of tourists for geology should be combined with archaeological, historical, cultural and environmental interests.

The first analogue terms and definitions about geo-tourism can be found in Australia or more precisely in the study of Jenkins where the phrase "fossicking" was used as a term to replace the so called "gold rush" used in 1850-ies to describe geology focused tourism.[2]

The term "geo-tourism" was used for the first time in the early 1990-ies in Malaysia, as well as the term "tourist geology" as a term for a specialized and applied geology that supports the growth of eco-tourism: "...conservation geology which is on the same level as conservation biology…."[3].

1 *Reynard, E. (2008) Scientific research and tourist promotion of geomorphological heritage, Geogr. Fis. Dinam. Quat.*

2 *Jenkins, J. M. (1992) Fossickers and Rockhounds in Northern New South Wales, In: Weiler, B. & Hall, C. M. (eds) Special Interest Tourism, Belhaven, London*

3 *Komoo, I. (1997) Conservation geology: A case for the ecotourism industry of Malaysia, In: Marinos, P. G., Koukis, G. C., Tsiambaos, G. C. &*

According to Stueve, geo-tourism is being defined in a **broader sense** - including a wider geographical, socio-economic and cultural context that is placed on the importance of geographical tourism. That is, geo-tourism is considered synonymous with "geographic tourism" which is aimed at integrative detecting a given destination, with all its natural and anthropogenic components. In this sense, geology and geomorphology are considered as additional elements of ecological systems and economic development. This most likely derives from the notion that geology is the basis of the physical environment and consequently, also of the ecological systems, as well as through expanding the cultural, spiritual and economic spheres.

In the United States by the National Geographic Magazine an attempt for defining geo-tourism was made. According to the magazine geo-tourism is the "geographical character of a given destination - the overall combination of the natural and anthropogenic values that make the location different from other".

Another definition of the magazine is the following: "Tourism that provides sustainability, or enhancing the geographical character of a place - its environment, heritage, aesthetic character, culture and the contribution to its population"[4].

The main disadvantage of these broader sense definitions is the possibility to support "geo-exploitation", because the conservation of these values is not emphasized. Furthermore another disadvantage is that geological and geomorphologic values of a location are not specifically separated as the main motivation for the tourists' visits, as opposed to other secondary and additional anthropogenic and natural values. Geo-tourism in this sense is placed within other types of tourism, such as geographical tourism, eco-tourism, educational tourism, etc., and is not emphasized as a separate and contemporary type of tourism.

In terms of the participants, or in a **narrower sense**, geo-tourism can be defined as "recreational geology", which as a set of complex activities is subject to seasonal effects.[5] Geo-tourism can extend the tourism season in more traditional, mostly coastal tourist regions and cause regenerating strategies in abandoned mines or old industrial regions.

It can be said that Hose provides more detailed definitions undergoing redefinitions by the same author. Therefore, geo-tourism represents the "set of interpretation facilities and for providing services that allow tourists to gain knowledge and understanding of geology and geomorphology in a given location, including the contribution that they have to the development of Earth Sciences"[6].

The same author then gives the following definition: "The promotion and explaining to an uneducated audience the geological features and/or the significance of a separate location in a facility and/or publication."

The redefinition by the same author, after extensive scientific research in this domain, is the following: "The set of facilities and services for interpretation with the aim to promote the values and social benefits of geological and geomorphologic localities and their materials, as well as to ensure their conservation for students, tourists and other occasional visitors".[7]

The redefinition by the same author, after extensive scientific research in this domain, is the following: "The set of facilities and services for interpretation with the aim to promote the values and social benefits of geological and geomorphologic localities and their materials, as well as to ensure their conservation for students, tourists and other occasional visitors".

On the other side also other authors in recent years provide definitions in a narrower sense. Dowling and Newsome consider geo-tourism to be a "sustainable type of tourism with a primary focus on experiencing the geological features of the Earth in a way that enhances the environmental and social understanding, respect and conservation, and which exhibits local benefits. It is about creating geo-tourism product that protects geo-heritage, helps in building communities, promoting geological heritage and includes a large number of stakeholders."[8]

The given definitions in a narrower sense manifest more advantages in comparison to the definitions in a broader sense. The "geo" element in them represents the geology and geomorphology. It can be said that geo-tourism combines the geological elements (forms and processes) with the components of tourism such as attractions, accommodation, package tours, activities, interpretation, promotion, planning and management.

The authors who review the definitions about geo-tourism in a narrower sense analyse this issue as a system composed of three subsystems:

- ***Forms*** (landscapes, earth forms, sediments, rocks, soils, fossils, etc.);
- ***Processes*** (tectonic activity, volcanic processes, abrasive processes, weathering processes, Aeolian processes, accumulation processes, etc.);
- ***Tourism*** (attractions, accommodation, tours, activities, interpretation, promotion, planning and management).

In interest of this paper a summarized definition about geo-tourism can be given:

Geo-tourism is a contemporary niche type of tourism with special interest that develops in a region because of the value of geodiversity (the set of geological, geomorphologic and soil phenomena, processes, relations, characteristics, interpretations and systems), combined with the other natural (biotic) and anthropogenic values; it encourages geo-conservation through sustainable development, interpretation and promotion of the values in that environment, that generate benefits for the local communities[9].

There are five key principles that are fundamental to geo-tourism[10]:

- Geology based

Stournas, G. C. (eds) Engineering Geology and the Environment, Balkema, Rotterdam

4 Travel Industry Association of America (2002) Geotourism Study, National Geographic Traveler Magazine

5 Hose, T. A. (1996) Geotourism, or can tourists become causal rocklounds?, In: Bennett, M. R., Doyle, P., Larwood, J. G. & Prosser, C. D. Geology on your Doorstep: the Role of Urban Geology in Earth Heritage Conservation, Geological Society, London

6 Hose, T. A. (1995). Selling the Story of Britain's Stone, Environmental Interpretation

7 Hose, T. A. (2003) Geotourism in England: A Two-Region Case Study Analysis, University of Birmingham

8 Dowling, R.K. & Newsome, D. (2006) (eds.). Geotourism. Elsevier, Oxford, UK

9 Risteski M., Kocevski J. (2013) Geotourism as a contemporary and sustainable type of tourism – XII International scientific conference on service sector, Ohrid, Republic of Macedonia, Published by Horizons – International scientific magazine, 2014

10 Dowling, R. K. (2011) Geotourism's Global Growth, Article, Geoheritage

- Sustainable
- Geology informative
- Creates local benefits
- Satisfaction of tourists

Geo-tourism means creating of such a state, or place where the local population and tourists can freely and without interference enjoy the local geological values.[11] It creates such an experience that connects the local landscape, community and tourists who exhibit different interests. Local businesses and communities need to cooperate in order to promote and create authentic and unique travel experiences. Much attention is put into informing tourists and local communities about the Earth values through geological interpretation and education. Geo-tourism businesses usually are managed by local communities and can include interpretation, package tours, providing services for accommodation and food and so on. On the other side it will generate new businesses and jobs for local people which will result in different economic benefits.

Geo-tourism can also generate benefits that will be used for the conservation of resources, in addition to social and cultural benefits. These benefits can be financial, where a part of the realized package tours in the region can be used to fund geo-conservation projects. The practical help in the field to the tourists involved in the collection of geological data and/or their analysis can be considered as an alternative.

The ***goals*** of sustainable geo-tourism can also be addressed:

- To create a greater awareness and understanding for the contributions that geo-tourism can have on the environment, local communities and economy;
- To raise the standard of living of the local population;
- To create benefits (income);
- To create a high quality geological experience for the tourists and
- To maintain and improve the quality of geo-heritage which are based on the previously stated goals.

The goals of geo-parks are achieved through the activities of conservation, education and geo-tourism. That is realized through protected and interpreted geo-localities, museums, information centres, trails, guided tours, school trips, popularized literature, maps, educational materials, information panels or seminars. In geo-parks economic activity and sustainable development is stimulated through developing geo-tourism. A high-quality brand for significant natural heritage is being promoted as well as local businesses involved in geo-tourism and creation of geo-products is being supported.

The Division of Earth Sciences of UNESCO began to develop the concept of creating a program for geo-parks far back in 1997 in order to support national and international activities for the conservation of Earth heritage. It was discovered that preservation and international recognition of geological heritage was not covered by any of the existing programs of UNESCO. Therefore, in 1999 a feasibility study was sent to the Executive Council in order to establish a program for geo-parks. Furthermore, it was reviewed whether some of the existing programs were associated with this initiative, such as the International Programme for Geological Correlation and the Man and Biosphere Program. The final decision by the Executive Council of UNESCO was not to develop a separate program within that framework. It can freely be said that from a legal point of view there is no such term as an "UNESCO Geo-Park". The Division of Earth Sciences continued to support the "Education of Earth Sciences"-strategy, through the promotion of Earth heritage, but only in cases where there was an explicit request by the Member States. The collaboration resulted in the creation of a European network of geo-parks in the year 2000 and the Global Network of National Geo-parks in the year 2004.

According to the charter of the European geo-parks they define the geo-parks as:

A European geo-park is a territory that includes special geological heritage and a strategy for sustainable development, supported by a European program to enhance development. Locations within a European geo-park must be connected in a network and to have benefits from the protection and management activities.

The European geo-park must protect the values of conservation of geological heritage and therefore there must not be any kind of destruction or sale of geological objects in it.

For a European territory to become a member of the global network of geo-parks of UNESCO, it must submit a complete application form to the European network of geo-parks, which acts as an organization for integration in the network responsible for the European continent[12].

The assumptions for a territory to be declared as a European Geo-Park are the following:

- It must be a strictly defined area;
- Most of the sites located within the territory of the European geo-park must form and be a part of the geological heritage, but their importance can be archaeological, ecological or cultural;
- To develop geo-tourism on its territory**;**
- An important goal is to help the local population to re-evaluate the values of heritage and actively to participate in cultural revitalization as a whole;
- They should experiment with the methods of protecting the geological heritage and to improve them;
- The park must communicate with local businesses engaged in geo-tourism activities.

4. Positive and negative impacts of geo-tourism

Each type of tourism causes impacts which can be positive and / or negative. The type of disturbance of any sort of recreational activity that are caused by tourists may depend on many factors, and depending on the nature they can also be permanent. Direct negative human impact caused by attending or recreation in the geological environment often

11 Dowling, R.K. & Newsome, D. (eds.) (2008) Geotourism. Proceedings of the Inaugural Global Geotourism Conference, 'Discover the Earth Beneath our Feet', Fremantle, Western Australia

12 http://www.europeangeoparks.com

results in drawing graffiti, erosion of loose rocks, disturbance of sensitive values (caves) and destruction as a result of excavation and collection of fossils.

The advantages that arise from the development of geo-tourism on a territory can be multidimensional, because of the fact that it generates benefits for all stakeholders involved in these processes. Several important advantages can be distinguished: generating economic, socio-cultural and environmental benefits through the development of sustainable tourism; generating new businesses and jobs; raising awareness about geodiversity and geo-conservation both for the tourists and for the local population; attracting more tourists interested in this type of niche tourism; extension of the tourist season; attracting scientists and researchers who will contribute in enhancing the level of protection of values, geo-conservation and preservation of the environment in general; developing alternative types of tourism that can be combined with geo-tourism in the tourism offer; cooperation between different stakeholders; creating a recognizable brand by creating a geo-park and so on.

The most important role of planning and management is to maximize the positive and to reduce the negative effects. However, intensive research activities should be done about the effects and impacts visitors and tourists have on the geological environments. Until recently it was considered that tourism does not manifest any important influences on these values. The reason for this was the fact that there was no broader knowledge about the impact of tourism on geology[13]. Later it was discovered that the rock formations and caves were influenced by both amateur collectors of minerals, rocks and fossils, as well as by professional collectors of souvenirs. On top of this vandalism in caves can be added in the form that tourists sign their names or initials. It should also be highlighted that there are damages caused by the climbers and mountaineers who destroy some rocks in their process of climbing.

With the increase of the number of tourists that visit these protected areas the potential also arises for negative impacts and the nature and level of impact can vary and be complex depending on the situation. The importance of the influences can depend on the type and the source of influence, the sensitivity of the environment, additional cumulative pressures, as well as the effectiveness of management in these environments. In some areas the influences that can be considered as negative can have positive influences in other areas.

RESEARCH FINDINGS ON THE POTENTIAL OPPORTUNITIES IN THE NATIONAL PARK GALICICA FOR DECLARING IT A GEO-PARK

With regard to the level of construction of accommodation facilities as well as the other elements of the material basis for the development of tourism this area has numerous advantages over the other regions. This region has also a dominant place concerning the level of attendance as well as spent tourist overnights.

The Galicica Mountain was declared a National Park for its values in 1958 but only on the Macedonian side. In the interest of this paper, the National Park Galicica deserves great attention because of the presence of geological and geomorphologic values which exhibit important features for a possible declaring of the Ohrid region, or the wider region of the National park as a geo-park and suitable for developing geo-tourism.

The Galicica National Park is located in the south-western part of the Republic of Macedonia, on the territory of the Galicica Mountain, along the shoreline of the Ohrid Lake, including parts of its branches of the Istok and Precna Mountain, as well as the island of Golem Grad in the Prespa Lake.

Besides its exceptional natural beauty and aesthetic value, Galicica is a unique environment with well-preserved natural flora in several ecosystems. The Galicica National Park contains more than 1,600 species of plants, which include numerous relict forms and at least 12 endemic forms, as well as about 100 species of plants that are collected for medicinal use.

The flora of the National Park Galicica includes more than 800 species, including many endemic and relict forms whose most distant borders stretch exactly on the mountain of Galicica. The presence of twelve discovered local endemic forms is very important. These forms are present only on the slopes of the Galicica Mountain, and a clear proof of the unique floral structure on the mountain. It should be emphasized that there is ongoing intensive research on the flora in the park. There are indications of an even greater number of endemic forms.

The fauna of Galicica is also very rich and diverse. There are no exact data on the number of invertebrate species. Vertebrates are present with 170 species including 10 species of amphibians, 18 reptiles, 124 birds and 18 mammals. The extreme importance of the National Park is considered in terms of the abundance of geomorphologic phenomena in this area that could be used as a resource basis in developing geo-tourism.

Geological surveys performed on the mountain of Galicica are undertaken by the Geological Institute – Skopje. According to them the rock massifs of a different age and mineralogical composition can be grouped into the following geological formations[14]:

- Complex of Paleozoic metamorphic and magma rocks;
- Complex of Mesozoic sediment rocks and
- Complex of Tertirary and Quarternary sediments.

Dominant morphogenetic processes participated in the past or are still involved today in the creation of diverse landscape forms: karst, glacial and periglacial forms. These processes are often intertwined (supplement each other). Their intensity has also been changing or has even completely disappeared depending on climate changes. On the Galicica Mountain dominant forms are the karst forms.

The Ohrid Lake, occupying the largest part of the protected area, is one of the oldest lakes in the world, which, due to its very clean waters represents a natural museum of relic freshwater organisms from the tertiary period, whose close relatives can be found as fossils. Its geographical isolation and the unchanging nature of its environment have helped many relict freshwater organisms from the tertiary period to be preserved in the Pelagonia area, whose close relatives can be

13 *Mathieson, A., Wall, G. (1982) Tourism: Economic, Physical and Social Impacts, Longman*
14 *Програма за развој на Југозападниот плански регион 2010 - 2015 (2010), Книга 1, Охрид*

found in fossil forms, and have helped through their evolution the formation of new species out of them. In this sense, the Ohrid Lake is similar to the Baikal Lake, but in a much lesser extent. There are many endemic invertebrates which include freshwater shellfish, crabs and sponges, in which includes also the round sponge *Ohridspongia rotunda*. More than 146 endemic species have been identified.

The city of Ohrid is a treasure trove for its cultural values and their diversity. Protected by UNESCO as a cultural heritage site since 1980 it is an interesting place for domestic and foreign visitors. Given the fact that part of the UNESCO protected area or borders go not only through the city, but also covers almost half of the territory of the National Park Galicica, there is a unique opportunity for combining these features with the geo-tourism values in this area.

Categorization and valorisation of the geological and geomorphologic forms in the National Park Galicica

For the categorization of landscape forms within the National Park Galicica an already developed methodology is being used, that is applied to the whole territory of the Republic of Macedonia, both for the overall geomorphologic elements and the special underground karst forms.[15]

The three categories to which these forms belong are as follows:

- Landscape forms which for some of their features are unique or especially rare in the Euro – Mediterranean region, or even on a Global scale;
- Rare or unique forms on the Balkan Peninsula; and
- Phenomena, localities or single forms that have local significance, on the territory of the Republic of Macedonia.

Such forms are the following: the mountain of Galicica itself – in the III category, the part of the mountain called Stara Galicica – also in the III category, and the island of Golem Grad – in the II category. If a detailed analysis is performed only on the territory of the National Park Galicica, then in the area of Stara Galicica (II category), as individual / single elements the following can be distinguished: **two cirques (III category), moraine deposits** at the mountain pass Polce and Zli Dol **(III category)**, the **horseshoe-shaped stone basins** inside the cirques **(II category)** and the **grass terraces** on the Prespa Lake side on Stara Galicica **(I category)**.

Churches and monasteries in the National Park Galicica

In the National Park there are numerous Early Christian and Medieval churches with different significance. Not only is the Ohrid region, known as the Balkan Jerusalem because of its significant churches, but also in the National Park there are opportunities for combining different experiences for the tourists and visitors in this area. Some of the most important in the National Park are:

- The Early Christian Basilica Studenchitsa (V-VI century AD)
- The Monastery St. Naum (X Century AD)
- The Church Mother of God Zahumska (XIV century AD)
- The Church – Dormition of Mother of God, Velestovo (XV century AD)
- The Early Christian Basilicas and Medieval churches on the island of Golem Grad – the Prespa Lake

As especially important cultural values that are represented in the area of the Ohrid region and the closer environment are the numerous cave churches. The whole region around the lake abounds with these creative spiritual works of the population living in this area. It derives from the fact that Ohrid almost from the very beginning of its existence was a cultural and religious centre where many such monastic dwellings were created.

The first monks ever appeared in this region as early as in the III century AD. Monasticism shows specific rise in the XIII and XIV century, influenced by the emerging Christian mysticism and the Hesychast movement. On the shores of the lake several important cave churches can be found.[16] They are significant because they are relatively close to the region of the National Park Galicica itself.

These churches are perfectly integrated into the surrounding landscape and represent a perfect example of combining human creativity with the natural beauties in a relatively narrow area. From a geo-tourism point of view they represent irreplaceable potentials because such attractive - motivic features cannot be found so far in any existent European geo-park. In this sense, the Ohrid region, or the National Park Galicica exhibits competitive and comparative advantages. Locations of cave churches show a unique opportunity to combine activities of a different character, such as the simultaneous presentation of geology, cultural - historical heritage and their spiritual value. The curiosity significance of the cave churches prevails, where through adequate tourism valorisation, equipment and protection they may represent Unique Selling Points in the framework of sustainable geo-tourism development.

DISCUSSION

From the above-mentioned it can be concluded that within the National Park Galicica or in the Ohrid region the prerequisites are met which are prescribed in the application form for declaring it a geo-park in terms of availability of certain geological and geomorphologic forms for their importance, significance and rarity, not only in regional terms, but also beyond, on a global level. Combined with the other natural and cultural values which are abundant in this region there exists a unique possibility of developing specific tourism products as part of geo-tourism that cannot be found anywhere else in the world.

The project "Support the Park", the implementation of which started in 2011/2012, supports the park in the transformation of an ordinary forest enterprise into an institution of protection, with a management plan for the protected areas, which is in accordance with international standards, modern management with visitors and programs for environmental education of the local population and tourists. This research was also a part of the Management Plan for the

15 *Колчаковски, Д. (2011) Геоморфолошки појави во Националниот парк Галичица, Природно – математички факултет, Универзитет „Св. Кирил и Методиј", Скопје*
16 *Жура, Г. А. (1999) Пештерните цркви на брегот на Охридското Езеро, Охрид*

National Park Galicica. One of the main aspects and goals of the transformation of the park is the development of activities in the field of sustainable tourism, which in turn will contribute to increase revenues from additional sources other than just the income from forestry. The basic idea was to improve the services for the visitors of the park, which would result in revenue that can cover not only the direct costs for the services, but also can contribute for the financing of activities in the domain of protection. Most of the offered services, as well as cooperation between the park and local residents will increase the acceptance of the development of tourism in the park and will bring direct benefits for the residents.

In continuation of this paper, just several questions will be covered that, according to us, show in a best way the attitudes and opinions of the tourists that visited this area concerning the development opportunities of geo-tourism.

To the question if the tourists have ever heard before about the National Park Galicica, the respondents provided different answers. 735 respondents answered positively to this question and only 86 gave a negative answer. This shows that the tourists are relatively well informed, but additional promotional activities are needed. In the sense of geo-tourism development, for example, it is not enough to ask the tourists only about the existence of the National Park Galicica, but also if they know anything about the geo-tourism values that exist in the Park. Potential tourists should also be included, not only the existent ones.

About the following question which included the motivation of the tourists to visit this National Park, a large diversity of answers was provided. The highest number of answers was related to holiday and recreation activities (269 respondents), followed by answers about the natural beauties (199 respondents), visiting the monastery of St. Naum (139 respondents), beach and lake activities (94 respondents) and visiting cultural-historical values (64 respondents). The least answers given were regarding entertainment, environment, sports, picnics, work, visiting the Prespa Lake, hiking, visiting friends, visiting the springs, cycling, yoga, hunting and collecting tea, i.e. these other types of recreational activities that are possible to be done in this area. The motivation for visiting the natural beauties dominates, which is very important from a geo-tourism point of view.

One of the questions was addressed to the importance of several categories which have influenced their decision to visit this region. Regarding this question several different answers were given. As most important (graded with the note 1) were the answers given about enjoying landscapes (568 respondents), visiting the monastery of St. Naum (529), sun and beach activities (499), picnics (403), cultural heritage (382), sporting activities (302), bird watching and other wildlife (245), and, at the end, collecting medicinal herbs (197 respondents). It is important that in each category the most answers were given as the most important. There are smaller variations in the other levels of significance, but mostly dominant is the highest level of significance. It can be concluded freely that most activities can be incorporated in future geo-tourism activities.

To the question "How many times have you visited the National Park?" the answers were not so positive. The largest number of participants in the survey answered that they were there for the first time (46%), followed by answers such as more than two times (20%), and the second time (19%). The rest did not provide any answer (15%). This provides the conclusion that more promotion activities are needed, as well as the need a recognizable tourism brand to be developed, with the aim to attract tourists to visit this region more times. This could be possible with proclaiming the park a geo-park.

To the question whether the existence of the National Park Galicica with a poorly developed tourism brand had any influence on their visiting different answers were provided as well. Most respondents answered with Yes (552 respondents), followed by the respondents who answered with No (139), and Maybe (112 respondents). The remaining ones did not provide an answer to this question. From these answers it can be concluded that there is a need for developing a known tourism brand – such as the already mentioned geo-park brand.

Another relevant question we believe should also be the question about what mostly attracts them to visit this region. The five best answers were as follows: the Lake (252 respondents), Churches (98), Beaches (68), Climate characteristics (50), Entertainment and night life (41). From these answers it can be seen that a combination of activities is possible. It is important to mention that the first two questions are related to natural and cultural values. The Ohrid Lake as one the oldest in the world is very interesting to explore, but also the above mentioned churches (and cave churches respectively), through which unique combinations are possible to meet the tourists' needs.

