The paper is aimed at an analysis and comparison of two karst areas. Among common problems of both territories are: sewage of untreated waste water from settlements and industrial plants to the underground space, infiltration of fertilizers and pesticides to underground spaces during torrential rains, washing away the topsoil into the underground space. The main difference consist in geographical positions. Whereas Moravian Karsts is situated in the vicinity of the regional center Brno and is partly a subject of suburbanization, Devetashko Plato marked depopulation tendencies. From it follows that Moravian Karst is under pressure of urbanization and tourism which compete with landscape protection. On the other side, Devetashko Plato area is not socially sustainable. These conditions create different approaches for the future management. In any case, the imaginations about the quantitative development should be abandoned. In both the cases the territories have to ensure sustainability in all three pillars: environmental, social and economic.

Keywords: social development, rural sensitive areas, Devetashko Plato, Bulgaria, Moravian karst, Czech republic

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INTRODUCTION

Territories under large scale landscape protection in post-communist countries pass through a complicated development. The policy of levelling the social development was abandoned. General trend of strengthening of landscape protection is confronted with the market conditions which are pushing to the intensive use of natural resources. Local administration has often to decide between the landscape protection (promoted by the institutions of the landscape protection) and local or micro-regional development (advocated by entrepreneurs). Local population writhe between the nostalgia for the home place and impossibility to find an appropriate work.

In the post-communist countries, the transition from the central planned to the marked economy meets another transition – from the productive to post-productive era – which is followed with