CONCLUSIONS

The research aims regarding the development of sustainable tourism is in accordance with the requirements and prerequisites for developing geo-tourism in the region of the National Park Galicica. In particular it can be seen in the sustainable usage of local resources without their exploitation and devastation since 2012 with the Management Plan and which is still continuing. Furthermore, important aspects represent the direct benefits of such activities for the local population, as well as education opportunities for sustainable tourism development. In the interest of this paper it can be considered that there exist excellent opportunities for developing a contemporary and modern type of tourism, such as geo-tourism. Thus, the relatively short tourist season will be prolonged significantly.

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PECULIARITIES AND PROBLEMS OF THE TOURIST INFRASTRUCTURE IN THE MOUNTAIN REGION OF SMOLYAN DISTRICT

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ABSTRACT

Tourist infrastructure is one of the essential factors for the tourist development of a destination. Along with tourist resources, facilities and personnel working in the tourist sector, infrastructure provides a great opportunity for tourist supply. During the last couple of years the aspiration for diversification and maximum utilisation of resources' potential, especially in the mountain regions, increased the investors' interest in building new tourist infrastructure and facilities which provokes different public reaction. On the one hand, the new initiatives are supported not only by the business sector but also by local communities and authorities. On the other hand, these projects provoke strong opposition from different organisations, mostly from environment protection organisations. This publication aims at presenting both points of view based on knowledge and research on tourist infrastructure in the district of Smolyan, the Rhodope Mountain. The goal is to indicate good practices and present ideas for future problem solving.

Keywords: *tourist infrastructure, mountain regions, Rhodope Mountain, tourist supply*

INTRODUCTION

Tourist infrastructure is "the complex of facilities, located in the area of the tourist sites and enterprises, and aims at serving mostly tourists"[1]. It also includes the objects of the resort and recreational environment, built to serve the specific tourist demand and the needs of the tourists oriented to certain tourist activities. The construction of tourist infrastructure is a necessary condition for development of any type of tourism. Nevertheless, it is a sensitive topic, especially in mountain regions and most of all in protected areas or areas containing plant and animal species protected by the law. Such a specific area with observed modern development processes is the district of Smolyan in the Rhodope Mountain. Completely built up regarding material facilities and tourist infrastructure are the municipalities of Smolyan and Chepelare. This is an "old" resort district in the mountain region, which was developed mostly as a ski and trekking destination in the 30s of XX century. The presentation of the problems and the different opinions would not be correct without analysing the modern state of the tourist infrastructure.

The methods used in the current research are secondary methods – analysis of the available literature, publications and official data from the municipal websites and projects for tourist and infrastructure development in the sector. The primary methods are mainly observation of the construction and structuring of the territory and facilities throughout a relatively long period of 20 years, including business sector and practical training of students. Crucially important for the research are the semi-structured interviews with representatives of the local authorities, business, employees in TIC and members of non-governmental organisations in the tourist sector.

INFRASTRUCTURE FOR SKI TOURISM

The district of Smolyan is located entirely on mountainous territory. The tourist resources of the Rhodope Mountain determine the peculiarities of tourist development in the area. The main type of tourism is the mountain tourism and its sub-categories. For a long period of time the district of Smolyan has been a recognised destination for ski tourism. It is a fact determining the construction of the necessary infrastructure for this type of tourism. Considerable investments in infrastructure have taken place and projects are still developed and implemented for infrastructure maintenance, renovation and finishing.

Two ski centres with national and international significance are located in the district – Pamporovo and Chepelare, and one local ski centre – Momtchilovtsi. The district possesses opportunities for creation of local ski centres, like the one in the village of Momtchilovtsi, which will balance the tourist visits in the peripheral areas and especially in some of the small settlements where accommodation facilities already exist.

Ski centre Pamporovo

Ski tourism in Pamporovo dates back to the end of the 30s of XX century. The present-day infrastructure, though, was developed later - after the 60s - and it turns the resort into a popular tourist and sport centre on a national and European level.

Best known are the ski slopes and facilities which compose the main infrastructure for development of ski tourism. Table 1 shows the currently existing slopes, their length, displacement, level of difficulty and the functioning facilities.

1 *Vodenska M., M., Assenova. "Introduction to Tourism", Publisher MATKOM, Sofia, 2011, p. 143*

Table 1. *Ski slopes and facilities in Pamporovo*

Types of slopes	Length	Functioning facilities	Displacement
Green slopes			
Snezhanka 1A bypass "Mal. Stena"	535 m	3,4–seat chairlift	46
Snezhanka 6	5150 m	3–seat chairlift	476
Snezhanka 6.1	3150 m	3,4–seat chairlift	259
Snezhanka 6A- "Yazovira"	420 m	3,4–seat chairlift	30
Studenets – Ski Centre 1	800 m	4-seat chairlift	130
Blue slopes			
Snezhanka 1 – "Malkata Stena"	850 m	T-bars; 4-seat chairlift	140
Snezhanka 8 – South slopes	1100 m	Button lift	120
Snezhanka 9 – the lakes	3200 m	Button lift; 2-seat chairlift	340
Stoikite № 2	3740 m	6-seat chairlift	453
Red slopes			
Snezhanka 4 – Malina	2245 m	Button lift; 2-seat chairlift	426
Snezhanka 5 – Ardashla	3300 m	3- seat chairlift	474
Snezhanka 10 - Snezhanka – ladies' slope	1400 m	4- seat chairlift	390
Snezhanka 11	740 m	4- seat chairlift	190
Snezhanka 12	400 m	3- seat chairlift	68
Snezhanka 13 – "Yazovira"	1700 m	4- seat Chairlift	130
Stoikite 1	3640 m	6- seat chairlift	453
Black slopes			
Snezhanka 2 – "Stenata"	700 m	T-bars; 4- seat chairlift	285
Snezhanka 3 – FREE RIDE	1415 m	Button lift	405
Snezhanka 4 – "Evropeiskata"	2245 m	Button lift; 3- seat chairlift	476
Cross-country skiing			**Length**
Snezhanka № 14 – Studenets - Mugla			25000 m
Snezhanka № 15 – Ardashla - Stoikite			7000 m

19 slopes for alpine disciplines are built on the territory of Pamporovo. Their total length is 37 km and the longest ones are the red slopes routes (advanced) – 13.4 km. The slopes for beginners (the green slopes) also share a big part – 10 km, which show that the resort offers slopes for beginner skiers, as well as for advanced skiers and professional competitors. There are two slopes for cross-country skiing with a total length of 32 km. These facilities provide opportunities to host competitions in different ski disciplines, including international competitions and the local authorities and business put significant effort in their development.

A slope for snowboarding was built in the winter season of 2010 – 2011 and since then Pamporovo offers a Fun Park with 14 facilities for jumps. The Fun Park is located under the peak of Snezhanka and the only Half-Pipe in Eastern Europe is located there with height of the walls 3.8 m and length – 112 m.

The ski facilities which provide service for the tourists in Pamporovo include 6 chairlifts with a total length 11.3 km and 7 tow-lifts with a total length of 4 km. The capacity of these facilities is 11 600 persons per hour.

When the winter season lacks snow, the slopes are secured by enough artificial snow to function – 90% of the ski slopes are secured by artificial snow. 145 hydrate shafts are built and 80 snow machines function during the ski season. Nevertheless, some problems throughout the seasons can be outlined:

- In case of a soft winter and high night temperatures, the quality of the snow cover produced by the machines is not good.
- There is only one water source for the artificial snow facilities and is located in the "Yazovira" area. This causes problems in the seasons when the water resources are insufficient.
- Lack of a cable car, the construction of which will make the resort more competitive among the other ski centres in Bulgaria.
- The problem regarding the prices of the ski-passes is a common problem in all ski centres in Bulgaria and determines the visit ratios. Price determination is a matter of business policy of the companies-owners of the facilities, an economic situation which causes tension in certain periods and last but not least, the competition between the three major ski centres in the country.

Table 2 provides details about the ski- and the tow-lifts in the ski centre of Pamporovo – type, length, displacement and capacity. Some of the ski lifts function also in summer.

Table 2. *Ski facilities in Pamporovo*

LIFT/TOW-LIFT	Type	Length	Capacity	Displacement
Stoikite - Snezhanka	6-seat chairlift	2992 m	2400	453
Studenets – Ski centre 1	4–seat chairlift	734 m	2000	208
Studenets – Snezhanka	4–seat chairlift	1100 m	2400	264
Ardashla – Snezhanka	3-seat chairlift	2140 m	1800	280
Sm. lakes – Snezhanka	2-seat chairlift	1550 m	365	340
Ardashla - Studenets	1-seat chairlift	1350 m	475	180
Ski lift "Stenata"	T-bars	600 m	240	20
Ski lift "Yazovira"	T-bars	800 m	380	130
Mini lift Snezhanka	T-bars	150 m	200	10
Mini lift Ski Centre 2	T-bars	100 m	100	10
Mini lift South Slopes	T-bars	350 m	280	20
Ski lift „Dvata mosta"	Button lift	1340 m	680	290
Ski lift "Akademika"	Button lift	700 m	280	160

Ski centre Chepelare

The first ski competition for the price of Chepelare took place in 1970, 45 years ago. The intensive development of the ski sport and respectively of the ski tourism in this destination starts since then. Natural resources in the area favour the development of this type of tourism, considering the height, exposure and the displacement of the slopes of peak Mechi Chal where the ski facilities are located.

The existing ski slopes are 20 km long. The old slopes and facilities are renovated and marked according to the European standards. 12 sloped are currently functioning with different levels of difficulty – 5 red slopes, 5 blue slopes and 2 green slopes. There is no slope for professional skiers – a black slope, which does not allow the resort to host professional competitions. Nevertheless, the resort is suitable for amateur skiers and for training of adults and children, as well as for hosting children competitions.

One of the main slopes is a 3250 m long red slope. It is equipped with a system of artificial snow machines – **Johnson Controls**. The 47 machines can cover the slope with snow in 100 hours with temperatures of 3 degrees.

Two services which are innovative in Bulgaria are offered by the resort – for the first time in the country the slopes are equipped with free of charge and wireless internet, and a system for access of the tourist to the ski lifts, developed by the Austrian company **AXESS.** It is used for the first time in the resort of Chepelare. The system provides smooth access to the ski lift without gathering of skiers in the busiest parts of the day.

The resort provides a 4-seat chairlift with capacity of 2000 persons per hour. The lift covers the distance from the town of Chepelare to the peak Mechi Chal (2700 m) in only 7 minutes. Next to the base station of the lift are located: children corner and ski rental service of the company "Chepelare Resort", owner of more than 300 pairs of ski.

Table 3. *Ski slopes in Chepelare 2011-2012*

Slope	Benchmark start (m)	Displacement (m)	Length (m)	Average inclination (m)	Class
1	1870	690	3350	27	Red
1A	1520	95	465	20	Blue
1B	1272	50	179	28	Red
1C	1200	20	179	15	Blue
3	1819	324	1346	24	Blue
3A	1771	49	650	17	Blue
4	1866	710	5292	14.8	Green
4A	1465	163	955	17	Blue
4B	1665	32	110	29	Red
5	1833	168	490	34	Red
6	1495	70	491	14	Green
7	1810	370	785	47	Red difficult

Table 4. *Ski routes in Chepelare 2011-2012*

Ski route	Benchmark start (m)	Displacement (m)	Length (m)	Average inclination (%)
1	1837	22	628	4
2	1758	105	968	11
3	1677	40	492	8
4	1570	15	134	11
5	1347	149	1114	14

Table 3 and 4 present the slopes and their length, displacement and level of difficulty, as well as the ski routes suitable for ski trekking, cross-country skiing and biathlon. The total length of the slopes here is 3.3 km. The resort disposes of 4 machines for preparation of the slopes, 5 ski rental services located in the ski centre Mechi Chal and 6 ski schools.

All those features make the resort of Chepelare one of the best destinations mainly for amateur and beginner skiers. As a settlement type of resort, Chepelare possesses the advantage of additional attractions in the accommodations – cosy atmosphere of relatively not large facilities. The opportunities which the resort should benefit from are: the proximity of the town of Pamporovo, providing opportunity for professional skiers, traditions in development of winter sports, especially biathlon and the creation of a school for training of talents (Ekaterina Dafovska, etc.).

The closure of the sport school in the town of Chepelare and breaking the traditions of training local staff could be a problem for the future development of ski sport for professionals and the training of personnel for the ski schools.

Chepelare outstands as a resort, hosting families with children and the local authorities, the non-governmental organisations and business should direct their efforts towards this segment by enhancing marketing researches and advertisement in the neighbouring North Greece, where a joint tourist packages could be offered, including summer programmes.

Ski centre Momtchilovtsi

The centre is a relatively new attraction for the winter-sport fans. In 2005 in the area of Kartola, 10 km from the village of Momtchilovtsi, the local sport club created a snowboard park at an altitude of 1600 m. The park disposes of several facilities and jumps. The access of snowboarders to its highest point is provided by two tow-lifts with a total length of 700 m. A ski rental service and a ski school, which is mostly dedicated to snowboard training, function in the park. The visitors are generally of young age.

The snowboard park near Momtchilovtsi is an alternative to the large tourist winter centres Pamporovo and Chepelare. Moreover, the offered prices are competitive indeed.

Other small facilities are registered in the district of Smolyan. They are mostly private or state-property locations – mostly tow-lifts and short slopes for beginners which are not included in the official statistics but could grow into future ski centres and locations of at least regional importance.

Such locations are: the slope, tow-lift and rental service in the village of Yagodina – municipality of Borino; the slope and the tow-lift in the village of Gela – municipality of Smolyan, etc.

There are good conditions for building similar facilities in the municipalities of Dospat, Devin, other areas in the municipalities of Chepelare and Smolyan, etc. By their construction should be considered the requirements for environmental protection.

The project for creation of a ski centre "Perelik" is in process of clarification and proof of the environmental protection details and requirements and its implementation has been currently ceased. The initial project plans the development of 217 km of slopes which will serve 27 thousand skiers. The placement of 150 snow machines is foreseen, as well as provision of 7740 parking places. Thematic parks for 4400 visitors are planned to diversify the stay of the tourists, especially the stay of families with children. Accommodation in eco-villages with traditional Rhodope architecture is projected.

The motives "in favour of" the project are:

1. A necessity to diversify the ski tourism product in the district of Smolyan and cessation of the strong concentration and over-building in the Pamporovo resort.
2. Utilisation of territories which possess the necessary natural characteristics – suitable elevation, displacement and exposure of the slopes, possibility to prolong the season due to the favouring climate conditions, relatively small density of the forestation in most of the planned areas for placement of facilities.
3. New possibility for means of living for the local population in the near small settlements in the region of the ski centre and cessation of the emigration and depopulation.
4. Building a resort of a new type without the typical gathering of numerous and unregistered sites of accommodation.
5. The resort can turn into a year-round destination due to the additional attractions.

The motives "against" the project are:

1. A major part of the area projected for development falls into a NATURA 2000 protected area.
2. How the new resort will be able to fulfil the goal of maximum projected visits (27 thousand skiers) when the closely located resort of Pamporovo is not capable to fulfil its maximum capacity.
3. Granting the interests of private owners in territories where development can take place only after change of the land use statute of the terrain.
4. The bad conditions of the common and transport infrastructure in the villages which are foreseen as most of the accommodation locations, and especially the difficult access due to landslides and rock collapse which breaks the transport connections, will impede the access to the resort.

5. The fear from another over-building of the land and thoughtless infrastructural decisions set in the public opinion.

Infrastructure for trekking, ecotourism and bicycle tourism

The condition of the trekking, ecotourism and bicycle tourism infrastructure plays a special role in the tourism development in the district of Smolyan. Trekking tourism is one of the oldest types of tourism in the Rhodope Mountain and the Smolyan region. Its development started straight after the liberation from Ottoman rule in this part of Bulgaria – after 1912. Numerous trekking routes were developed, marked and mapped during the entire 20th century. The development of infrastructure for one of the most popular types of tourism in the country – ecotourism started during the 90s of the XX century. Projects for numerous eco routes and specialised eco paths were implemented. This tendency is typical for each one of the municipalities in the district. The development of bicycle routes and bike parks is a new tendency in the development of summer tourism during the last couple of years and has a positive effect on the number of visits in the summer season.

62 eco routes with more than 364 km total length are built in the district of Smolyan. Most of them are located in the municipality of Smolyan where more than 85 km eco routes are created only in the valley of the Arda River. Some of the most attractive routes are located in this municipality – "The Canyon of the Waterfalls", "The Path of the Smolyan Lakes", the "Nevyasta eco route", etc. Very popular among tourists are also the "Zagrazhdenska" eco route – municipality of Banite; Yagodina – the cave "Dyavolsko garlo" – between the municipalities of Borino and Devin; the "Sveta Nedelya" eco path – the municipality of Zlatograd; Madan – the cave "Sharenka" – the municipality of Madan; Nedelino – peak "Sveta Nedelya" – the municipality of Nedelino, Tsigansko gradishte – "Sadilishteto" – the municipality of Rudozem and many others.

Many **tourist routes** cross the territory of the district of Smolyan. The longest one was finished in 2010 and goes across the municipalities of Chepelare, Smolyan, Rudozem and through the passage "Elidzhe" continues on Greek territory to the village of Paranesti, the Livaditis waterfalls and the town of Stavrupoli. This cross-border route is at least 12 days long and is an excellent opportunity for cross-border exchange of tourist trekking between the north – Bulgarian and south – Greek parts of the Rhodope Mountain.

One of the three European tourist routes – E-8 crosses the district of Smolyan. This is: the North Sea – Danube River – Carpathian Mountains – Rila Mountain – Rhodope Mountain – Bosphorus route.

Other popular routes in the district are: Chepelare – hut "Izgrev" – "Gluhite kamani" – "Tchudnite mostove"; Chepelare – hut "Izgrev" – "Gluhite kamuni" – "Groben prohod (Mezarguidik)" – peak "Persenk" – hut "Persenk"; hut "Persenk" - "Groben prohod (Mezarguidik)" – hut "Skalni mostove" – "Tchudnite mostove" – the village of Zabardo; "Haydushki polyani" – hut "Prespa"; Gela – "Ledenitsata"; Arda – Gozdevitsa – peak "Kom"; Davidkovo – hut "Svoboda", etc.

The bicycle routes, bicycle paths and bike parks have gained in importance for the last couple of years. Local statistics record 8 bicycle routes and numerous bicycle paths. The first bike park in the district was opened in the resort of Pamporovo in the summer of 2012. It is located under the peak Snezhanka. It is composed of bicycle routes and bicycle paths with a total length of 15 km and is one of the new attractions in the resort.

Attractive infrastructural sites are the **extreme routes** (Tarzan type) for adventurers. 7 such facilities are created so far, 6 of which are located in the municipality of Smolyan and 1 is located in the municipality of Devin.

The steep mountainous terrain in some parts of the district provides good conditions for **rock climbing**. The traditions are created by a number of local mountaineering clubs which maintain the facilities, train beginners and provide security functions. One of the most visited and well secured terrains for rock climbing is "Nevyastata", "Momtchilova krepost", "Trigradski skali" – Haramiyska, Golubovitsa – "Garga dere" where a trolley ropeway is set. The climbing spots are 6 and most of them are located in the municipality of Smolyan.

Sport facilities like tourist infrastructure

The existence of sport facilities and their maintenance are an important element of the infrastructure, much of which is used for tourism. Based on the research and analysed data of the municipalities we come to the conclusion that the district of Smolyan does not provide good sport facilities. As a matter of fact, all facilities which existed and were once centre of sport life and tourist visits are currently in bad condition and some of them are unusable.

30 sport halls, mostly built for educational purposes for schools in the region are functioning in the district. Some of those facilities are utilised by tourists mostly in the summer season and by different educational programmes – traditional dances, rehabilitation camps, environmental schools, etc., but the majority of those facilities are not recognised by the mass tourist. 36.7% of the halls are located in the district centre, 16.7% are located in each of the municipalities of Chepelare and Zlatograd. The rest of the municipalities provide very limited possibilities for sports, especially in the cold seasons.

The condition of the sport playgrounds is similar – there are 28 which have been built mostly for educational purposes. The stadiums which are supposed to attract more visitors do not meet the requirements for organisation of competitions. They are 13 ones and are used mostly by the local population.

An interesting facility is the complex consisting of three playgrounds for field hockey. This sport is not popular in Bulgaria but thanks to the efforts of a group of enthusiasts it is a part of the present-day sport life in the municipalities of the Smolyan district. These are "Banite", "Nedelino" and "Zlatograd". Most active is the sport club in the village of Banite where teams of all age groups could be found. It proves the fact that the district, and most of all the settlement named, has realistic chances to develop sport tourism.

From the rest of the sport facilities, the most often used one is the sport hall of the district where competitions in volleyball on a national level take place and the volleyball fans visit the organised tournaments and the stadiums where sport competitions on a national and most of all regional level take place and attract tourists in the district. A total number of 8 swimming pools are located in the district (not counting the ones in the hotels) which function only in the summer

months and are mainly of local importance, 2 tennis courts, 5 fitness halls and 4 off-road routes.

The opportunities for cross-border sport exchange with the north parts of the Republic of Greece, which would significantly improve the market of the offered sport services, have not been made use of yet. The opportunities and authority of the school of weightlifting in Smolyan which is one of the best in the country are not used either.

Other infrastructural facilities:

Other infrastructure which provides opportunity for development of more types of tourism, apart from the above mentioned infrastructural facilities on the territory of the district of Smolyan, includes:

Hunting farms: They provide terrain for hunting of wild animals. One state hunting farm is located in the studied area – "Izvora" – on the territory of the municipality of Devin. It was established in 1975 with an area of 9000 ha and three hunting regions – "Kozi Rog", "Luk-balkan" and "Chural". Hunting trophies of an exceptional variety and quality are observed. The populations of the chamois, capercaillie and mouflon are a subject of special protection. Other hunted animals are the fallow deer, red deer, roe deer, wild boar. As of January 2012, the hunting farm "Izvora" has recorded a 30% increase in the number of hunters and the income they bring.

The hunting farm "Kormisosh" is located in the municipality of Laki, neighbouring the municipalities of Smolyan, Chepelare and Banite. Hunting and shooting of animals in the neighbouring municipality of Laki is influenced by the variety and maintenance of the species in this hunting farm.

The only private hunting farm in the district is located in the village of Zabardo – Chepelare municipality. The terrains for such farms are rented for a period of 15 years. This is regulated by an order of the president of the State Forestry Agency in the country. A number of 64 hunting sections are rented.

One of the peculiarities about hunting in the district is the opportunity provided by the ***State hunting farms***. The 14 hunting farms in the district of Smolyan are subordinate to the Regional Forestry Directorate - Smolyan. A task of the forestry farms, apart from provision of care and protection of the forests and the variety of species, is to implement Hunting business plans in the state hunting and forestry farms, maintenance of the ecosystem variety and protection of the biodiversity there. These responsibilities require that state forestry farms are involved in the hunting activity and the development of hunting tourism on their territories.

An attractive possibility is to create conditions and sections for **photo safari** in the hunting farms – a service with a still limited provision.

Facilities for sport fishing – these infrastructural facilities are very important for the development of fishing tourism – as a hobby and a sport. There are 17 fishing facilities in the district, the largest number of which are located in the municipality of Smolyan – 7, followed by the municipality of Zlatograd – 4 and the municipality of Devin – 3. All of the municipalities in the district provide possibilities for fishing, including sport fishing. The municipality of Dospat possesses a huge potential mostly because of the location of the Dospat dam there and the cleanness of the rivers in the municipality.

Facilities and attractions for water sports – the number of such facilities in the district is limited. Those are the water attractions in the Dospat dam – mostly boats and pedalos, canoeing, rowing, jets, etc.; the water attractions offered lately by the dam "Tsankov kamak"; the waterslide in the village of Banite – unique in the region. A comparatively new attraction is entering by boat some of the water caves. This activity is provided by the local speleological clubs in Mogilitsa and Trigrad. The resources possessed by the district are not efficiently utilised. There are no facilities and routes for rafting and the canyoning is in its initial stage of development. There are not enough facilities for water ski and other water sports like rowing, canoe-kayak, etc.

Horse riding establishments – recently, there has been an increasing interest in some settlements in building horse-breeding establishments and supply of services related to horse riding – horse riding on different ecological and tourist routes, horse races evolving from the old tradition of "Todorova kushiya" on the feast of "St. Todor", most popular of which is the one in Momtchilovtsi. There are 4 major horse riding establishments in the district – in the villages of Levochevo and Arda in the Smolyan municipality and Trigrad and Tcheirite in the Devin municipality. The rest are small and owned by individual owners of accommodational facilities in the district.

Tourist information

The informational activity in the tourist sector is an important element of the tourist services. A good system for provision of tourist information from different kinds is developed and functioning in the district of Smolyan. Most important are the ***Tourist information centres (TIC)***. These facilities inherit to a certain level the old offices of "Balkantourist".

The tourist information centres in the district of Smolyan are a total number of 14 – 21.2% from all the centres in Bulgaria (2012). 9 of them are actively functioning. Most of the tourist information centres are established with the financial help of projects implemented under different programmes. Most of them are municipal centres and are financially supported by the municipal budget. A number of them, though, are established by different non-prof it groups and organisations and their financial supply is highly vulnerable.

TIC in the district of Smolyan:

- Municipality of Smolyan – 7 TIC – in the town of Smolyan, the villages of Arda, Mogilitsa, Smilyan, Momtchilovtsi, Shiroka Laka, Stoikite;
- Municipality of Chepelare – 2 TIC – in the town of Chepelare and in the village of Orehovo;
- Municipality of Zlatograd – TIC in the town of Zlatograd;
- Municipality of Rudozem – TIC in the town of Rudozem;
- Municipality of Borino – TIC in the village of Borino;
- Municipality of Dospat – TIC in the town of Dospat;

- Municipality of Devin – TIC in the town of Devin.

According to data of the town-hall of Shiroka Laka, since 2011 a second TIC, which is private property, has been functioning in the village. There are three centres for visitors in the district – in the village of Smilyan – Visitors' Information Centre in the community centre "Prof. Assen Zlatarov", a Visitors' Centre in the village of Gradat, under the fortress "Momtchilovata krepost" and a Visitors' Centre at the rock phenomena of "Tchudnite mostove", the village of Zabardo.

The tourist information centres in the municipality of Smolyan are synchronised through the so called Network of TIC in the municipality, created as a result of the project "E-network for administrative service delivery in the Municipality of Smolyan". All information from the Network is provided on the web-page - http://eservices.smolyan.bg/tic/

The main problems regarding useful functioning of the TICs are:

1. Financing of the activities and expenditures, necessary for their functioning;
2. The need for coordinated actions of the centres on a regional and national level, and exchange of information;
3. Their location – to be located in suitable places useful for the tourists;
4. The qualities and the professional competence of the personnel working in the centres.

CONCLUSION

According to the common opinion among experts in territorial planning of resorts and recreational territories, "Multi-seasonal and multi-functional resorts with small capacity and connected to the existing settlements and resorts should be established in the country"[2]. Such should be the profile of the resorts in the Rhodope Mountain and in the studied district of Smolyan. "An important factor is the capacity or the accommodation capacity of the main resort resource, which is the capacity of the ski slopes in the mountain regions like the studied one. Neglecting this factor and creating larger tourist facilities and accommodations then their capacity limit, will lead to overloading of the slopes and the lift lines, similar to the overcrowding of the sand beaches on the sea coast, means disruption of the visitors' comfort and a threat for the ecological balance"[3]. The rest of the infrastructure in the destination asserts the perception of a year-round destination, based on the local resources, experience, created products and successful market promotion. Dealing with the problems of the present-day tourist infrastructure and the opportunities for project development and building are part of the tourist development in one of the strongest and most active in its existence and establishment tourist destinations in Bulgaria which is located in the Smolyan district.

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3 See reference nr. 2.

SUSTAINABLE ECONOMIC VALORIZATION OF THE NATIONAL PARK KOPAONIK

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ABSTRACT

Summary: The paper deals with the possibility of sustainable use and protection of natural resources as a condition for long-term development of tourism in the National Park Kopaonik. Since the mid-twentieth century, tourism in the National Park Kopaonik has been rapidly developing, both in a positive and in a negative sense. Its positive side is reflected in the fact that tourism plays a major role in the economy of a given area, is the main source of employment and a way to fight poverty. The downside is the loss of authenticity of the National Park. In order to adapt to the needs of tourism development the area has suffered degradation of the natural environment and commercialisation of the cultural and historical heritage. Kopaonik is one of the most promising areas for the development of tourism in Serbia and it will eventually get even greater importance. What is needed to make this branch of the economy complement is the reliance on sustainability and eco-tourism. This approach, expansion to rural areas through accommodation and promotion of protected cultural and natural values, will help to keep the whole chain sustainable, promising and very attractive for modern tourists. Relying on the extraordinary natural resources, tourism in this area can greatly contribute to improving the living standards of the population.

The aim of this paper is to point out the potential and limitations for the development of sustainable tourism in the National Park Kopaonik, as well as to explore new opportunities for enrichment and extension of the existing offer, so that the attractive tourist experience could be enabled to tourists, while preserving the natural environment and promoting economic development and welfare of the local community and all this in order to achieve better positioning of this destination on the tourist market.

Keywords: *National Park Kopaonik, sustainable economic development, valorisation*.

INTRODUCTION

The national park covers the upper, the highest parts of the mountain Kopaonik. Morphologically, the base of the area represents a large, relatively flattened region of medium height, about 1700 m. This central plateau - Flat Kopaonik or Great Plain – is surrounded and closed by mountain hills (Pančićev peak - 2017 m, Karaman -1934 m, Gobelja -1934 m, Coward -1726 m), interconnecting with high folds. The High Kopaonik Mountain is only open to the northwest valley Samokovske River. The National park includes the slopes of the valley of the Ibar, Jošanička and Brzećkoj say, as something like a separated SPA Kopaonik Mountain range in the north (Vučak – 1718 m).

Pronounced altitude differentiation of relief, heterogeneous geological composition and specific climatic conditions have influenced the formation of a variety of factors, which is why the flora of Kopaonik is characterized by a large number of species, among which are represented quite endemic and relict plants, which indicates that this area is significantly a flora refuge (refurgijum). A special feature of the Kopaonik is great expression of vegetation belts related to the change in altitude and exposure, or alternation of different types of plant communities from the bottom to the top. In addition to the richness and diversity of ecosystems and natural rarities, the national park is characterized by a whole and great natural beauty that stems from the extraordinary value of its landscape. Grassland, spruce and mixed forest stands and unusual sculpted boulders of granite rocks represent a symbol of the Kopaonik landscape. They are joined by hills with rounded peaks and steep gorges, river valleys parts, primarily the Samokovske River.

The National Park Kopaonik is characterized by a lower degree of preservation of the indigenous nature, primarily forest vegetation, on the one hand, and an increased presence of activities that it is hard to find a place in the functions of the National Park, on the other. In verified existing plans and programs of development of tourism, great effort was made to synchronize these activities with the protection requirements and other basic functions of the National Plan with the aim tourism to gain very significant financial and organizational support for its development. A very sensitive issue is planning to intensify agriculture, forestry and mining as well as water management and energy in this area in relation to the regime of the National Park.

On the surface of the National park, except for the village of Brzece, there are no permanent settlements. However, at the very edge, there is a more rural area (Lisa, Black Head, Đorđevići, the Kriva River) which is traditionally associated with the use of the land in the park. Prospects of development of rural tourism, the effects caused by the earthquake and the

necessity of rapid development of the areas impose an obligation to determine the relationship between the National Park and the settlements, in accordance with the common interests.

Globally, the use of land in the Kopaonik Massif is determined by geophysical and physical-geographic factors. Although it is a closed area, away from the flow of communications and intensive development and uninhabited, the general characteristics and assessment of the situation that relates to the natural environment and the current method used under the influence of anthropogenic factors has led to disruption of the balance and forms of production, which can have unwanted consequences.

PROTECTION OF NATURAL RESOURCES AND THE ENVIRONMENT

Due to its uniqueness and authenticity, the applicable spatial plan of the National Park Kopaonik envisages rigorous protection of the area. In the area of the National park zones have been established three levels of protection.

Areas with first-degree protection regime - including localities and individual objects of nature, protected streams and sources, in other words, all values are evaluated as being of outstanding representatives of native ecosystems or individual representatives of a rich biodiversity. Within the National Park Kopaonik zone with first-degree protection regime cover an area of 698.34 h, including nature reserves: Barska River, Kozje rocks, Jankova bara, Samokovska river, Vučak, Mrkonje, Gobelja, Metođe, Jelak, Ravnica, and Suvo rudiste, as well as a number of individual objects of natural values and immovable cultural property that is physically located in areas with second and third degree of protection. All forms of use and activities that could undermine and disrupt the functioning of the native ecosystems, shall be prohibited in areas where this level of protection, while the scientific research and controlled education and presentation allowed.

Areas with second-degree protection regime - include space with protective function of the sites in the mode of the first level of protection, general protection of habitats of rare and endangered plant and Animal Species protection against specific values and immovable cultural property, degraded areas, as well as the surface on which it is carried part of the research, educational, sports and recreational activities. Zone in the degree of protection occupies 3610.00 h National Park, including the upper basins of the Bar, Samokovske and Gobeljska River in the municipality of Raska and zone Brzecke and Duboke River in the municipality of Brus. The individual values of natural and immovable cultural property are occupying an area of 50 hectares in the protection zones of the second and third degree.

Within the zone with the regime of the third degree of protection (7501.06 ha) are all the other surfaces of the National Park outside of established basic surfaces of the first and second level of protection.

Protective zones around national parks (19984.85 ha) is divided into two sub-zones / areas.

- *The area of immediate protection of the National Park* is characterized by enhanced care and protection of forests, controlled chemicals use in agriculture, limiting the mining pit mine with minimal disruption to the natural environment, the prohibition of warehouses and industrial plants, construction planning and design of settlements in order to protect the national park.

- *The area of indirect protection of the National park* (where these activities are allowed without major restrictions, but with mandatory control noise and environmental pollution).

In regard to the protection of nature and natural values of the National park very modest results were achieved. The reason for this is the non-implementation planning documents, but also incomplete planning basis. Based on the existing spatial plan and existing programs of protection and development of the national park, all anticipated urban plans and projects relating to the protection and regulation of national parks and existing projects were not implemented in practice. For failure to preserve nature of the national park was influenced by the neglect of forest roads, forest order neglect, uncontrolled collection of wild fruits, medicinal and aromatic herbs, non repaired mines, the impacts of industrial, mining and energy pollution from the environment to air pollution, as well as the consequences of NATO bombing, uncontrolled production on agricultural land plot within the protection zone of the National Park, poaching, etc . Pollution is affecting all environmental media - water, air, land. The main sources of pollution are waste water from the mines of iron, tourist centers and resorts in protective zones where there is no sewage system; storm water; emissions from cars; heating tourist centers on liquid fuel and coal without filter devices; wild landfill waste and others. Construction of the alpine ski slopes and lifts have a negative impact due to inadequate cuts forests, as well as partial change the configuration of the terrain and the destruction of undergrowth. In particular, contributes to erosion, due to the neglect of necessary revitalization of soil and grass cover care.

In relation to natural values, immovable cultural values are less important, and research activities are much more modest. Insufficient exploration, accountability and immovable cultural property, are conditioned by lack of resources and difficult field affordability parts of the park, and lack of interest of operators of tourism development. Many objects are exposed to decay due to unauthorized physical protection.

In addition to these activities, natural disasters are largely a danger to the area National Park and its buffer zones. Earthquakes threaten the spaces around epicenters, the higher slopes and potential landslides. Fires can cause atmospheric electrical discharges, as well as geological, morphological, climatic and vegetation characteristics of the area, but the human factor. Landslides, dredging, landslides, soil erosion torrents, erosion are partly of natural origin, but more often anthropogenic origin (non repaired mines, inadequate processes for the construction of roads, ski slopes and facilities of the superstructure, deforestation, unregulated storm water runoff and others.). Since 1999, when the national park was bombed suspected in increased artificial radioactivity. Previous studies have not confirmed these suspicions, but they are not yet finalized. The bombing destroyed grass and shrub subalpine vegetation and called into question the survival of rare and endemic plant and animal species, spruce forests, wildlife and others. LANDSCAPE changed the character of the area, damaged mausoleum Josif Pancic and the direct and indirect consequences in the soil, water and air. There are still a number of unexploded cluster bombs that threaten the visitors and nature.

The main objectives of the Protection and Development of the National Park Kopaonik are:

• Development of tourism activities to be aligned with the goals of conservation and protection of natural values and the natural environment of the National park,

• Activation and inclusion of complementary economic activities in tourism development,

• integration of mountain resorts in Tourist offer and improving the quality of life in them,

• education of employees, visitors and the general public about the values and goals of sustainable development to protect the national park,

• directing part of tourism revenue to fund programs and measures to protect natural and cultural values of the area,

• reducing the entry of motor vehicles in the territory of the park, their control and the introduction of alternative forms of transport inside the park,

• Marketing presentation values of the park and tourist attractions on the European and domestic markets.

Map 1: *NP Kopaonik with Stemen protection (http://www.npkopaonik.com)*

POSSIBILITIES FOR DEVELOPMENT OF YEAR-ROUND TOURISM OFFER

Kopaonik National Park in the winter and the summer provides excellent conditions for rest and recreation. The special charm of the area is favorable climatic and geomorphological conditions, as well as natural resources with a pronounced high-altitude vegetation. Winter sports play an important role in the development of tourism, but they should be invested in. One of the problems in rate follows the construction and development of ski infrastructure is the source of finances. Ski facilities are the most expensive infrastructure in any type of recreational tourism development. For example, in the Alps, a large part of the investments in the ski resort comes from public funds to states, regions and local communities with the aim of maintaining jobs and local government ekonomije. Slovenia, in the last decade subsidize almost all ski resorts in

terms of reconstruction lift, but even after that the areas not generate enough profit to be able to achieve competition in Austria and Italy. In the summer tourism, less investment is required, and the expected profit is higher.

Development and promotion of tourism centers must have absolute limits of growth, in order to maintain a high level of environmental quality, while simultaneously offer a dynamic experience of the tourist destinations. Increasing the choice of winter and summer activities, tourism offer would be a response to the constant demand of tourists for new challenges. These activities should not require a large investment, but not to disturb the natural environment. Thanks to its exceptional natural only in case, during the summer season it is possible to organize a number of activities in the National park and its protective zones (exploring nature, hiking and mountain tours, excursions with mountain bikes, rowing on the rivers kayaking, mountaineering, parachuting, orientation and orientation in nature , golf, archery, mushroom picking, tubing for the kids, etc.). All the activities and movements of tourists must be aligned with the regime of protection and control, due to the sensitivity of mountain biosystems in the year when they are in full vegetation. It is necessary to consider a number of other sports that were in the winter promoted at a much lower price than the construction of ski lifts, and at the same time would pose no threat to the disruption of the environment (pipe laying for sledding, placing slides, etc.).

In the adrenalin adventure park visitors should experience a variety of activities and entertainment in the natural environment. Park should consist of two parts - the easier and more difficult obstacles, and visitors should be able to participate in activities individually or in groups, with mandatory supervision of the professional team and maximum protection. Within the park there should be a center for the rental and purchase of equipment, restaurant with local food, local produce shop and gift shop that symbolizes the National Park Kopaonik and adventurous adrenalin park.

In addition to the development of sports and recreational facilities, the fundament development of agro-tourism is also very important. Traditional villages on the periphery of the National Park with valuable ethno-cultural heritage resources and potential storage capacity, with the reconstruction and equipping (introducing architectural solutions that will rely just on traditional Kopaonik eco-house and mountain building style) and the production of organic food may be included in rural tourism. In order to obtain land certificate for organic food production, it is necessary that at least three years is not treated with chemicals, but that is prepared using manure or biological and liquid fertilizer. Production of organic food in the world is at a high price, and the absence of industry and poor use of chemicals in production, farmers and land in this region have a great chance to occupy a high position in the world market. Domestic product (dairy products, manufacture of meat, honey, etc.) Would be recognizable by,, green label "for healthy food. The realization of this idea precedes the creation and implementation of programs for the rehabilitation and revitalization of NP Kopaonik, primarily in the rehabilitation of the consequences of NATO bombing, which, as provided in the proposal of the plan, includes removal of explosive devices and ruins, and involves repairing damaged soils and vegetation.

The villages in the protected zone of the national park are suitable for the construction of small hotels and houses according to the principles of sustainable design that would be a great contribution to the development of eco-tourism. It is the application of innovative techniques in the past,, green "design that includes local styles, materials and construction techniques from the area to fit with the environment. Also, it is considered that there is already established market for eco-house that would include a fitness center as well as for the care of the body (yoga, medicinal herbs, massages ...), organic cuisine and cooking classes and rooms for workshops. This project could serve as a center for nature-based activities, as well as visits to farms, archaeological sites, monuments and others.

Development of attractive and themed hotel, designed for families with small children, would contribute to a better development of villages. Hotels should offer family rooms and studios, a small wellness center and sports facilities for adults, indoor and outdoor pool with various attractions for children, ski school, park and outdoor play area inside the hotel, a variety of devices for playing, a special children's menu, as well as educational programs and all-day entertainment for children. In addition to organizing special classes and workshops on local cuisine, an activity that in the summer could be offered to tourists is collecting and making teas and natural medicines from herbs.

One of the most significant trends in tourism today is health tourism, which is increasingly gaining in importance. Due to climatic conditions and invaluable environment, with diverse sports and recreation program, offer wellness vacation (relaxation of stress, natural life, enjoying nature), the introduction of special fitness programs in nature, with better connectivity with Jošanička Spa, Kopaonik could become one of the leading centers of health tourism in this part of Europe.

Etnogaraphic treasure represents great wealth and value of people of one area. Old crafts in this area died due to lack of interest, under the influence of new industrial products, as well as modern lifestyle. In this regard, we should encourage the revival of some traditional crafts that were once present in the Kopaonik National Park. This way, Kopaonik would have its hallmark, and tourists could buy as a souvenir various items made from natural materials. It is necessary to create and set up a table with information about the National Park Kopaonik near to its borders. Appearance panel should be unique to the park and should include his trademark. The garden should contain well-spaced characters for directing and informing visitors (signs and symbols recommended by the decision of the WTO). It is necessary to develop a planned center for visitors and add a counter to inform visitors in multiple languages. The magazine of National Park Kopaonik should be made and freely distributed to visitors, contributing to faster and better informing tourists about all the possibilities and values in this destination. The magazine would contain simple service information, the rules of the park, pictures, details about the monuments etc. Printing does not have to be expensive and could be payed by the advertisements of small and medium-sized enterprises mentioned in it.

One of the goals is to connect with the surrounding areas with dominant natural tourism resources (Vrnjacka spa, Goc, etc.) and organizing one-day and multi-day visits. Connecting the tourist offer of Kopaonik and Golija, primarily over the Ibar zone of medieval heritage (from Zica monastery in Kraljevo, the old road from Studenica monastery to monastery Gradac, to Dezevo and Novi Pazar and Sopocani Monastery with the Old Ras). In the valley of the river Ibar there area series of medieval fortresses and monasteries on both, Kopaonik and Golija side. Existing wine tours can be enriched

with new activities in Meadow of Pokreja (municipality Brus) and Lukarevina (Aleksandrovac Municipality) - working in the vineyards, enology courses, wine tasting and food from the vine, staying in basements - houses for seasonal use in vineyards and others. The possibility of cooperation between local tourist agencies should be considered. Seminars on the topic of sustainability on which to exchange experiences and strategies in implementing sustainable tourism in other areas, should ne organized. In order to create skilled and educated personnel, local communities, park administration or non-governmental organizations, we should intensify training for employees. In addition to courses on the services provided to visitors, this training should include courses on the values of nature and the environment, socio-cultural and economic sustainability and the implementation of sustainable tourism. The point is that all subjects should be acquainted with the object and purpose of sustainable development of tourism in the area of Kopaonik, to identify the best examples from the region and learn about opportunities of integration. Important moment is the introduction of sustainable tourism program to measure the social, ekonomic and impact on the environment (sustainable tourism certification programs for accommodation facilities, camping, agrotourism). Organizing various joint events may contribute to linking the private and public sectors. For example, Sunday,, local cuisine "would be the event in which all hotels could participate and prepare food according to old recipes of foods and products of the local population. Festivals, fairs and various competitions would also contribute to the attractiveness and brand identity. In addition to the well-known winter sports competitions, we could organize competitions in a photo safari, photographing landscapes, interesting plants, unusual buildings, etc., as well as various exhibitions, festivals, flowers, cheese, wine, folk festivals, fairs honey, mushrooms, products of forest fruits and others. These events should be organized in the spring and autumn, in order to give impetus to the development of tourism in peripheral season.

CONCLUSION

Bearing in mind that in its motivation and exercise it is least opposed to the natural environment and could be able to achieve the greatest economic and social effects in relation to all other present and potential activities in the area of the National park, it has the biggest advantage for the development of sustainable tourism. Respect for fundamental principles of sustainable development require the fulfillment of three conditions: ecological impact in terms of tourism development and the complementary activities that can be implemented in areas of outstanding natural values; economic viability, in terms of investment and active protection of mountain areas, and social acceptability, in terms of protecting local interests, improve living and working conditions, the inclusion of local people in the tourist offer and nature protection.

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V. NATURAL RESOURCES AND ECOSYSTEM SERVICES: ADAPTATION TO CLIMATE CHANGE IN MOUNTAIN REGIONS

IS FOREST BIOMASS EXPLOITATION A PANACEA TO DEAL WITH ENERGY POVERTY IN MOUNTAINOUS AREAS?

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ABSTRACT

Mountainous areas are characterized by increased thermal energy loads compared to lowlands, mainly due to the cold climate and the, usually, old building stock. Moreover, mountain societies face serious difficulties in covering sufficiently their energy needs, a phenomenon that is known as energy poverty, which is getting real harder under the influence of economic crisis.

One solution to mitigate energy poverty in mountainous areas is utilizing forest biomass, which is often found in great quantities in highlands. However, energy exploitation of forest resources must be thoroughly designed and regulated. Because of the intensification of poverty phenomena, incidents of illegal logging have increased, particularly in Southeastern Europe. Furthermore, cheap, inefficient ways of biomass exploitation may cause air pollution and health problems.

In this paper, the parameters of forest biomass utilization through an efficient, central co-generative energy unit providing heat to the households via a district heating network are presented. The mountainous town of Metsovo, Greece has been used as a case study. The energy needs of Metsovo as well as the dimensions of energy poverty in the area were estimated. The biomass potential was calculated based on extensive time – series of forest production data. Emphasis was placed on avoiding conflicts between energy exploitation and other uses of timber. The energy unit and the district heating network were dimensioned according to the energy needs, the inclining topography and the biomass potential of Metsovo, and the corresponding costs were estimated. Finally, the feasibility of the project was assessed through social cost – benefit analysis.

It was proved that a central co-generative unit and a district heating network for biomass utilization, presents several advantages for mountainous settlements: reduction in households' energy costs; decrease in the environmental footprint due to lower fossil fuel usage and replacement of inefficient woodstoves; convenience for the users compared to manually fed burners; ensuring forest products' sales because of the need for stable timber quantities. Additionally, the competitive price of biomass energy could help towards avoiding unregulated logging, apart from contributing to energy poverty alleviation. Nevertheless, such projects demand high capital costs and their feasibility may depend on state subsidy.

In conclusion, forest biomass exploitation can be helpful towards confronting energy poverty in mountainous areas. Still, for being a sustainable solution it must be based on thoughtful planning, certain rules and modern, effective technologies. Hence, specialized regulation and sufficient funding are necessary.

Keywords: *energy poverty, forest biomass, renewable energy, district heating, cogeneration*

INTRODUCTION

The phenomenon of energy poverty

Energy/fuel poverty is an important social problem, closely related to the global energy and economic crisis. Fossil fuels stocks are finite, as non-renewable resources, while energy demand is constantly increasing. Therefore, energy prices tend to increase, as a rule. Especially in recent years, the austerity policies imposed in Europe, and especially in Greece, as a consequence of the economic crisis have worsened the problem. Reduced incomes combined with high energy prices have made the situation unbearable for a lot of households, which cannot afford to meet sufficiently their energy needs.

Apart from the economic aspect of the problem, energy poverty has evolved into a serious human health issue, linked with several physical and mental diseases, as well as with excess winter mortality. According to the World Health Organization, in 2000, indoor air pollution has been announced as one of the top ten global health risks. Globally, over 1.3 billion people live without access to electricity and 2.6 billion people without clean cooking facilities, according to the International Energy Agency. These figures differentiate in Europe, where it is assessed that between 50 million and 125 million people are fuel poor (EPEE, 2009).

The earliest research on fuel poverty was based on "adequate home heating" and "adequate warmth" (e.g. Lewis, 1982; Boardman, 1986), by quantifying households which fail to achieve minimum heating standards. Many other approaches have followed, some of which criticise previous assertions, such as that of Healy (2004), who supports that "fuel poverty is caused by a complex interaction between low income and domestic energy inefficiency" or that of Buzar (2007), who defines the problem as "the condition wherein a household is unable to access energy services at home, up to a socially

-and materially- necessitated level". A similar definition has been given by the Practical Action organization: "Energy poverty can be defined as the lack of adequate modern energy for the basic needs of cooking, warmth and lighting and essential energy services for schools, health centres and income generation".

Practically, the European countries do not have a consistent approach to recognizing people living in fuel poverty (BPIE, 2014), with the exception of the United Kingdom. The United Kingdom is the only country with an official definition, legitimized in 1998: "A household is in a situation of fuel poverty when it has to spend more than 10% of its income on all domestic fuel use, including appliances, to heat the home to a level sufficient for health and comfort" (EPEE, 2009). This definition has been recently updated according to a Government consultation, according to which, households are considered fuel poor if "they have required fuel costs that are above average (the national median level) and were they to spend that amount, they would be left with a residual income below the official poverty line" (BPIE, 2014). Apart from the United Kingdom, approximately 10 Member States use different lines of identifying energy poor people, based on several criteria, such as minimum income threshold, vulnerable customer categories etc. (BPIE, 2014).

Energy poverty in mountainous areas

The problem of energy poverty affects so much lowlands and urban areas, as mountainous areas. However, it is claimed that mountainous areas are highly exposed to energy poverty on a permanent basis, due to four main characteristics: cold climatic conditions, old buildings without insulation, low incomes and geographical isolation (Katsoulakos et al., 2014). Specifically for the case of Greece, Katsoulakos et. al (2014) report that the majority of buildings in mountainous areas were built before the first Building Energy performance Regulation applied in Greece (1980) and even earlier, before 1960, a fact that implies high energy losses. This fact, along with the decrease in temperature with altitude and the low incomes prevailing, as a rule, reveal the high vulnerability of mountain populations to energy poverty, compared to lowlands. Moreover, the increase in energy costs because of the great distance between mountainous areas and the main energy centres, has been noticed in several references (Johansson and Goldemberg, 2002; Katsoulakos and Kaliampakos, 2014). As an example, it is reported that heating diesel oil and gasoline prices in mountainous Greece are considerably increased (reaching an increase of 5% and 10% correspondingly), compared to the nearby urban centres.

Many other findings reveal the greater risk of energy poverty for mountainous areas. In a study of Katsoulakos and Kaliampakos (2014) for the case of Greece, it is indicated that thermal energy demand is 2.7 times higher at 1000 m altitude compared to sea-level, causing an increase of over 80% in the corresponding energy consumption and energy costs. This study presents a degree-day methodology for quantifying the differentiation of energy demand with respect to altitude, highlighting the decisive role of altitude in heating degree days, and consequently in thermal energy needs, with an accuracy of 85%. As a result, the high thermal loads of mountainous areas in Greece have been quantitatively defined: a typical residence at 800 m altitude has approximately 200% higher thermal energy needs, resulting in 50% higher total energy needs, compared to a residence at sea-level. In the context of this study, the percentage of energy poor households in mountainous Greece have been estimated, by comparing the energy expenses of households with their income distribution, applying the UK rule of income's 10%. It is found that energy poverty exists at all altitudinal zones but in high altitudes the problem is even more acute, with more than 8 out of 10 households being vulnerable to energy poverty.

Recognizing the unfavourable socio-economic conditions prevailing in highlands, it is implied that addressing the problem of energy poverty in mountainous areas is more than a moral imperative. Apart from the local scale of the problem, alleviating energy poverty in mountainous areas, in general, should be a priority for policy makers targeting to the sustainable development of these areas, since the higher poverty risk of mountainous societies has been generally acknowledged. According to the Food and Agriculture Organization of the United Nations, almost 35% of the global mountain population faces severe poverty problems.

Energy poverty and forest biomass

Energy poverty mitigation can be achieved by three main ways: income increase, fuel prices decrease and energy efficiency improvement of dwellings (BPIE, 2014). Regarding the second factor of fuel prices for the case of Greece, it should be noted that the austerity measures implemented with the advent of the economic crisis have mainly resulted in heavy taxation for Greek households. This brought about a great increase in fuel prices in 2012 and as a result, the demand for heating oil supply has dramatically decreased throughout the last two years. Inevitably, the majority of consumers turned to alternative fuels, such as biomass (firewood, wood pellets, briquettes etc.) for domestic heating. However, during the last months, the price of heating oil has dropped again, becoming competitive in the market and affordable for households, but still it appears that consumers have permanently turned to alternative fuels. The demand for biomass remains particularly high at present, despite the current low heating oil prices.

Biomass is recognized as one of the most important renewable energy sources (RES), mainly due to its multiple benefits arising from both production and exploitation of it for energy and other products. It includes any type (forest biomass, plant residues, wastes and energy crops) which may be used for the production of solid and / or liquid fuels (Boutetsiou, 2010). In 2001, the use of biomass for energy was estimated at about 14% of the global primary energy (Bauen and Kaltschmitt, 2001). According to the Centre for Renewable Energy Sources of Greece, in 2000, biomass represented 62% of the total RES energy production in the European Union - by which wood covered the 50.5% - and only 7.2% of the total primary energy production. In Greece, the corresponding figures for biomass and especially for wood and wood waste were 67.3% of the total RES energy production and only 3.4% of the gross inland consumption.

This paper examines the forest biomass utilization, as a way to address the problem of energy poverty in mountainous areas. Biomass utilization has the advantage of primary heat production, which is a crucial parameter for mountainous

areas, regarding their high thermal energy demand. Nowadays, forests contribute to 14% of the global energy supply and are capable of reaching up to 50% of the energy requirements worldwide, during this century (Hall et al., 2002). Forest biomass is mainly found in mountainous areas, as most mountain ranges are covered by extensive forests. In Greece, where over 70% of its territory is being characterized as mountainous (Nordregio, 2004), 50% of forest areas are found in mountainous areas, fully enriched with biomass potential. The mountainous town of Metsovo, Greece has been used as a case study for the current research.

DATA AND METHODS

The evaluation of biomass utilization and its benefits on environment and society in the area of Metsovo, followed the below mentioned steps:

- Calculation of the biomass potential
- Estimation of thermal energy and power demand
- Dimensioning of the basic parameters of the biomass energy unit and estimation of capital and operational costs
- Cost - benefit analysis of the project (including social cost benefit analysis) with probabilistic analysis
- Assessment of the biomass unit operation impacts on energy expenses of the households
- In order to approach more accurately the thermal loads of Metsovo - which is the most decisive factor both for dimensioning a biomass unit and for estimating the energy expenses of the inhabitants - a detailed study was realized that included:
- Development of residence models according to their age, typology and construction materials
- Estimation of the energy performance of the models by using specialized software (Epa-Cad)

RESEARCH FINDINGS AND DISCUSSION

Biomass potential

The broader area of Metsovo is rich in forest resources. About 28,500 ha of forests are systematically exploited; the majority of them are covered by black pine trees (pinus nigra) and beeches (fagus sylvatica). The forest exploitation in the area of Metsovo leads to three main products, namely firewood, technical timber and posts for electricity and telecommunications networks.

The calculation of the biomass potential of the area under study was based on forest production data recorded by the Local Forest Authorities. The available data covered the period between 2003 and 2012. A ten year period is considered sufficient for an adequate estimation of the wood quantities extracted from the forests. In Table 1, the mean annual quantities of forest products in the area of Metsovo are presented.

Table 1. *Mean annual quantities of forest products in Metsovo for the years 2003-2012. Data obtained from the Local Forest Authorities.*

Product	Mean annual production (tons/year)
Firewood	4,112
Technical timber	6,180
Timber for posts	2,139
TOTAL	**12,431**

Apart from forest production, the quantities of woody residues are another important biomass source. The Forest Authorities of Metsovo estimate that the residues of firewood production correspond to a 10% percentage of the production and the residues of technical timber production to a 20% percentage. Hence, residues of forest production are estimated to be 2,074 tons/year.

There are a significant number of small wood industries in the Municipality of Metsovo, which produce big quantities of sawdust, partially used for heating. According to the National Informative System for Energy (NISE) of Greece, the residual quantities of sawdust (not used for heating) in the area of Metsovo is about 500 tons/year. Finally, according to the NISE and the archives of the Municipality of Metsovo, the woody residues of agricultural production in the area are estimated to be 810 tons/year (dry weight).

Therefore, the total theoretical woody biomass potential in Metsovo is **15,815 tons/year**. Considering that the calorific value of woody biomass is 4kWh/kg, the total thermal content of the biomass potential is **63,260 MWh/year**.

Thermal loads

The analysis was made for the thermal loads of the residential sector, because these constitute the vast majority of the thermal loads of the town of Metsovo. The area under study is characterized by cold climatic conditions winters. In Table 2, the heating degree days are presented.

Table 2: *Heating Degree Days in Metsovo per month (base temperature 16°C)*

Heating Degree Days (°C*days)												
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
463	415	393	253	120	38	32	28	77	186	298	414	2,718

Taking into account the available statistical data about the residences' characteristics, 17 models of residences were formed. Then, by using suitable software the heat transfer coefficients of the models were calculated. This allowed the estimation of the thermal energy demand in the residential sector of Metsovo, as well as the estimation of the thermal power demand. The thermal energy demand for hot water production was calculated according to the relative standards used in Greece (Directive 20701-1). The total, annual thermal energy demand in Metsovo was calculated to be **21,275 MWh** and the maximum thermal power demand **4.85 MW**. In Table 3, the heat transfer coefficients of the house models are summarized. In Figure 1 the monthly thermal power demand is presented.

Table 3. *Heat transfer coefficients of residence models in Metsovo*

Model No.	Conductivity heat transfer coefficient (W/°C)	Ventilation heat transfer coefficient (W/°C)	Total heat transfer coefficient (W/°C)
1	420,92	59,51	480,43
2	375,57	81,83	457,4
3	420,92	59,51	480,43
4	375,57	81,83	457,4
5	404,66	59,51	464,17
6	427,83	76,87	504,7
7	375,93	59,51	435,44
8	403,97	75,63	479,6
9	488,05	40,91	528,96
10	351,38	59,51	410,89
11	364,91	75,63	440,54
12	504,35	109,11	613,46
13	231,86	45,87	277,73
14	223,55	63,23	286,78
15	250,31	74,39	324,7
16	184,19	55,79	239,98
17	240,28	74,39	314,67

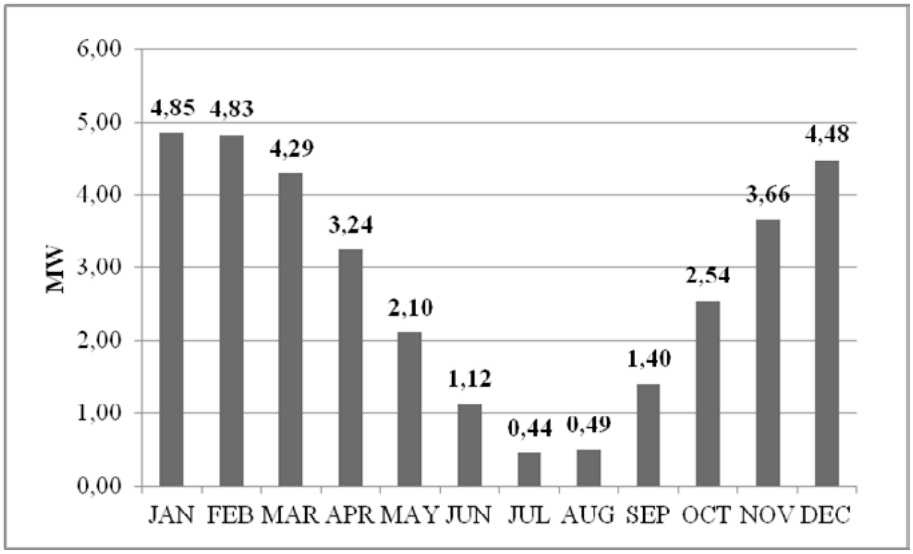

Figure 1. *Monthly thermal power demand (MW) of Metsovo residential sector*

High thermal loads due to the cold climate and the great number of old, without insulation residences make sufficient coverage of energy needs difficult in Metsovo. A typical residence demands 26.6 MWh/year for space and water heating. If a diesel oil-based heating system with an overall performance ratio of 90% is used, about 2,940 l of diesel oil are needed. The price of this type of fuel climbed up even to 1.4 €/l in 2014, which means that a typical residence in Metsovo had to spend

over 4,100 € for covering thermal energy needs. Oil prices have recently fallen, so during the winter period of 2014 - 2015 this cost has become more affordable. However, it is not sure that the downward trends in oil prices will continue (O' Neil, 2015).

Basic biomass unit design

The utilization of biomass for providing heat to the households of Metsovo was studied to be realized through a central unit with two high-pressure biomass burners. The unit was supposed to be co-generative, in order to operate with high performance rate. An LPG burner should be installed for back-up power feed. Combining the biomass potential and the thermal loads, the basic characteristics of the energy unit were estimated. It was supposed that the biomass unit will cover about 70% of the households. This percentage is reasonable and corresponds to the percentage of households that prefer to use district heating systems in Greece, where they are available (DETIP, 2015). Moreover, it was considered that the unit will not operate in full - power through the whole year, in order to maximize energy production, but it will operate mainly to cover the thermal loads. This could be a protective measure for the forest resources of Metsovo, against intensive exploitation. Taking the aforementioned into account, the biomass unit will have an installed capacity of 4 MW. The power of the electricity generator will be 680 kWe and the power of the LPG burner will be 250 kW. Such a unit will provide 14,900 MWh of thermal energy to the households of Metsovo and 3,920 MWh of electrical energy to the electricity grid. Such a biomass unit will need to consume about 7,200 tons of woody biomass. This quantity corresponds to less than half of the theoretically available biomass potential and therefore, the operation of the unit will be ensured and will not lead to overexploitation of forest resources.

Feasibility assessment

The total capital cost of the biomass district heating unit was estimated to be a little more than 11.000.000 €. This estimation was based on an extensive study of the Greek energy market. Table 4 contains a more detailed illustration of the unit's capital costs.

Table 4. *Capital costs of biomass district heating unit*

Expense categories	€
Design - Licensing	150.000
Energy unit	2.465.000
Biomass burners and boilers	2.300.000
LPG burner and boiler	15.000
Electricity generator	150.000
Storage infrastructure	440.000
Wood storage	420.000
LPG tanks	20.000
District heating	7.043.000
Transfer network	4.000.000
Distribution network	1.013.000
Heat exchangers	2.030.000
Supporting infrastructure	260.000
Buildings	125.000
Διαμόρφωση περιβάλλοντος χώρου	125.000
Land purchase	10.000
Incidental expenses	517.900
Working capital	200.000
TOTAL	11.075.900

The operation and maintenance cost of the energy unit includes:

- personnel costs
- maintenance of equipment
- fuel costs (wood and LPG)
- The total, annual operational cost was estimated to be 903,000€.
- As far as the financial inflows of the unit are concerned, the following assumptions were made:
- the price of thermal energy will be 77 €/MWh (about 30% lower than the corresponding cost of using domestic diesel oil burner, when the diesel oil price is at the level of 1 €/l)

- the price of electricity sold to the network will be 175 €/MWh (according to the relative legislation in Greece)
- Hence, the total annual income of the energy unit will be 1,833,300€.

Considering that the discount rate is 5% (MoPF and MoE, 2010), the investment's lifetime is 20 years and that no subsidy is given for the investment, it was extracted that the Net Present Value (NPV) of the energy unit is 866,000 € and the Internal Rate of Return (IRR) 6.1%. If a subsidy of 40% is provided for establishing the energy unit (a common practice for renewable energy units in Greece) the NPV will increase at the level of 5,000,000 € and the IRR at 14.4%. Therefore, without any financial support the energy unit is viable, even marginally. Using Monte - Carlo simulation for a probabilistic analysis of the unit's feasibility, it was calculated that (without subsidy) there is a possibility of 90% for the unit to be financially viable.

Benefits for the local society

The operation of the district heating biomass unit will contribute to achieving improvement in the environmental footprint of the town of Metsovo. It is supposed that priority will be given to the replacement of diesel oil burners and wood - stoves, since these types of energy systems produce most of the air pollution in the area. The replacement of these systems with biomass based district heating and the production of "green electricity" by the biomass unit will result in the following reduction of air pollutants emissions (EEA, 2013; Katsoulakos, 2013):

- CO_2 - 7,122 tons/year
- NO_x - 20 tons/year
- SO_2 - 15 tons/year
- PM_{10} - 600 kg/year

The CO2 emissions of the residential sector after the operation of the biomass unit will be 65% less than in the current situation. This is a major improvement of Metsovo environmental footprint.

The utilization of biomass in Metsovo can play a crucial role in the direction of alleviating energy poverty in the area. Under the current circumstances an "average" household using a diesel oil burner should spend 14.6% - 17.6% of its annual income for covering thermal energy expenses, depending on the price of diesel oil (taking into account the prices of the last five years). By using the district heating system the percentage can be reduced to 10.2%. If the construction of the biomass unit could be subsidized, then the households using district heating will spend less than 7% of their income for heating purposes. Such a serious reduction in energy expenses could protect the mountainous society of Metsovo from energy poverty and allow its inhabitants to keep high living standards. Combining this issue with the positive environmental performance of the biomass unit, it is worthy to provide financial support for its foundation and this should be taken into account by policy and decision makers. Besides, the social cost - benefit analysis, which takes into account all the positive and negative externalities of the biomass project shows that the social NPV is at least 6,690,000 € and the social IRR at least 7%. This finding supports the necessity of subsidizing the construction of the biomass unit.

Comparison with other biomass - based solutions

Because of the great increase in diesel oil price in Greece between 2009 and 2012 (over 200%), many people in mountainous settlements replaced the diesel oil burners with firewood ones, in order to cover in a cheaper way the high thermal loads of their residences. This solution was applied in Metsovo by about 20% of the households. Indeed, a typical residence in the area could achieve great reduction in thermal energy costs by using a firewood burner compared with the use of diesel oil, up to 65%. However, supposed that 70% of the households use domestic firewood burners (instead of biomass based district heating), the below mentioned points should be taken into account:

- The PM10 emissions in the town of Metsovo will be increased by 1950 kg at an annual basis. The increase in CO emissions is estimated at 260 tons/year.
- The necessary quantity of firewood exceeds the local forest capacity
- No electricity is produced and hence, the efficiency of biomass utilization decreases significantly
- Firewood burners should be fed manually, even twice a day during cold periods, and the produced ashes have to be regularly removed from the system. This makes their operation arduous.

The actual situation presents more negative points than the potential extensive use of firewood burners. A lot of households, because of the income reduction in Greece, as a result of the economic crisis, are not capable of installing a new biomass system. So, the use of existing wood stoves and open fireplaces has increased. The use of such systems does not only have very low environmental performance, but it is also completely ineffective for heating purposes. An open fireplace produces 70 times more PM emissions than a diesel oil burner and 9 times more PM emissions than a firewood burner (EEA, 2013). It is practically impossible to cover sufficiently the thermal loads of a residence by using fireplaces and / or wood - stoves. Usually one or two rooms are heated and the other spaces of the residences remain cold, with negative impacts on comfort conditions and residents' health. Such an insufficient coverage of thermal energy needs is tied with the presence of energy poverty, even if the energy expenses remain at low level.

CONCLUSIONS

Some main points are highlighted below:

- Energy utilization of mountain forests can be a socioeconomically acceptable solution for alleviating energy poverty in mountains areas. Central combustion units that distribute heat via district heating networks seem to be the most integrated practice. Firewood heaters present low operational costs but their PM emissions are high and they demand a lot of manual effort for feeding and cleaning.
- The utilization of biomass through modern combustion units demands high capital costs. Financial support - e.g. in a form of subsidy in the construction cost - is necessary for ensuring the feasibility of such a unit and for having

the possibility to provide thermal energy with low cost for households.

- The operation of a biomass combustion unit needs stable quantities of woody biomass, which can ensure long-term forest exploitation, confronting unemployment in mountainous areas. Moreover, a well organised and long-term exploitation of forests combined with providing affordable biomass - based energy to the households would discourage illegal logging.

Auspicious perspectives for mountainous areas cannot be securely built without alleviating energy poverty. Biomass utilization is an effective solution, since it can provide affordable energy to mountain societies produced by local, renewable resources. Nevertheless, biomass should be exploited at the basis of integrated plans and with sufficient funding.

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TOURISM CLIMATE INDEX IN THE COASTAL AND MOUNTAIN LOCALITY OF ADJARA, GEORGIA

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ABSTRACT

Tourism climatology information was provided through climate indices such as those found in applied climatology and human biometeorology. There are more than 200 climate indices. In general, the tourism climate indices can be classified into three categories. Elementary indices are synthetic values that do not have any thermo-physiological relevance and are generally unproven. The bioclimatic and combined tourism climate indices involve more than one climatological parameter and consider the combined effects of them. An example of a combined index is the Tourism Climate Index (TCI) developed by Mieczkowski in 1985.

Values of TCI for mass tourism (or "Average Tourist") vary from -30 to 100 and they are subdivided into 10 categories. TCI values >= 80 are excellent, while values between 60 and 79 are regarded as good to very good. Lower values (40 – 59) are acceptable, but values < 40 indicate bad or difficult conditions for mass tourism, etc.

In this work the determination of the TCI to four coastal and mountain localities of the Adjarian Autonomous Republic (known tourist and health resort region of Georgia) is carried out (Batumi, capital of the Adjarian Autonomous Republic: 41.64° N, 41.64° E, 9 m a. s. l.; Kobuleti: 41.82° N, 41.78° E, 3 m a. s. l., distance from Batumi - 23 km along the coast of the Black sea; Khulo: 41.64° N, 42.30° E, 921 m a. s. l., distance from Batumi - 56 km; Goderdzi, 41.63° N, 42.52° E, 2025 m a. s. l., distance from Batumi - 73 km).

For the indicated localities the monthly average values of TCI in the period from 1961 through 2010 with the use of data of the Hydrometeorological department of Georgia are calculated. The contrast of TCI values in dependence on area relief is revealed. The special features of the variability of TCI values during this period of time in connection with climate changeability are studied. The most favorable from the point of view of the bioclimatic characteristics of a locality for the development of different forms of tourism periods of the year are determined (Sun & Beach Tourism, Eco Tourism, Birdwatching, Sport Tourism, Rural Tourism, Cruise Tourism, Wine Tourism, Ski & Mountain Resorts, MICE Tourism, Gambling Tourism etc.).

Keywords: *Tourism Climate Index, Bioclimate, Climate Change, Tourism.*

INTRODUCTION

Tourism as an important sector of the global economy is influenced by the geographical location, topography, landscape, vegetation, fauna, ecological situation, weather, climate, etc. The weather and the climate are two factors that in many respects influence decisions regarding areas to be visited (Matzarakis, 2006). Many climate indices for tourism have been applied in past research. Survey information about them can be found for example in the works (Abegg, 1996; Matzarakis, 2006).

A climate index approach is one way and researchers have attempted to represent the multifaceted nature of the climate potential for tourism. Several indices have been developed over the last 45 years to assess the suitability of climate for tourism activities (Mieczkowski, 1985; Scott and Boyle, 2001; Matzarakis and Freitas, 2004; Matzarakis et al., 2004).

The most widely known and applied index is the tourism climate index proposed by Mieczkowski (Mieczkowski, 1985). This index is a combination of seven factors and parameters. Mieczkowski's "Tourism Climate Index" (TCI) was designed to use climate data, being widely available for tourist destinations worldwide. Data about TCI are used for the information on the "Average Tourist" and can be useful for the planning developments of mass tourism.

TCI is used in many countries of the world (Abegg, 1996; Scott and Mc Boyle, 2001; Matzarakis and Freitas, 2004; Matzarakis et al., 2004; Cengiz et al., 2008; Kovács and Unger, 2014; Mendez-Lazaro al., 2014), including such countries of the Black Sea-Caspian region as Turkey (Toy and Yilmaz, 2010) and Iran (Farajzadeh and Matzarakis, 2009; Gandomkar, 2010; Shakoor, 2011; Ramazanipour and Behzadmoghaddam, 2013; Ghanbari and Karimi, 2014). In the South Caucasus countries, a monthly value of TCI has been calculated in Georgia, first for Tbilisi (Amiranashvili et al., 2008), then for Batumi (Amiranashvili et al., 2010; Kartvelishvili et al., 2011), Anaklia (Amiranashvili et al., 2011), Baku and Yerevan (Amiranashvili et al., 2014).

For tourism climatology this bioclimatic parameter has also been used lately as Physiologically Equivalent Temperature (PET) – a combination of daily air temperature, relative humidity, wind velocity and mean cloud cover, etc. PET is one of the most popular physiological thermal indices derived from the human energy balance which is used in the analysis to describe the effect of the climate (Matzarakis et al., 2010; Shiue and Matzarakis, 2011; Matzarakis et al., 2014).

For evaluating the bioclimatic potential of the localities in Georgia from the human thermal comfort the complex, thermal indices as Air Equivalent-Effective Temperature (EET- combination of air temperature, relative humidity and wind velocity) and Air Radiation Equivalent-Effective Temperature (REET- combination of air temperature, relative humidity, wind velocity and solar radiation intensity) was used. A question about the use of data about the air thermal regime (as and TCI),

with certification of the health resort and tourist resources of Georgia is examined (Amiranashvili et al., 2011).

As it follows from the aforesaid, the studies of the complex bioclimatic characteristics of health resort and tourist zones (including TCI) are of great importance. Significant studies on these issues are carried out in Turkey and Iran. At the same time, an explicit deficiency in the studies of the tourism climate index in the countries of the South Caucasus (adjacent with Turkey and Iran) is observed.

The purpose of this paper is to compare the characteristics of tourism climate conditions (TCI) in four coastal and mountain localities of the Adjarian Autonomous Republic (known tourist and health resort region of Georgia) and to determine the most suitable months for various tourism and tourist activities in these cities. In addition to this, the special features of the variability of TCI values during period of time from 1961 to 2010 in connection with the climate changeability have been studied.

This work is the beginning of a more detailed study of the indicated index of tourism in the South Caucasus countries, which will make it possible to reveal the common picture of the distribution of this bioclimatic factor for the entire Black Sea-Caspian region.

STUDY AREA, METHODS AND DATA

The study area covers (Figure 1, Table 1) four coastal and mountain localities of the Adjarian Autonomous Republic (Batumi – the capital of the Adjarian Autonomous Republic, Kobuleti, Khulo and Goderdzi).

The Adjara Autonomous Republic is situated in southwestern Georgia along the Black Sea coast. It borders with Turkey and the Shavsheti Range on the south, the Meskheti Range on the north; the Arsiani Range on the east and the Black Sea on the west. The Meskheti, Arsiani and Shavsheti Ranges create the very interesting geographic relief of Ajara. Their average height is 2000-2500 m. The highest peak in Ajara is Mount Kanli (3007 m) in the Arsiani Range. The beautiful Goderdzi Pass (2025) m is on the same range as well. The deciduous as well as the coniferous forests on the mountain slopes of the Adjara highlands create unforgettable views.

The total area is nearly 3000 km^2 constituting approximately 4 percent of Georgia. The Adjarian coastline is 57 km long. The following seaside resorts and resort places are situated alongside the coast: Pichvnari, Kobuleti, Bobokvati, Chakvi, Tsikhisdziri, Mtsvane Kontskhi (the Green Cape), Makhinjauri, Batumi, Gonio, Kvariati and Sarpi.

Figure1 *Arrangement of four locations in Adjara for which the values of TCI are calculated*

Table 1. ***Coordinates of four locations of Adjara***

Location	Latitude, N, Degrees	Longitude, E, Degrees	Altitude, m, a. s. l.	Distance from Batumi, km
Batumi	41.64	41.64	9	0
Kobuleti	41.82	41.78	3	23
Khulo	41.64	42.30	921	56
Goderdzi	41.63	42.52	2025	73

Adjara is well known for its humid climate (especially along the coastal regions) and prolonged rainy weather, although there is plentiful sunshine during the spring and summer months. Adjara receives the highest amounts of precipitation both in Georgia and in the Caucasus. It is also one of the wettest temperate regions in the northern hemisphere. No region along Adjara's coast receives less than 2200 mm of precipitation per year. The west-facing (windward) slopes of the Meskheti

Range receive more than 4500 mm of precipitation per year. The coastal lowlands receive most of the precipitation in the form of rain (due to the area's subtropical climate). September and October are usually the wettest months. Batumi's average monthly rainfall in the month of September is 320 mm. The interior parts of Adjara are considerably drier than the coastal mountains and lowlands. Winter usually brings significant snowfall on the higher regions of Adjara, where snowfall often reaches several meters. Average summer temperatures are between 22–24 ºC in the lowland areas and 17–21 ºC in the highlands. The highest areas of Adjara have lower temperatures. The average winter temperatures are between 4 – 6ºC along the coast and around -3 -2ºC in the interior areas and mountains. Some of the highest mountains of Adjara have average winter temperatures of -8–(-7) ºC.

In the work the Tourism Climate Index (TCI) developed by Mieczkowski (Mieczkowski, 1985) is used. TCI is a combination of seven parameters, three of which are independent and two in a bioclimatic combination:

$$TCI = 8 \cdot Cld + 2 \cdot Cla + 4 \cdot R + 4 \cdot S + 2 \cdot W$$

Where C ld is a daytime comfort index, consisting of the mean maximum air temperature Ta, max (°C) and the mean minimum relative humidity RH (%), Cla is the daily comfort index, consisting of the mean air temperature (°C) and the mean relative humidity (%), R is the precipitation (mm), S is the daily sunshine duration (h), and W is the mean wind speed (m/s).

In contrast to other climate indices, every contributing parameter is assessed. Because of a weighting factor (a value for TCI of 100), every factor can reach 5 points. TCI values >= 80 are excellent, while values between 60 and 79 are regarded as good to very good. Lower values (40 – 59) are acceptable, but values < 40 indicate bad or difficult conditions for understandable to all tourism.

For the indicated localities the monthly average values of TCI in the period from 1961 through 2010 with the use of data of the Hydrometeorological department of Georgia are calculated. The difference between the mean values of TCI during the periods 1986-2010 and 1961-1985 with the use of Student's criterion was determined (level of significance not worse than 0.15).

RESEARCH FINDINGS

The results of the TCI calculations are presented in Figure 2-3 and Tables 2 and 3.

As it follows from Figure 2, the average annual values of TCI during 1961-2010 covered all four changes from the category "Extremely unfavourable" (Goderdzi) to the category "Very good" (all locations).

The intra-annual distribution of the TCI values for Batumi and Kobuleti (coastal cities) is of bimodal nature with an extremum in May-June and September. Let us note that a bimodal type of distribution of the TCI values is observed in many other places. For example the cities of Mahabad, Jolfa, Marageh, Sagez, and Parsabad (Iran) had a bimodal-shoulder peak distribution. Maximum TCI values were recorded in May, June and October. In these cities the spring and autumn weather are climatically comfortable for tourism (Farajzadeh and Matzarakis, 2009). New Orleans, Charleston, New York, St. Louis, Prague, Thessaloniki also relate to the cities with bimodal-shoulder peak TCI distribution (Scott and Mc Boyle, 2001; Matzarakis et al., 2004; Kovács and Unger, 2014), etc.

The intra-annual distribution of the TCI values for Khulo and Goderdzi (mountain localities) has a summer peak TCI distribution. An analogous type of TCI distribution, for example, is observed in Calgary, Seattle, Yellowknife and Toronto (Scott and Mc Boyle, 2001).

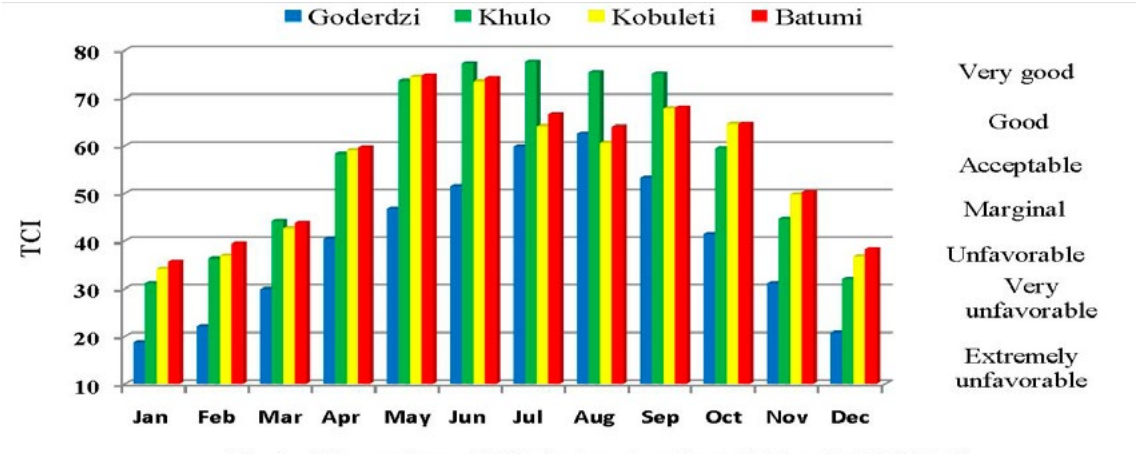

Figure 2. *Mean values of TCI in four locations in Adjara in 1961-2010*

The TCI values in the different cities of Iran change in the range from the category "Acceptable" to "Ideal" (Farajzadeh and Matzarakis, 2009; Gandomkar, 2010; Shakoor, 2011; Ramazanipour and Behzadmoghaddam, 2013; Ghanbari and Karimi, 2014), in Baku and Yerevan from "Marginal" to "Ideal", in Tbilisi, from "Marginal" to "Excellent" (Amiranashvili et al., 2014), in Debrecen, Prague, Thessaloniki and other cities of central Europe from "Very Unfavourable" to "Excellent" (Kovács and Unger, 2014), etc.

Table 2. *Monthly variations of TCI in four locations of Adjara in 1961-2010*
Mean - Mean 1961-2010; Mean I - Mean 1986-2010;
Mean II - Mean 1961-1985; Differ. I-II, α ≤ 0.15

Month	1	2	3	4	5	6	7	8	9	10	11	12
Location	**Batumi**											
Mean	36	39	44	60	75	74	67	64	68	65	50	38
Mean I	35	39	44	61	74	75	67	63	69	65	49	37
Mean II	36	40	44	59	75	73	67	65	67	64	52	39
Differ. I-II	No	No	No	No	No	2	No	No	No	No	No	No
Location	Kobuleti											
Mean	34	37	43	59	74	74	64	61	68	65	50	37
Mean I	34	37	44	62	74	73	62	56	67	66	50	37
Mean II	34	37	42	57	75	74	67	65	69	63	49	37
Differ. I-II	No	No	No	5	No	No	-5	-9	-2	No	No	No
Location	Khulo											
Mean	31	36	44	58	74	77	78	75	75	59	45	32
Mean I	30	36	44	59	73	77	76	74	75	60	45	32
Mean II	32	37	45	58	74	78	79	77	75	59	45	32
Differ. I-II	No	No	No	No	No	No	-3	-3	No	No	No	No
Location	Goderdzi											
Mean	19	22	30	40	47	52	60	63	53	42	31	21
Mean I	18	22	33	42	49	52	62	66	55	43	31	20
Mean II	19	22	28	39	45	51	57	59	51	40	31	21
Differ. I-II	No	No	5	3	4	No	5	7	4	No	No	No

The lower mean monthly values of the upper level of TCI (Very Good) in Batumi, Kobuleti and Khulo (in comparison with many of the above-indicated cities) are caused by the more rainy climate and a smaller sunshine duration, decreasing the contribution share of R and S to the general value of TCI.

In table 2 data on the monthly variations of TCI in four locations of Adjara in 1961-2010 and the changeability of TCI in 1986-2010 in comparison with 1961-2010 are presented.

In the indicated periods of time the following changes of TCI occurred.

Batumi. There is an increase of the TCI value in the last year of the 25-year period only in June. In this case this increase does not affect the TCI category – "Very good".

Kobuleti. There is an increase of the TCI value in the last year of the 25-year period only in April. This increase has influenced the TCI category. A change in the category occurred – from "Acceptable" to "Good", i.e., the climatic situation was improved. During July, August and September in the last year of the 25-year period a decrease a decrease of the TCI mean value occurred in comparison with the period 1961-1985. In this case in July and September the TCI category did not change and remained "Good". In August the decrease of mean value of TCI led to a change in the TCI category from "Good" to "Acceptable".

Khulo. No significant decrease of the TCI values in July and August. This decrease in the last year of the 25-year period does not affect the TCI category - "Very good".

Goderdzi. A significant increase of the TCI values from March through May and from July through September is noted. In this case in May and September the TCI categories did not change ("Marginal" and "Acceptable" respectively). In March the "Very unfavourable" category became "Unfavourable" and in April the category "Unfavourable" changed to "Marginal", while in July and August the category "Acceptable" turned into "Good".

Thus, the process of global warming exerted most favourable influence on the alpine point Goderdzi. In March, April, July and August the TCI categories were increased by one gradation. As a whole, the indicated changes of TCI values noted are not very essential and within the limits of adjacent gradations.

In Figure 3 and Table 3 the data concerning the repetition of TCI monthly mean values and the number of months of various TCI categories in four locations of Adjara in 1961-2010 are presented.

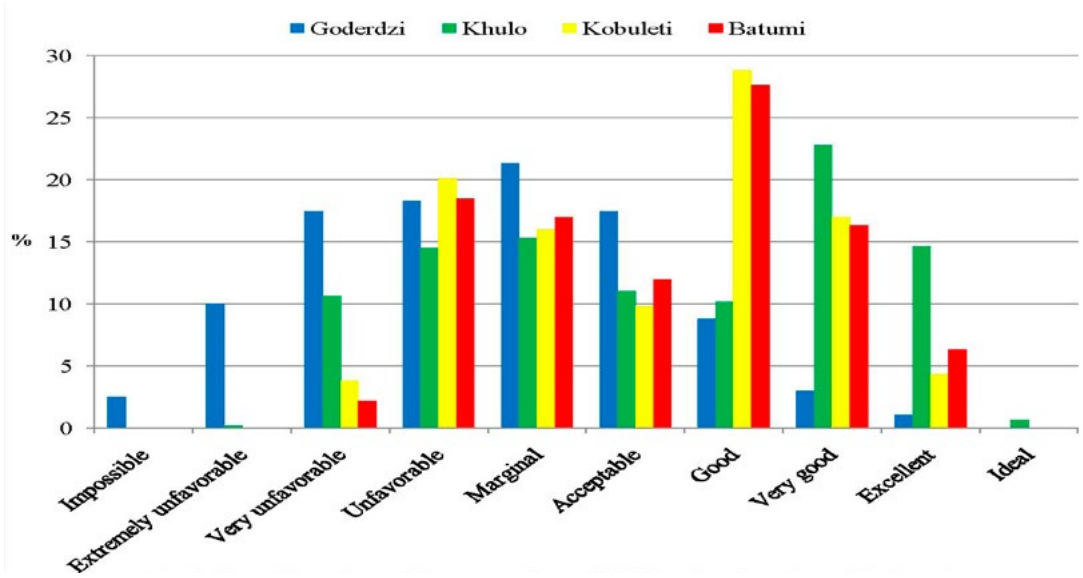

Figure 3. *Repetition of the TCI monthly mean values in four locations of Adjara in 1961 - 2010*

As seen in Figure 3 and Table 3, monthly repetition of TCI in Batumi and Kobuleti in the range from "Very unfavourable "to "Excellent" is found, with a max repetition of the TCI category "Good", in Khulo - from "Extremely unfavourable" to "Ideal" (with a max repetition of the category "Very good") and in Goderdzi - from "Impossible" to "Excellent" (with a max repetition of the category "Marginal").

Table 3. *Number of months of a various TCI category in four locations of Adjara in 1961-2010*

TCI Category	Goderdzi	Khulo	Kobuleti	Batumi
Impossible	9	0	0	0
Extremely unfavourable	37	1	0	0
Very unfavourable	64	39	14	8
Unfavourable	67	53	74	68
Marginal	78	56	58	62
Acceptable	64	40	36	44
Good	32	37	105	101
Very good	11	83	62	60
Excellent	4	54	16	23
Ideal	0	2	0	0
Marginal-Ideal	189	273	277	290
% from year	51.7	74.7	76.0	79.3
Month in year (mean)	6.2	9.0	9.1	9.5

Thus, the bioclimatic characteristics (TCI) of Goderdzi permit implementation of mass tourism in this locality on the average in the course of 6.2 months per annum, in Khulo, Kobuleti and Batumi - from 9 to 9.5 months per annum.

DISCUSSION

In Adjara contrast of TCI values depending on the area relief is observed. Depending on the location of a tourism site the duration of the season for mass tourism on the average is varied from 6 to 9-10 months per annum. At the same time in Adjara it is possible to develop specialised forms of tourism that have no special requirements with regard to the weather (in essence, excess precipitations). As a whole here the following forms of tourism are already developed and over the long term can be introduced (http://gobatumi.com/en).

Sun & Beach Tourism: Sun and beach tourism is one of the most popular types of tourism in Adjara. The subtropical climate, the warm sea air, the infrastructure of the sea resorts, the sea and mountain combination create favourable conditions for holidays. The total length of the swimming zone is 21 km. The average sea temperature is + 21-29 °C.

Eco Tourism: Ecotourism is one of the leading types of tourism in Adjara. Foreign tourists are especially interested in ecotourism while visiting the region. The diverse flora and fauna as well as the abundance of historical and cultural monuments have created favourable conditions for ecotourism development. There are 4 protected areas on the territory of Adjara. Their diversity clearly indicates to the great potential of ecotourism in the region.

Bird & raptor watching Tourism: Just outside the city of Batumi - situated in the foothills of the Lesser Caucasus, on the eastern shoreline of the Black Sea - is one of the best places in the whole western Palearctic to watch migrating raptors. Here, it is possible to witness a migration spectacle that is rarely paralleled anywhere in the world: over 800000 raptors

belonging to 35 species are recorded here each autumn, as they make their annual journey south from Scandinavia, over the forests of Russia and the steppes of Central Asia to their wintering grounds in Africa. Strong movements of storks, cranes, bee-eaters, swifts, swallows, and a diverse assemblage of other "songbirds" are also seen here. The unique topography and climate in the region set the stage for bringing together so many birds at one time, at one place, guaranteeing a totally unique natural history experience.

Rural Tourism: There are many hunting and fishing places in Adjara with seasonal hunting of wild boar, hare and badger and trout fishing in the rivers. In the woods you can pick strawberries, bilberries and blackberries. Adjara is a diverse region. The constituent municipalities greatly differ from one another. For example, Kobuleti is rich in diverse parks: a Botanical Garden, the Mtirala National Park, the Kintrishi Protected Areas, the Ispani wetland and the Tikeri Managed Nature Reserve. Khelvachauri is famous for honey, Shuakhevi - for high quality tobacco, Khulo - for dry potatoes and plaited cheese, etc.

Wine Tourism: Adjara is one of the oldest centres of viticulture and enology. Adjara holds a worthy place within the world viticulture and enology in the formation of the ancient traditions of vine cultivation. The region played a significant role in the creation of vineyards. In this small area more than 40 cultural vine species have been created and approved.

Ski & Mountain Resorts: Adjara has great potential for the development of skiing resorts. Arrangement of skiing resorts has been widely conducted in Adjara recently with recreational-healthcare as well as entertainment purpose. They are designed for all four seasons of the year. The infrastructure of the resorts is actively reconstructed in the municipalities of Shuakhevi and Khulo, namely in the resorts of Gomarduli and Ghomas Mta in Shuakhevi and Kedlebi, Goderdzi and Beshumi in Khulo municipality.

MICE Tourism: Recent local and international events held in Adjara have recently made the Adjara region famous for MICE tourism activities. New projects directed at creating tourist infrastructure in the region promote conducting of international fairs and events and attract professionals working in the MICE-sector not only during the summer season but all the year round, too.

Cruise Tourism: Historically the Batumi Sea Port has always functioned as the logistic centre in the Caucasus. It was the first port providing the transit country status of Georgia. The announcement of the Batumi Port as "Porto Franco" in 1878 contributed to its further development. At the beginning of 20th century the Batumi Port held the leading position along the Black Sea littoral according to its significance and turnover. At present the Port of Batumi hosts several big cruise ships. A plan of reconstruction of the Port of Batumi is aimed at enabling it to accept sea vessels of all types and sizes.

Gambling Tourism: Gambling business is very popular in Batumi. A vast choice of casinos is offered to local as well as visiting gamblers. Gambling business is legally permitted in Georgia. At present, the majority of casinos in Batumi are located in the buildings of 5-star hotels. The recent construction of high-level hotels in Batumi points out that the development of the casino business in Adjara in many hotels is in the hands of some of the biggest casino operators.

In the future more active development is desirable of sports tourism (yacht tourism, pedestrian tourism, etc.); medical and sanitary tourism; cultural tourism (archaeology, history, agriculture, ethnography); adventure and extreme tourism (trekking, mountaineering, skiing, horseback riding, mountain-biking, etc.); conventions and conferences; religion tourism; VIP tourism etc.

CONCLUSIONS

Climate has a strong impact on the tourism and recreation sector and in some regions represents the natural resource on which the tourism industry is predicated. In this work the determination of the climatic potential of tourism in four locations of the Adjarian Autonomous Republic (Georgia) in correspondence with the "Tourism Climate Index" (TCI) made use of in other countries of is carried out.

In the future we plan a more detailed study of the climatic resources of this region for tourism (mapping the territory on TCI, long-term prognostication of TCI, determination of other climatic and bioclimatic indices for tourism - Physiologically Equivalent Temperature, Mean Radiant Temperature etc.).

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CAMBIAL ACTIVITY OF PINUS HELDREICHII CHRIST AND PINUS PEUCE GRISEB IN NP "PIRIN"

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ABSTRACT

Alpine ecosystems exist at limited temperatures and they are one of the most susceptible to the global ecological changes. Therefore studies on the natural ecosystems, their development in the past and the climate changes are very important. Previous research on tree the rings of the Bosnian Pine (Pinus heldreichii) have shown that at high elevation of the Mediterranean sites, the maximum latewood density (MXD) may contain a much stronger climatic signal than the tree ring width. We therefore studied the climatic signal in MXD of Pinus heldreichii from the Pirin Mountains in Bulgaria, found significantly positive correlation with the summer temperatures (Jun-Sep) and negative correlation with the summer precipitation and on this basis produced a 200-year summer temperatures reconstruction for the Balkan region. Yet we found that a successful dendroclimatic analysis requires much better understanding of the processes of tree ring formation. Therefore we initiated an additional study on the cambial activity and production of tracheids during the growth period. We found that in 2010 and 2011 the onset of cambial activity was delayed until the end of June – the beginning of July. In 2012 it started at the beginning of June. The late start in 2010 and 2011 was probably due to cold periods in April and May. Despite it the number of produced cell sand related tree ring width was high. This confirms our initial hypothesis that warmer winters promote wider tree rings. The production of new cells continued until the end of September, while the differentiation until the middle of October. In both years the Pinus heldreichii trees produced more cells than the Pinus peuce trees. Our results outline the importance of understanding of the xylogenesis processes and open new possibilities for construction of supra-long anatomical chronologies, which may provide new insight into the reflection of climate variability in tree ring anatomy.

WATER RESOURCE BALANCE FOR THE VITOSHA NATURAL PARK, INCLUDING ANALYSIS UNDER CONDITIONS OF CLIMATE CHANGE AND EXTREME PHENOMENA

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ABSTRACT

This report presents some results of implementing the studies of the National Institute of Meteorology and Hydrology (NIMH) on the Development of water balance of the Vitosha Natural Park (NP) financed under the Operational Programme Environment 2007-2013.

Water resources are under increasing pressure from climate change and land use. The results of the global and regional climate models confirm that these tendencies for the effect on water resources and water demand will continue. The results of NIMH researches show that mountainous areas are affected to a lesser extent by the effects of climate change and extreme events – floods and drought, but some negative tendencies are established. For the aims of the Vitosha NP management, water and water resource system (WRS) balances are developed for different scenarios. A new methodological approach to the assessment of the water and WRS balance has been elaborated with integrated analysis of all elements (precipitation, temperatures, evapotranspiration, soil and land cover, hydrogeology, water intake and water use, water transfer, WRS, etc.). A water use scheme, a methodological approach and a simulation model of WRS have been developed. Simulation modeling of the WRS balance of the Vitosha NP, including analysis in terms of climate change and extreme events (drought and flood), has been developed. A methodology for ecological flow determination is applied. Assessment and analysis of drought conditions, which include analysis of drought with hydrological series modeling and drought index analysis are made. Evaluation of high water is developed. Areas at risk, taking into account the natural and anthropogenic factors in GIS environment, are analyzed. According to the results of the analysis and appropriate long-term strategic and short-term measures are developed. Recommendations and management measures are given. The developed water and WRS balances are the first ever comprehensive study for the Vitosha NP water resources and for the possibilities of their use.

Keywords: *Vitosha Natural Park, water balances, water resource systems, vulnerability assessment, climate change, hydrological drought management, water scarcity, water exploitation index, mitigation measures*

INTRODUCTION

Vitosha is the first natural park in Bulgaria and on the Balkan Peninsula. The "Development of Water and Water Resource System Balance for the Territory of the Vitosha Natural Park" is the first comprehensive study of its kind on the water resources of the Vitosha Mountain and the possibilities of their use for the purposes of the integrated management of the park. The project is developed by experts of the National Institute of Meteorology and Hydrology (NIMH), the Geological Institute (GI) of the Bulgarian Academy of Sciences and the University of Architecture, Civil Engineering and Geodesy as part of the "Implementation of the priority activities of the Management Plan of the Vitosha Natural Park – Phase II". The project is funded by the Operational Programme Environment 2007 –2013.

METHODOLOGICAL APPROACH AND MODELING

The essential issues for the sustainable management of water resources in the park are the development of water balance, hydrological WRS model for the distribution of water resources in the park area and their use by the surrounding settlements and the preparation of GIS (geographic information system).

According to the Intergovernmental Panel on Climate Change "Vulnerability is the degree, to which a system is susceptible to, or unable to cope with adverse effects of climate change, including climate variability and extremes. The growing frequency of extreme phenomena aggravates this problem, increasing direct and indirect impacts on water resources and water supply. In this context the emphasis is also laid on the analysis of the trends in the natural and anthropogenic factors, climate change and extreme phenomena – floods and drought, and recommendations for management.

To this end a new methodological approach to the assessment of the water and WRS balance has been elaborated with integrated analysis of all elements (precipitation, temperatures, evapotranspiration, soil and land cover, hydrogeology, water intake and water use, water transfer, water resource system, etc.). The methodology for the water resource system/ water balance and assessment of vulnerability of water resources in deferent climate change and extreme phenomena (drought scenarios) has been developed on a transnational level, river basin level and local level – water body, WRS and reservoir. The methodology is based on DPSIR (Drivers, Pressures, Status, Impacts, and Responses) approach. Vulnerability is a function of the character, magnitude and rate of climate variation to which a system is exposed, its sensitivity and

its adaptive capacity" (Marinov, I. et al., 2014; CC-WARE, 2014, www.ccware.eu; Georgieva, D., I. Ilcheva, 2014; Thematic assessment of vulnerability …, 2012; Mitigation vulnerability …, 2014; Ilcheva, I. et al., 2014). The main stages are:

1. First stage: Modeling and assessment of the climatic factors, scenarios and trends; Indicators.

2. Second stage: Evaluation of the trends in water resource alterations, including under different scenarios of climate change or drought; Drought scenarios; Assessment of the available water resources; Assessment of the groundwater resources; Water balance models; Trends analysis.

3.Third stage: Developing a scheme of Water management system and water use in the region.

4. Fourth stage: Analysis of the demographic and economic development; Assessment of the current and future water consumption – optimistic, realistic and pessimistic variants and ecological runoff.

5. Fifth stage: Evaluation of water shortage, vulnerability and risk of water resources and water supply under different scenarios and variants.

At this stage juxtaposition is made of the available water resources (at present and under the different scenarios) and the current and future water consumption, which makes it also possible to reveal the deficits. A new approach and a substantiated system of indices are implemented to evaluate water shortage and vulnerability by joint analysis of the WEI exploitation index and the water stress assessment with the risk assessment of water supply and the indices for the analysis of the water resource system operation (the WSHI water shortage index, probability, reliability index, etc.); Identification of "critical issues and areas" (Ilcheva, I., 2008; Georgieva, D., I. Ilcheva, 2014; Mitigation vulnerability…, 2014); Integrated WSR and forest ecosystem management.

6. Sixth stage: Analysis and formation of prevention and adaptation measures. The possible strategic, tactical and operational measures are formed and analyzed for the identified vulnerable regions and sections; Analysis of various strategic and operational measures as a strategy for developing the scheme of water use; Analysis and adaptation under conditions of climate change, drought and floods.

1.1. Application of the methodology

1.1.1. Physical-geographical characteristics and natural resources

Vitosha is divided into four parts, each of them starting from the Cherni Vrah peak (Black Peak) and spreading to the lower areas. A digital terrain model (DTM) has been developed for the purposes of the water balance. The distribution of the altitudes and the relevant areas is represented by the hypsographic curve in Figure 1.

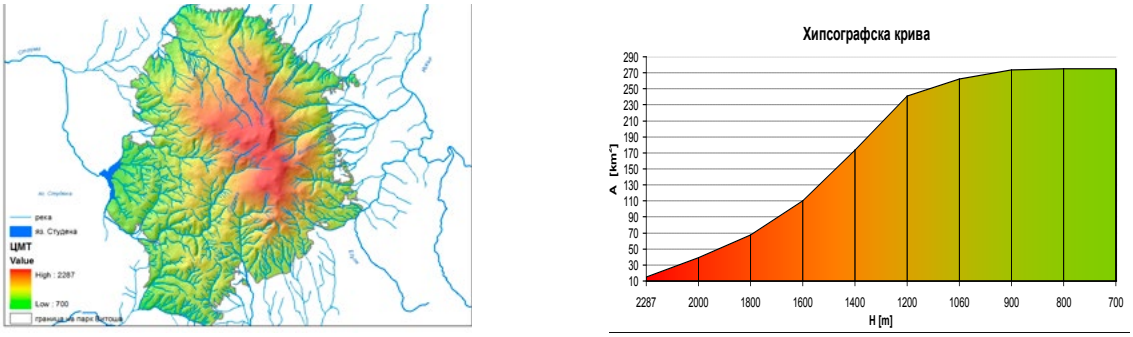


Figure1. *Digital terrain model and hypsographic curve*

1.1.2. Climate of Vitosha Mountain. Analysis of climatic elements and trends

Climatic conditions are one of the major factors determining the existence of ecosystems in a given area and its water balance. In the Vitosha Mt. they are formed under the influence of an aggregate complex of factors, slope inclination and exposition, relief types, but primarily – by altitude. All factors forming the local climate are analyzed for the purposes of the water balance, evaluating the climatic elements: sunshine and solar radiation, icing and snow cover, wind, cloudiness, temperature, precipitation (…V. Alexandrov, A.Gocheva, Development of Water balance…, 2014). To reveal the trends, analysis has been conducted for the changes in the factors during different periods: 1961-1990; 1971-2000; 1981-2010, etc.

1.1.3. Water balance modeling. Hydrological regime

Vitosha is rich in water resources – springs, rivers, streams and waterfalls. The rivers take their sources from the plateaus and peak lands in the high parts, forming water catchment zones for the tourist centers and settlements in the area. The main watershed of the Balkan Peninsula, separating the Aegean and the Black Sea basin, passes along the mountain ridge. All rivers that spring from the Vitosha Mt. are tributaries of the Iskar or Struma Rivers.

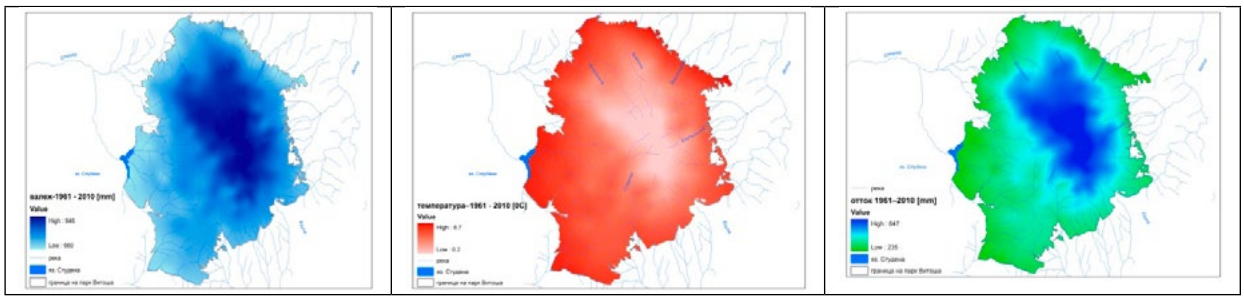


Figure2. *Spatial distribution of precipitation, temperature and runoff for 1961-2010*

The density of the river network within the range of the Vitosha Natural Park varies from 1 in the low parts to 2.5 km/km^2 in the high parts. The annual runoff modulus changes from 7.5 to 15-20 l/s/km^2 with height. The runoff volume is 60 to 70% of the annual runoff in high-water periods and 10% - in low-water seasons. The water balance model is developed for different periods – 1961-1990, 1961-2010. The natural water resources of the rivers within the area of the Vitosha Natural Park and the main water intakes are evaluated (Balabanova, Sn., 2010).

Evaluation of the hydrological regime and water resources

As a result of water balance modeling, the natural runoff for all river catchments at the boundary of the Vitosha NP, as well as for all major water intakes and water balance points, has been evaluated. The obtained results represent the basis for analysis and runoff series formation and for assessment of the parameters of water intake locations and water balance points.

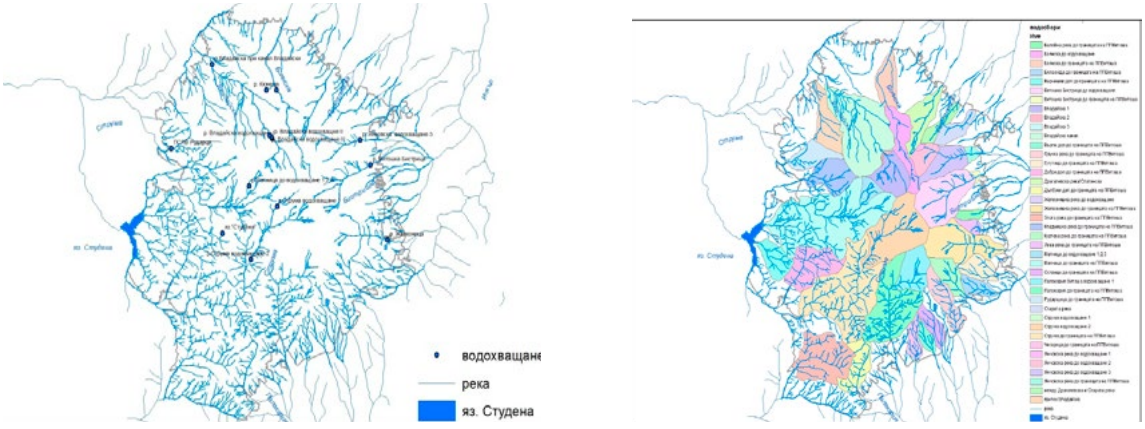


Figure3. *Evaluation of the hydrological regime and water resources of water intakes and at the boundary of the Vitosha NP*

1.1.4. Assessment of groundwater resources, coefficient of underground recharge. Development of a hydrogeological map

The situation with respect to groundwater and karst water exploitation in the area and their interrelation with the Struma River (Benderev, Al., et al. 2014; Benderev, Al, T.Orehova, Vl. Hristov, S.Kolev, I.Ilieva,… Development of Water balance…, 2014) is analyzed. The role of groundwater is evaluated and a map of the coefficient of river underground recharge is composed. The value of the coefficient of river groundwater recharge varies from 0 to 0.95 in single sections depending on the effect of basic factors adopted by the methodology applied. The average weight values of the coefficient of river underground recharge at the expense of groundwater in the river catchments on the territory of the Vitosha Park and the mean value for the entire area is 35.79%. The first ever hydrogeological map of the region has been developed.

1.1.5. Developing a scheme for water resource use and water demand scenarios

All tourist sites and their water consumption have been identified. The demographic and economic development and water consumption of the settlements in the region are analyzed. A computational scheme has been elaborated for water use, taking into account the tourist centers, water intakes, collection derivations and the Studena Dam water resource system.

The main anthropogenic factors disturbing the natural runoff regime that have been taken into consideration in the assessment of resources, water balances and WRS balances of the Vitosha Natural Park, are the collecting channels of the Vladaya, Palakaria, Studena reservoir, the main and reserve water intakes of the Vladaya, Boyana, Kyunets, Zheleznitsa, Vitosha Bistritsa and Yanchovska Rivers (for drinking water supply of Sofia and Sofia Municipality) and the water intakes of the Struma, Rudarshtnitsa and Matitsa Rivers (for drinking water supply of the town of Pernik, Batanovtsi, Rudartsi, Dragichevo, etc.).

The numerous tourist huts, rest houses, etc., violate the runoff. Some of the huts are connected to the Sofia Water plumbing and are with central supply. When developing the simulation model of water resource system balance, all water consumers and water supply groups are identified and described by water use schemes and parameters of facilities, registers of water sources and water users, GIS.

1.1.6. Identification of the tourist water supply groups and assessment of the water consumption of tourist sites. Water consumption of all tourist water supply groups and centers is calculated according to Regulation No.4 and the Management Plan of the Vitosha NP.

1.1.7. Demographic and economic development of the settlements in the region. Water abstractions and water demand scenarios.

The Vitosha Natural Park comprises the territory of three administrative units: Sofia-City district (Sofia Municipality), Sofia district and Pernik district. There are 12 settlements at the foot of the Vitosha Mt., 4 quarters of the Sofia City and over 20 villa zones (most of them outside the park boundaries). The demographic and economic development of water use is analyzed to assess the main trends and water consumption. Water consumption is assessed for three basic variants according to the demographic and economic development. According to the Sofia Water Company, the water supply of the capital will be ensured mainly by the Rila plumbing conduit and the Iskar Dam. Parts of the water intakes in Vitosha are reserve ones. Over 95% of the water supply of Pernik and the settlements in the area are ensured by Vitosha water. The villa zones are most intensively developed (Rudartsi, Dragichevo), especially in summer. Records and GIS have been composed.

1.1.6. Methodology for minimum ecological flow assessment and provision

Minimum ecological flow Qeco is associated with the acceptable disturbance of the runoff regime. The high priority of Qeco is a necessary condition for achieving "good ecological status". According to the Water Act "… minimum admissible runoff in rivers shall be 10% of the average multiannual water quantity, but not less than the minimum average monthly water quantity with a probability of 95%". Methodologies for evaluating the water ecosystems have been applied to assess the ecological water quantities in some basic points of the Vitosha NP. The assessment of impact on the river ecosystem is determined by the following scheme:

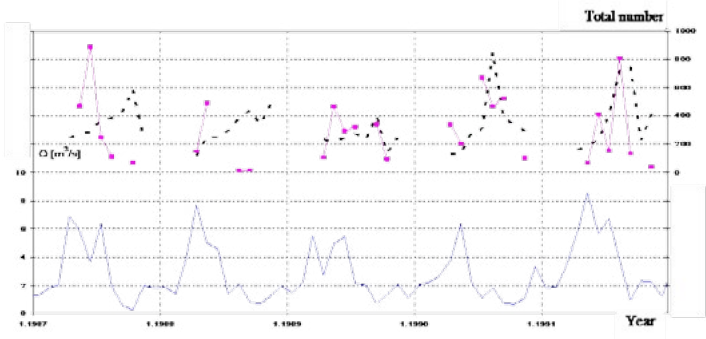
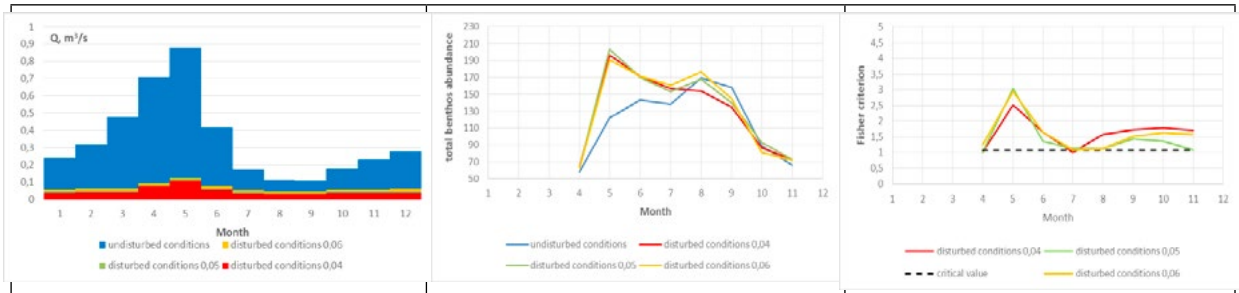


Figure4. Comparison between the hodographs of the observed (pink) and modeled (dashed line) total number

- The development of the zoo benthos is modeled in natural flow regime (undisturbed conditions), including periods of low and high waters. The obtained modeling series for the total number are called standard regime and serves as comparison basis for the determination of the minimum ecological flow.
- Models for different drought scenarios of zoo benthos development are worked out.
- A comparison with the standard regime is done using Fisher criterion, for assessment of the importance of zoo benthos cenosis variations for different scenarios (Zaharieva, V., 2004). A variant is selected where the river ecosystem is consistent with undisturbed conditions. Qualitative assessment of the impact of a factor or group of factors (different drought scenarios) on the output parameter (modeled total number) is obtained by the means of dispersion analysis.



Runoff distribution after the water intake under natural and disturbed regime	Model investigations of the zoo benthos development for each variant	The monthly changes of Fisher criterion

Figure5. Methodology for ecological runoff assessment

1.1.7. Assessment of water shortage and water stress. Water resource system balances and simulation modeling

A simulation model has been elaborated to assess the vulnerability of the water resources and water supply under various scenarios: scenarios for the resource, including "drought" scenarios, variants for demographic development and socio-economic systems, water use scenarios, different alternative water supply schemes, "with" or "without" water transfer, various management decisions and measures. Under these conditions simulation modeling is the most powerful mechanism for assessment of the vulnerability and risk for the water supply systems and the ecological runoff. The SIMYL simulation model (developed in NIMH) is implemented. The model performs distribution of the available water resources in accordance with the priorities of the Water Act (Niagolov, I., 2004; Nigolov, I., et al. 2014).

The first basic scenario for the water resource system balance of the Vitosha NP is for the worst case – the maximum one: for the assessed water resources maximum water consumption for the settlements and industry of the town of Pernik, and for the maximum variant of water consumption of all tourist water supply groups and centers, calculated according to Regulation No.4, for 100% loading of the tourist huts and sites in the Park. The second basic scenario is moderately realistic: for the long series, variant with 15% loading of all tourist huts and variant 3 with reduced water losses in the settlements. The third basic scenario is in fact a group of scenarios with a "drought" variant of 10 dry years. Analysis is made for climate change. The fourth and fifth scenarios refer to the evaluation of the impact of different new schemes of water use, including water transfers and different strategic and tactical measures.

2. Analysis and adaptation under conditions of climate change and drought

The main trends and risks are evaluated for the purposes of the Management Plan and the influence of climate change

and extreme phenomena (floods and drought) on water and natural resources is analyzed. Climate change and the trends established for Southeast Europe and Bulgaria are also valid for the region of the Vitosha Natural Park, but to a lesser extent – Figure 6.2.4 (Marinov, I. et al., 2012; CC_WaterS, 2012). The climate scenarios analyzed in works like (Balabanova, S., 2012; Marinov, I. et al., 2012; CC_WaterS, 2012) show an expected runoff reduction in the area of Pernik within the range of 7-15% for the period 2020-2050 compared to the reference period 1961-1990. Temperature rise and reduced precipitation are expected (Figure6).

3.1. Analysis under drought conditions

- Trend analysis **–** Mann - Kendal test has been used.

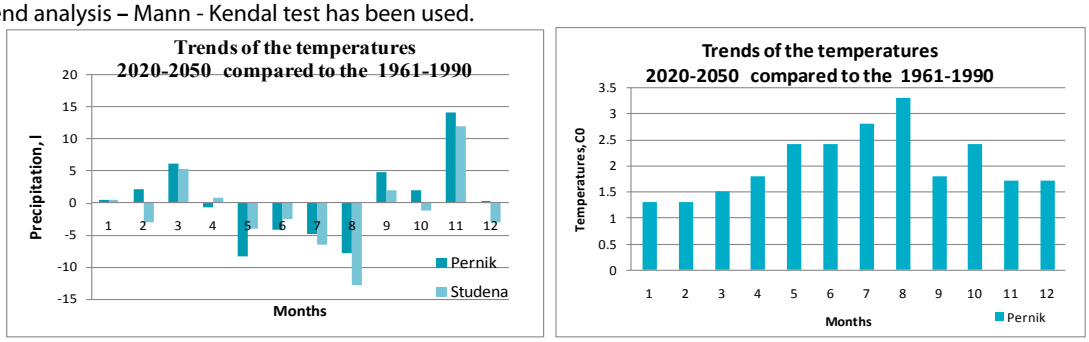


Figure 6. *Changes in precipitation and temperature. Scenario 2020-2050 versus 1961-1990 (Spiridonov, V., V. Alexandrov, NIMH, CC_WaterS, 2012)*

- Analysis of drought by modeling of hydrological series:

The modeling allows for analysis of water resource system balances in drought scenarios and forecasting. The modeling of 1000-year series enriches the information about river runoff for possible realizations of dry and medium dry years (probabilities of 75% and 95%):

a) Increasing the number of realizations – if the observed data exhibit 10 dry years and 2 very dry ones, 274 dry years and 54 very dry years will be obtained for the modeled period.

b) Increasing the number of realizations of dry year periods – if the observed data contain 1 dry period of 10 years (1984/85–1993/94) with an average annual volume of 9,535 $m^3 10^6$ with probabilities F(75%)=11,99 $m^3 10^6$ and F(95%)=10,13 $m^3 10^6$ respectively, then more decades with a similar average annual water volume per decades are observed in the modeled data. There are 100 decades for 1000-year modeled series and the probabilities are F(75%)=12,01 $m^3 10^6$ and F(95%)=11,05 $m^3 10^6$ respectively. The decades of dry years modeled in this manner afford much more scenarios for investigating the risk of water supply and ecological runoff.

c) Different monthly distribution – the modeled series yield another realization.

- Drought assessment using drought indices – De Marton, SRI, SPI1 and SPI3.

3.2. Simulation modeling and water shortage under the "drought" scenarios

On this basis, to assess the impact of drought on water shortage and water system operation, the analysis is carried out under different "drought" scenarios. The analysis of the results is the ground of the recommended measures for adaptation and management under climate change and drought conditions.

3.3. Floods – risk factors and preventive measures

The main causes of flooding are: natural – result of abundant precipitation, intensive snow melting, climate change; result of anthropogenic activity – deforestation, erosion, urbanization, etc.; topographic characteristics of the area – soil structure and saturation, density of the river network, land cover; occurrence of forest fires (Yordanova, A., Balabanova, Sn., Development of Water balance…, 2014; Velizarova, E., 2014). Evaluation of high water for the period of 1961-2010 is developed. Vulnerable zones have been identified – Figure8.

3.4. Water supply and sanitary - protection zones; Integrated WRS and forest ecosystem management

The territory of the Vitosha Natural Park comprises zones with special status: sanitary-protection zones, reserves, Natura 2000 areas, etc. To protect the water intended for drinking water supply, sanitary-protection zones (SPZ) are established at the water intakes, part of them including the Torfeno Branishte reserve and falling within the Water Protection zone of Vitosha. In this context, the good practices for integrated water and forest ecosystem management, developed by the experts of the Executive Forest Agency (EFA), the Forest Research Institute (FRI) and NIMH – BAS, have been analyzed (CC_WaterS, 2012; Mitigation of vulnerability of water resources in climate change, CC-WARE, 2014; Marinov, I. et al., 2012).

3. Results and conclusions

The results show that for the last 115 years the precipitation gradient of the studied area is markedly reduced – from 35 mm/100 m for the period (1896-1945) to about 22 mm/100 m for the last fifty years (Gocheva A., 2014). The comparison of the absolute maxima and minima for the periods (1961-2010) and (1961-1990) proves that the absolute maxima have become higher during the last 20 years. Climate change and the established trends for Southeast Europe and Bulgaria are also valid for the Vitosha NP, but to a lesser extent (CC-WARE). Climate scenarios show an expected runoff decrease for the area of Pernik HMS within the range of 7-15% for the period 2020-2050 compared to the reference one 1961-1990.

The general trend is that when comparing the resources for 30-year periods the resource is reduced (Mitigation vulnerability…, 2014): 1961-1990 – 18455.527 $m^3 x 10^6$; 1971-2000 – 16236.532 $m^3 x 10^6$ and 1981-2010 – 15567.947 $m^3 x 10^6$. During the last period of 1981-2010 increasing amplitude of the extreme phenomena is observed (Figure7).

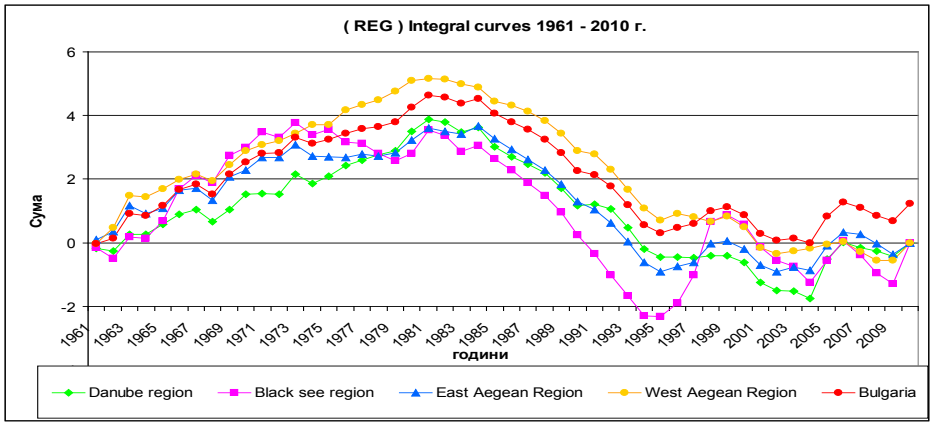


Figure7. *Integral curves for the Basin Directorates (Balabanova, S., Mitigation…, 2014)*

The assessment of water shortage and the water system balance prove that the rich hydro-resource potential of the Vitosha NP exceeds even the maximum theoretical possibility of water consumption of all sites on the territory and ensures sufficient water resources to provide the water supply of the surrounding settlements within the frame of normative provision. But however, the uneven runoff distribution in space and time and lack of regulating volumes lead to water shortage in low-water and prolonged drought periods.

The joint assessment of the risk for water supply and the water stress shows that the water exploitation index WEI+ for the region of Pernik and the Studena reservoir is high (40-50%), which is an indication for certain vulnerability of the area (Denislava, G., I.Ilcheva, 2014). But even in the worst case scenario, with maximum consumption of the settlements and industry of the town of Pernik, for maximum variant for water consumption of all tourist water supply groups and 100% loading of the tourist huts and sites in the Vitosha NP, the biggest consumers are supplied. Minimum deficiencies, when water supply is ensured close to the normative provision, occur in the drinking water supply of Pernik and settlements. Larger deficiencies occur in the quarters supplied by water intakes, the villages Rudartsi, Dragichevo, Kladnitsa, Marchaevo and Vladaya, where water is often insufficient in low-water months. Water shortage also occurs for the tourist groups because of the same reasons.

The groundwater resources are sufficient to meet the envisaged consumption in compliance with the permit regime. The average annual runoff modulus of the Vitosha Mountain, recharged by rain-snow water, reaches up to 10,0-12,0 l/s/km^2, the minimum one being evaluated to about 1,0 l/s/km^2. The juxtaposition of the data for the total exploitation resources (307.8 l/s) with these for the total current exploitation (about 45.0 l/s) reveals that for the present the groundwater on the territory of the Vitosha NP is not threatened by overexploitation. The WEI is about 15%.

RECOMMENDATIONS FOR MANAGEMENT AND ADAPTATION MEASURES

In connection with the mentioned generalizations, when updating the management plan of the Vitosha Natural Park, the following measures are – Figure8:

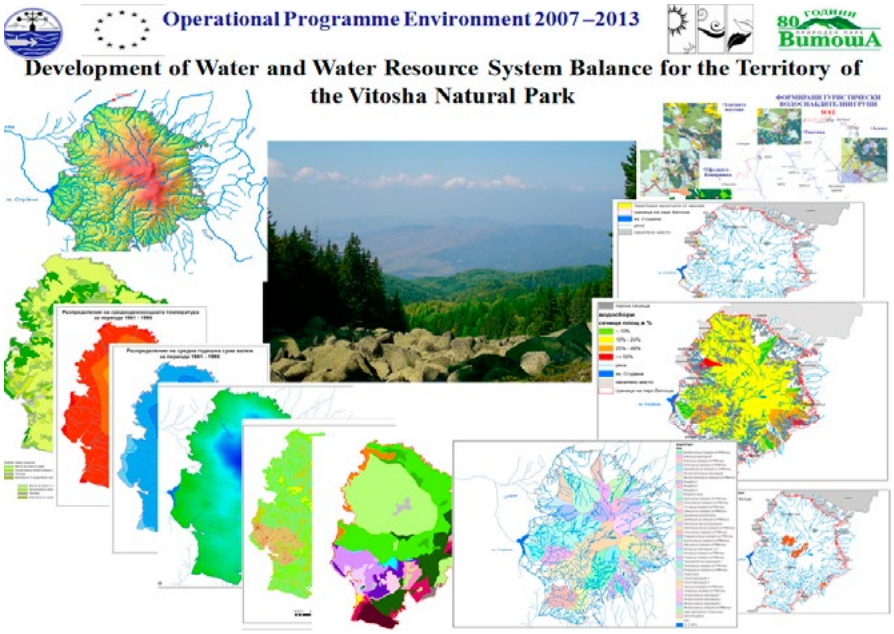


Figure 8. *Water and Water Resource System Balance for the Territory of the Vitosha NP and management and adaptation measures*

1.1. Management according to the requirements of the water protection zones and reserves

The protected sanitary zones and reserves guarantee the conservation of water resources with respect to quantity and quality. Joint analysis is recommended for the water-protection forests and management of water resources and WRS (water supply) systems (Mitigation vulnerability…, 2014). It is necessary to implement monitoring and control and to integrate the efforts of the different institutions with relevance to the protection of water and natural resources and their management, including control and conservation of the water-preservation and protected areas. Under these conditions it would be expedient to develop special Regulations for the forestry activities in protected areas as the Vitosha NP in order to facilitate their management.

1.2. Management according to the permission regime and surveillance monitoring

The permission regime of the issued permits for water use and the priorities of the Water Act should be adhered to in the course of management. The water use scheme, the developed GIS and registers of water intakes and water users on the territory of the Vitosha Natural Park provide full description of the restrictions laid down in the issued permits. This topical information should be included in the regulations for use of water resources when updating the Management Plan of the Vitosha NP. In all cases, the Directorate of the Vitosha NP has to update, monitor and regulate water use in compliance with the permission regime. The ecological quantities should correspond to the specified ones in the issued permits. In this context Sofia Water AD and Pernik W&S should develop their investment programmes for the territory of the Vitosha NP in the direction of monitoring and measurement of the water intakes and return water, water quality monitoring, sanitary-protection zone maintenance and upgrading of infrastructure.

1.3. Management under conditions of climate change and extreme phenomena – drought and floods

- Management of water under conditions of climate change and drought

The assessment and analysis of the water balance, taking under consideration climate change and its impact on the water and forest ecosystems, has been performed by experts of the Executive Forest Agency, the Forest Research Institute and NIMH – BAS (Marinov, I. et al., 2012; Marinov, I., T. Lyubenov, 2007; Mitigation vulnerability,…2014; Ilcheva, I. 2014; C_WaterS, 2012; CC-WARE, 2014; Georgieva, D., I. Ilcheva, 2014).

The analysis of water resource distribution via water resources systems and reservoirs, the WRS/water balances (including on river basin level and during droughts) represent an instrument for identification of permanent (water shortage) and temporary deficiencies and "critical issues and areas" (Ilcheva, I. 2014; Georgieva, D., I. Ilcheva, 2014; Rossi, G., V. Nicolosi, A.Cancelliere, 2008). According to the results of the analysis appropriate long-term strategic and short-term measures are developed. Recommendations are given for management under conditions of water shortage and drought on the territory of the Vitosha NP the adjacent settlements.

- Measures for adapting the forest ecosystems to climate change and extreme phenomena

Measures and good practices for management of water resources and water supply, and water and forest ecosystems under conditions of climate change and extreme phenomena – floods and drought, have to be implemented on the territory of the Vitosha NP. The main natural factors, exerting adverse impact on the forest ecosystems, are increasing temperatures and decreasing precipitation, aggravation of the salubrious state, ecosystem degradation (Marinov, I. et al., 2014; CC_WaterS, 2012; CC-WARE, 2014; Marinov, I., T. Lyubenov, 2007; Velizarova, E., 2014). Joint analysis of the water protection forests and the management of water resources and WRS /water supply systems are recommended (Mitigation vulnerability…, 2014).

- Prevention measures have to be taken in the identified flood vulnerable regions.

A geo-information system of the water balance results has been developed – Figure8.

The results of this work are directly related to the Management Plan of the Vitosha Natural Park, the water supply of the settlements in the region, The Programme of Measures of the West Aegean and Danube Region Basin Directorates and establishment of the Vitosha protected area as part of the European ecological network NATURA 2000.

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HYDROLOGICAL AND QUALITATIVE ANALYSIS OF WATER FLOW IN THE VLADAYSKA RIVER CATCHMENT OF THE VITOSHA NATURAL PARK

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ABSTRACT

The area of the Vitosha Mountain is very poorly studied in hydrological terms as only three hydrometric stations work on its territory. The Vladayska River is the river with most considerable and anthropogenic impact in the Vitosha National Park (NP). To determine the river runoff quantity, the regional relationships, analogues and water balance are used. An assessment and analysis under drought conditions are made with trend analysis. The water quality, which is the most important indicator of the impact on human activity, is investigated. The study on anthropogenic impacts on the water quality of the Vladayska River is based on the combined Canadian method Water Quality Index. The physicochemical parameters, that are sufficiently representative to perform a comprehensive assessment of the river state, are selected: 1. Physical indicators, such as pH, conductivity; 2. Indicators, characterizing organic pollution - dissolved oxygen, biochemical oxygen demand; 3. Specific indicators reflecting the pollution from the municipal and business-residential sector – ammoniac nitrogen, nitrite nitrogen, orthophosphate, sulphate ions, hydrocarbon ions, calcium ions, magnesium ions.

Keywords: *mountain, river runoff, drought, ecological status, water quality*

INTRODUCTION

In this report some of the results, such as an evaluation and characterization of the water resources in quantitative and qualitative terms, from the research implementation "Preparation of water balance of the Vitosha Natural Park" in the Operational Programme Environment 2007-2013 are represented.

Water resources are under increasing pressure from climate change and land use. The results of global and regional climate models confirm that these tendencies will continue to have effect on the water resources and water use. Results from the studies at the National Institute of Meteorology and Hydrology (NIMH) show that mountainous areas are affected to a lesser extent from the effects of climate change and extreme events (floods and drought), but they are not ignored.

DATA AND METHODS

The area of the mountain is very poorly studied in hydrological terms, since at the time only 3 hydrometric stations (HMS) work on its territory, namely:

1. № 226/18370 Palakaria River, Relyovo Village;
2. № 90/18420 Vladayska River, Knyajevo District, Sofia;
3. № 94/51650 Struma River, Pernik.

The three stations are located so, that they can be used to derive regional dependencies. Therefore, the methods used for analysis of river flows are the method of analogy, probability analysis and available regional dependencies.

The Vladayska River originates from the area Upper Marshland at the foot of the peaks: The Saddle and Cherni Vrah. There is only one working hydro-meteorological station on the river - HMS № 90/18420 in Knyajevo district, opened on 01.09.1954.

Table 1. *Main characteristics of the watershed Vladayska River*

HMS	River	Location	Area of catchment F sq. km	Average Altitude. H m.
18420	Vladayska	Knyajevo	48,90	1354

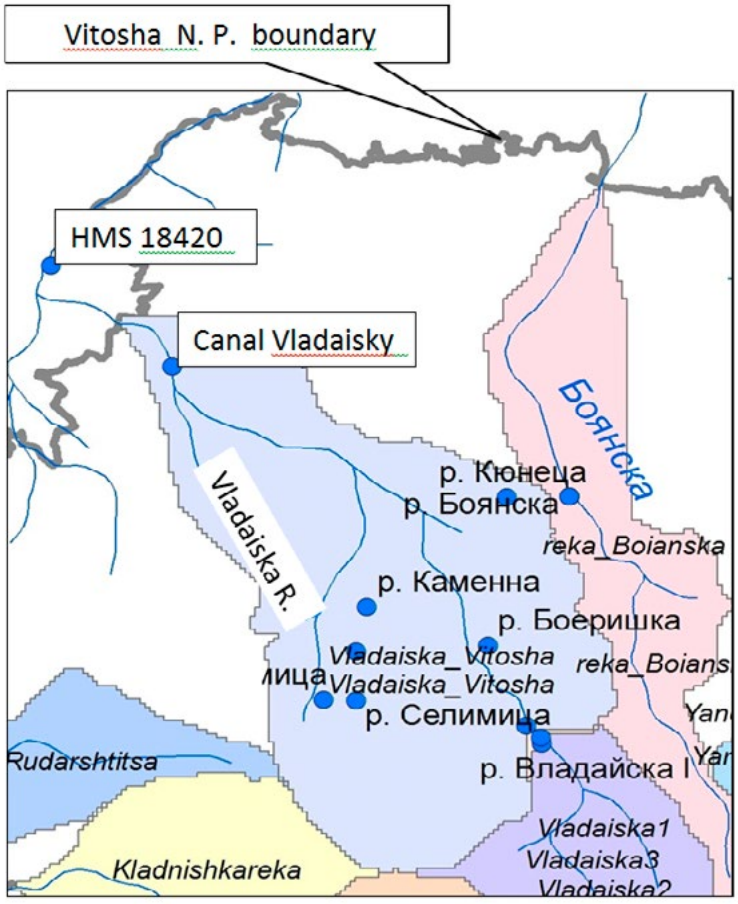

Figure 1. *The Vladayska River watershed*

Water quality is determined in two sites:

1. At elevation of 1827 m altitude before the first catchment in the range of sanitary-protective zone;
2. 2. At the Vladayska River in the village of Vladaya - information by the Regional Inspectorate of Environment and Water (RIEW).
3. The assessment of the hydro-chemical condition is carried out by using the Canadian methodology - Water Quality Index. This method has been chosen, because:
4. 1. It allows a complete characterization of the anthropogenic impact types and forms of water bodies pollution to be obtained, as well as with the summarized result the status of river flows in different areas can be determined.
5. Features with different number and type of composite indicators and with different sets of ingredients and limit values can be designed, as well as the opportunity biological ingredients, such as coliform to be included in the study.
6. When assessing the pollution this method provides information about the frequency and intensity of the anthropogenic impact on the river water.
7. With this method information is obtained for each sample - how many of the planned survey indicators are actually measured, how many of them meet or exceed the benchmarks.

The study includes the following indicators:

1. General physical parameters: pH, conductivity, river water temperature, suspended solids, water hardness;
2. Indicators characterizing the organic pollution: dissolved oxygen, biochemical oxygen demand (BOD5), oxygen saturation (in percentage).
3. Indicators reflecting pollution from economic and communal households: compounds of nitrogen - ammonia nitrogen, nitrate nitrogen, nitrite nitrogen, orthophosphate;
4. Indicators reflecting specific pollutants - heavy metals: Pb (lead), Cu (copper), Zn (zinc), Hg (mercury), Cd (Cd), calcium, magnesium and sulphate ions.
5. Based on these calculations, the expert assessments of hydro-biological and hydro-morphological elements of the water quality, as well as the ecological status of the Vladaya River (Ordinance № 4 / 2012) are determined.

RESEARCH FINDINGS

As an analogue to determine the natural flow in some points of the river, measured data according to HMS № 90/18420 for the period 1961 – 2010 are used. The runoff hydrograph, its trend and the total annual flow curve are given in Figure 2.

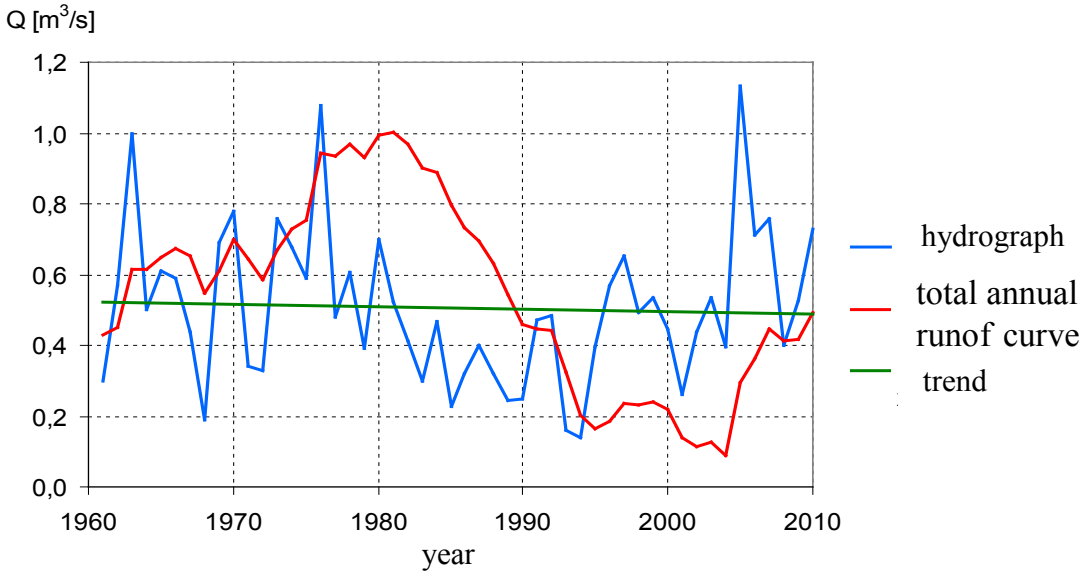

Figure 2. *Runoff hydrograph, trend curve and total annual runoff curve according to HMS № 90/18420*

It can be seen, that the period is characterized by a high water phase from 1961 to 1981 and a phase of low water from 1981 to 2004. The phase of high water resumes after 2004. The trend shows no statistically significant decrease in runoff. Figure 3 presents the inter-annual runoff distribution. It is characterized by high water in spring from March to June, when the river runs 60÷70% of annual flow.

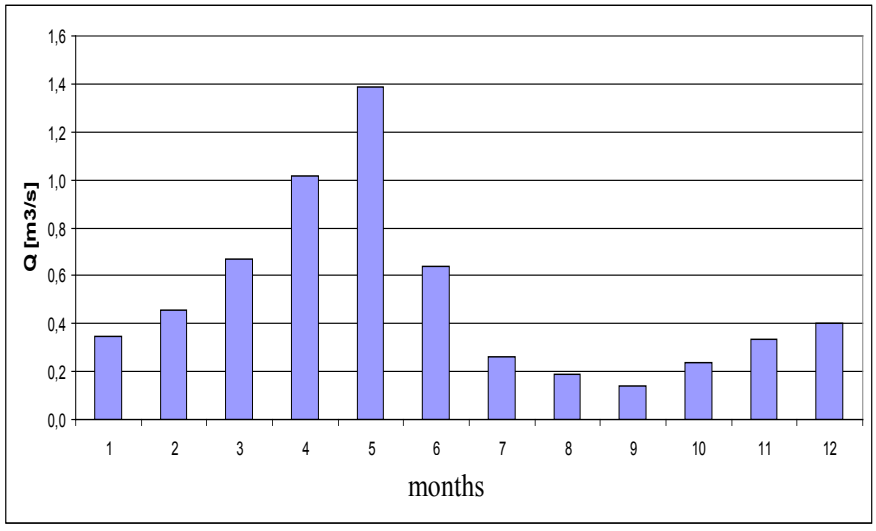

Figure 3. *An inter-annual runoff distribution according to HMS № 90/18420*

Prof. Mandadzhiev and colleagues ("Characteristics of the annual and minimum runoff in the mountainous areas of Bulgaria", 1982) provide the following characteristics of the average annual runoff in high-altitude areas:

Table 2: *Characteristics of the natural runoff in the Vitosha Mountain in altitude zones*

Zone H M.	Area F KM.^{2}	runoff modul l/s/km^2	runoff Q m^3/s	runoff volume M^3.10^6	C_V	C_S	runoff volume W_P, M^3.10^6				
							5%	25%	50%	75%	95%
I. Above 1600	91,68	26,94	2,47	77,90	0,280	0,484	116,50	91,42	76,16	62,41	51,29
II. 600 to 1600	1442,56	5,07	7,32	230,65	0,440	0,869	418,90	289,00	215,90	156,60	93,64

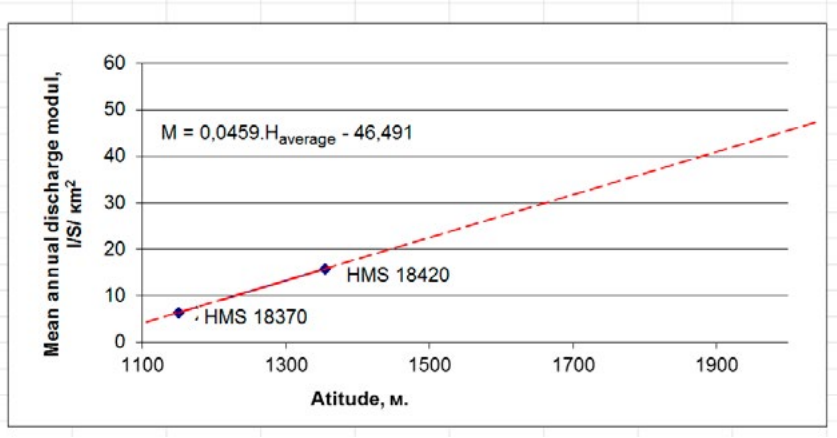

Figure 4. *Correlation for the discharge of the Vladayska and Palakariyska rivers*

The zones are introduced by hydrological point of view, according to the water resources in the Vitosha Mountain. The first zone is lower than the marginal zone of the forest zone (its wooded line reaches 1800 m. – the North-western slope). This is an area with the greatest water capacity and less developed human activity and collecting derivations. It is convenient to transfer water from one river basin to another. The runoff is distributed only in space. The second zone includes the mountain slopes, where most of the forest is located. Economic activity in this zone is more developed, both – over the catchment area and the river network. The runoff in this area is distributed in time and space. It is conditionally accepted, that the I-st and II-nd zones include the real mountain.

Human impact on the Vitosha water resources in qualitative and quantitative aspect is the result of two main groups of activities:

1. On the territories of the catchment areas - forestry, agriculture (agro-ameliorative and irrigation activities) and tourism;

1. In the river network - hydraulic construction for water supply needs, etc.

In the first zone changes in the conditions of runoff formation as a result of activities in the territories of the catchment areas cannot be expected. In the II-nd zone due to intensive activity after 1950 and accordingly to the forest structure change (afforestation), logically, change in the runoff amount is observed.

The described human activity does not influence remarkably the natural water resources of the Vitosha mountain, which (according to the study of D.Mandadzhiev) is within the accuracy with which the runoff is measured (i.e. no more than 10%) and now the runoff quantity is the same as it was in 1935, when data was available.

However, the minimum flow is highly sensitive to the human activity impact and it is essential for the ecological balance assessment for a given area, but it is very little studied. D. Mandadzhiev uses a map (Atlas of Bulgaria, R. Rusev) with the average annual runoff module izolines and he introduces relevant dependencies for the calculation period. He gives the following characteristics of the minimum flow:

Table 3. *The characteristics of the minimum flow for the period 1956-1975*

HMS	River location	Runoff	Average annual runoff		Variation coef. C_v
			runoff Q, m^3/s	runoff module, M, l/s/км²	
18420	Vladayska R. Knyajevo D.	minimum	0,041	0,383	1,271
		annual	0,770	15,70	0,441

The next values are given in the NIMH research "Determination of the average, minimum and maximum water levels with different repetition" (2004):

Table 4: *Runoff characteristics for the period 1991-2002*

№	HMS	95% reliability minimum average monthly Q [m^3/s]		Average monthly runoff Q [m^3/s]	
		registered	natural	registered	natural
_18420_	Vladayska R. _Knyajevo D.	0,010	0,018	0,479	0,727

All catchments in the Vladayska River are in a water supply zone in the Vitosha mountain. Sofiyska voda AD provides its own monitoring to control the quantity and quality of the extracted water. Primary disturber of flow in the river is the collecting canal "Vladaisky" which transfers water from the Vladayska River to the Struma River for the Studena Reservoir.

The collecting canal "Vladaisky" takes water from the Vladayska river catchment at elevation of 1050 m with built-up Q=1,5m^3 /s.

Table 5: *The characteristics of the natural runoff at the Vladaisky canal*

site	F	Q[m3/s] 1961-2010	H, м.	L [km]
Canal "Vladaisky", The Vladayska River	21,048	0,337	1724,2	8,57

Taking into account the size of the catchment data in Table 1 and Table 3, the registered discharge is converted by analogy to natural discharge at the Vladaisky canal at the Vladayska River (Table 5)

Figure 5. *The catchment of the collecting canal "Vladaisky"*

The inter-annual runoff distribution after the canal in natural and disturbed conditions is presented on figure 6. Due to the high degree of regulation, only the ecological flow remains in the river when all catchments work.

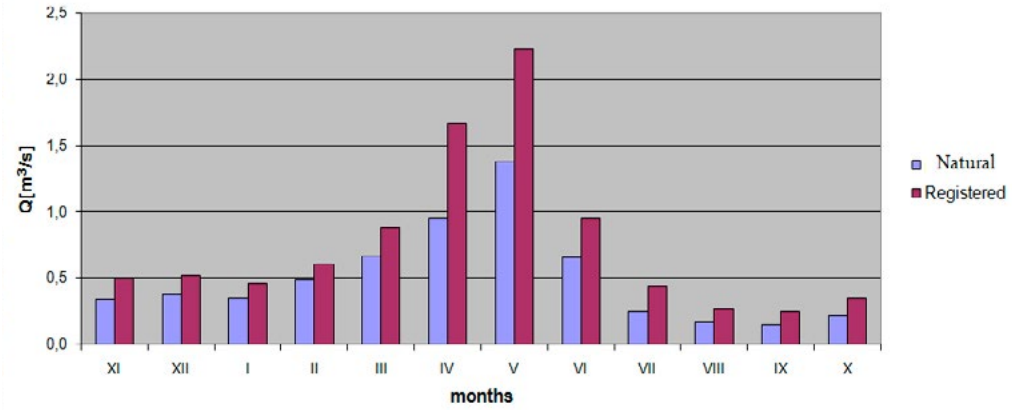

Figure 6. *An inter-annual runoff distribution after the Vladaisky Canal under natural and disturbed conditions*

The average monthly and annual water discharges and volumes of natural flow of the Vladayska River (at the canal) with reliability 95%, needed for the ecological minimum determination, are given in Table 6.

Table 6: *Average monthly discharge Q [m^3 /s] and volumes W [m^3.10^6]with a reliability of 95% for the Vladayska River (at the canal)*

reliability	XI	XII	I	II	III	IV	V	VI	VII	VIII	IX	X	annual
$Q_{0,95\%}$	0,042	0,045	0,043	0,070	0,121	0,390	0,254	0,095	0,046	0,013	0,013	0,026	0,150
$W_{0,95\%}$	0,110	0,120	0,116	0,176	0,324	1,011	0,682	0,247	0,124	0,034	0,033	0,069	4,721

Three smaller catchments of Alpine type are built also in the catchment of the Vladayska River. They are located in the reserve "Peat reserve" of the Vitosha NP. Conditional catchments are numbered as follows:

• *Water intake 1*. It is intended to supply water to the villages of Vladaia and Marchaevo. It is located 500m from the existing reservoir and at elevation 1828 meters. From the intake through asbestos cement water-conduit of Ø200mm the water heads to the tanks in the Vladaya and Marchaevo villages.

• *Water intake 2*. It is intended to transfer the waters of the Vladayska River to the Boyanska River. It is located 80 meters north of Catchment 1 and is located at elevation 1816 meters. From the intake of the Vladayska River by a derivation Ø350mm of stoneware pipes the water is transferred to the Boyana River.

• *Water intake 3*. It is located 120 meters to the north of Water intake 2, elevation 1787 meters. The water from the catchment is discharged into a tank and used to supply the huts and holiday homes located in this part of the Vitosha Mountain.

These intakes are well studied and are under continuous monitoring and control. Their main features, determined in GIS environment, are:

Table7: *Basic characteristics of the three catchments*

Name	Area F [km²]	$Q_{average}$ [m³/s] 1961-2010	Altitude $H_{average}$ [m]	River length L [km]
Vladayska R., intake 1	4,773	0,090	2024,24	2,3
Vladayska R., intake 2	4,945	0,093	2019,33	2,45
Vladayska R., intake 3	5,023	0,094	2016,8	2,6

In the basin of the Vladayska River three fountains are also built and have permits:

a) in the section of the river catchment "Opheliite" at the Stone River
b) in the section of the river catchment "Selimitsa" at the Selimitsa River
c) in the section of the river catchment "Kumata"

Table 8: *Basic characteristics of the three foutains*

№	Site	$H_{average}$, M	$Q_{average}$, l./s	F км.²	M l./s/ км.²
1	Fountain "Opheliite"	1749,4	18,70	0,954	19,6
2	Fountain "Kumata"	1836,8	7,796	0,356	21,9
3	Fountain "Selimitsa"	1954,9	3,91	0,226	17,3

For assessment of the hydro-chemical state of the Vladayska River, the monitoring studies of Sofiiska voda AD have been used. Samples were collected from the upper reaches of the river at the water intake 1. The only organized source of wastewater in the territory of the zone is the meteorological station of the Cherni vrah Peak:

- BOD = 0,371 kg / day.
- HB = 0,455 kg / day.

The above amounts are negligible and do not constitute a potential danger of river water pollution and thus there is no need of additional measures for treating this wastewater.

Ordinance No.9/16.03.2001 defines the water quality requirements for drinking purposes, regardless of the origin and category values for the test results of the parameters of the water samples from the Vladayska catchment.

The parameters are function of 1) for physical and chemical features: temperature, oxygen mode (dissolved oxygen), conductivity, pH, nutrient conditions; 2) for heavy metals and metalloids – Pb, Mn, Zn, Mg; 3) for biological pollutants: Coliforms - litter, Phytoplankton, bacteria count, bacteria count coli; 4) for specific pollutants – biological cyanides.

The investigation for the period 2013 - 2014 includes 4 samples, taken in June and August. The assessments for the water intake 1 are made on the basis of Ordinance No.4 for characterization and assessment of subsurface waters state in force from 06.03.2013.

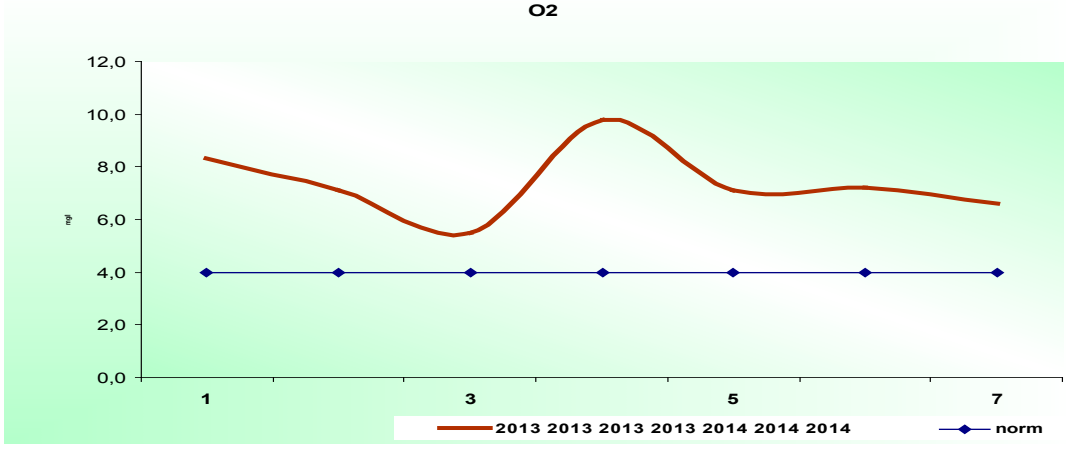

Figure 7. *Changes in O_2 (mg/l) for the period 2013-2014*

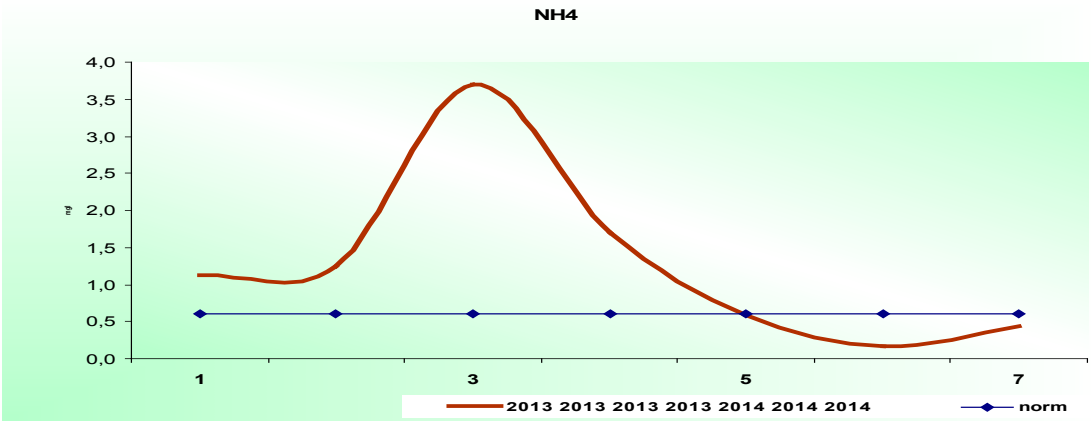

Figure 8. *Changes in NH4 (mg/l) for the period 2013-2014*

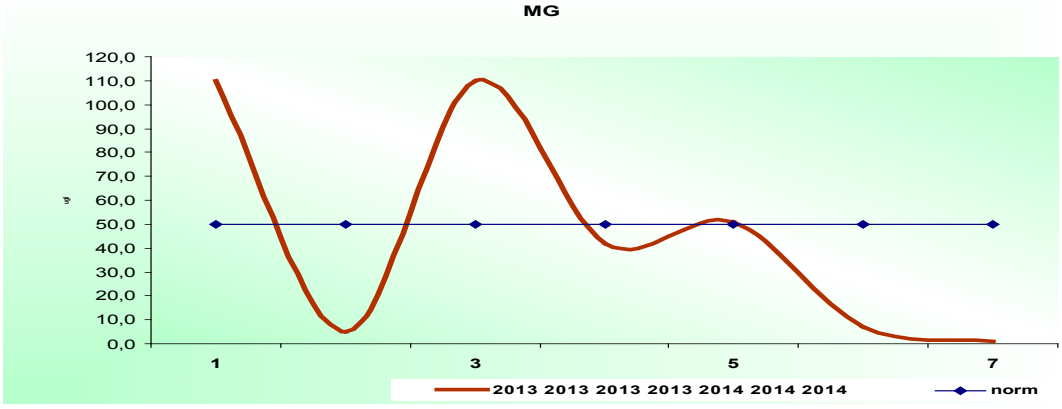

Figure 9. *Changes in Mg (mg/l) for the period 2013-2014*

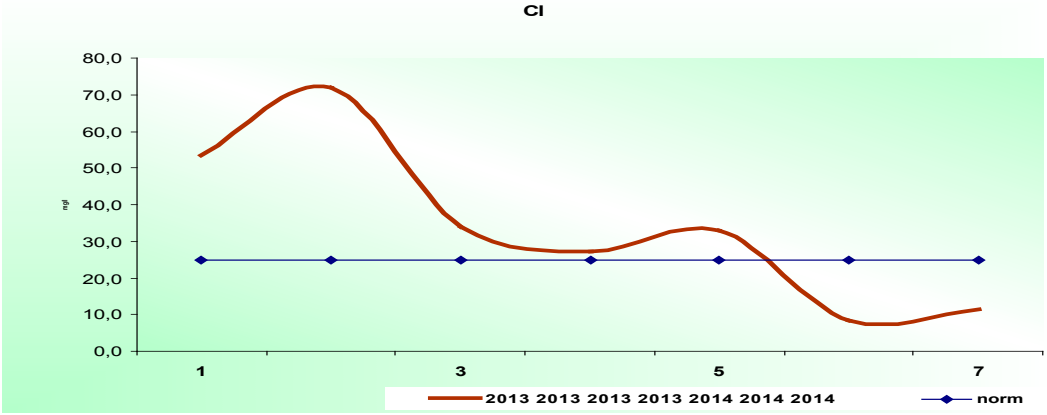

Figure 10. *Changes in Cl (mg/l) for the period 2013-2014*

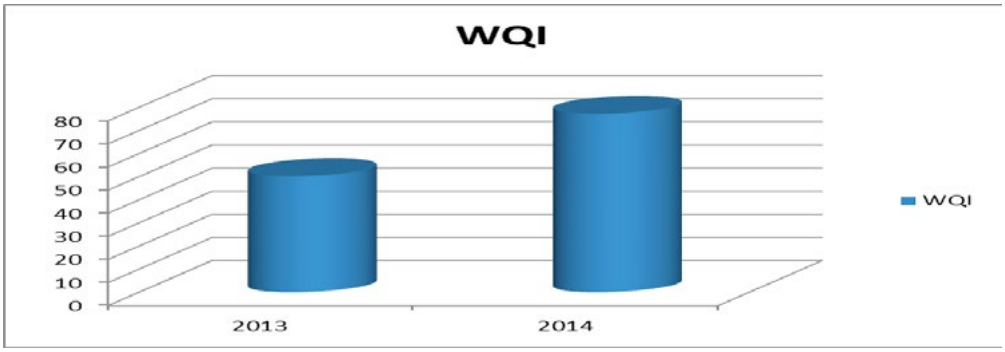

Figure 11. *Alteration of WQI for the last two years*

Summaries, WQI is given on Figure 11, which corresponds to good condition.

Components, involved separately in the study, show that the water quality in this section is not subject to anthropogenic impact and it is classified as "highly-modified water body", because:

1. Physical and inorganic chemical indicators meet the water requirements of ordinance No.9/16.03.2001.

2. The organic water pollutants indicators for the content of inorganic substances from industrial nature, as well as the biological indicators meet the requirements.

3. In addition, the water quality is classified as soft, i.e. the water hardness is very low - 0.18 mg/l;

In general, within the meaning of the ordinance – the drinking water is safe and clean, when it does not contain microorganisms in concentrations, presenting a danger to human health.

However, with regard to the hydromorphological conditions from RBMPDR, the Vladayska River is viewed from its spring to the village of Vladaya and it is not classified as "highly-modified water body". The common hydromorphological status by indicators is "very poor condition". In terms of hydrological regime the status falls within the category "moderate". The morphological status is very bad. The reasons for this lie in the regulation of the flow by changes in the riverbed, i.e. corrections in the built dams. This leads to a change in the morphological conditions and limits the fish migration.

The biological elements for water quality at the Vladaya village site (from RBMPDR) are:

1. Makrofiti: Assessment in EQR / RI/ - poor ecological status;

2. Fitobentos: IPS - 4.9, i.e. poor ecological status, EQR - 0.21, i.e. very poor ecological status;

3. Bottom macro invertebrate fauna: total number of taxa – 3, i.e. very poor ecological status; biotic Index - 1, i.e. very poor ecological status.

CONCLUSIONS

1. Human activity has not noticeably affected the natural water resources of the Vitosha Mountain. The main runoff intake of the river runoff is the canal "Vladaisky", that transfers water from the Vladayska River to the Studena dam;

2. Mountainous areas are affected to a lesser extent from the effects of climate change and extreme events - floods and drought than other areas in Bulgaria. Highly sensitive is the minimum flow that is essential for the ecological balance assessment of the area, but it is little investigated;

3. But, the ecological status in the village of Vladaya is bad. The reason for this is the lack of a sewerage system in the village. The domestic and industrial waste waters as well as other agricultural agents, regulation of runoff, construction of dams adjustments, in-taken inert materials, construction in the riverbed and others from the village of Vladaya and the settlements around it are led away for direct discharge;

4. Measures, which must be watched closely, are: a) those concerning the preservation of the water resources, i.e. to ensure management of the water resources on basin principle as well as protection of national interests; b) additional regulation of the outflow; c) provision of the ecological outflow in the river;

5. To develop knowledge and awareness of the best possible utilization of the water resources - assessment of flood risk, drawing up maps of the regions at risk of flooding and assessment of the risk from drought and its impact on the river waters quality and ecosystems are necessary.

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A REGIONAL APPROACH TO CLIMATE CHANGE ADAPTATION IN BULGARIAN MOUNTAINS

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ABSTRACT
Climate change and the need to adapt to the possible consequences of it pose a number of questions for public management and social development, which solution becomes more imperative after each successive IPCC report since 1990. In this connection, the European Commission published the 2007 Green Paper \"Adapting to climate change in Europe - options for EU actions\", followed in 2008 by the White Paper, which sets the framework of the European strategy for adapting to climate change. In 2013 was adopted the \"EU strategy for adaptation to climate change". In the strategy special attention is paid to the adaptation policies which are closely linked and coordinated with the management policies on disaster risk reduction at various levels of governing and various economic sectors. No less important in our opinion is, the sectoral policies for adaptation to the risk of climate change to be integrated into a wider policy framework, common to the regions with similar geographical features such as mountains, coastal, rural and urban areas. This paper offers an integrated regional approach to risk assessment of climate change and adaptation needs as a case study on Bulgarian mountain regions. Discussed are issues related to the typology and boundaries of the mountain regions, the observed and projected regional climate changes according the IPCC Fifth Assessment Report and potential threats for mountain's ecosystems and society. In conclusion are outlined priority areas in which to pursue a policy of adaptation to climate change in mountain regions of the country.

Keywords: *mountain regions, climate change adaptation, risk analysis*

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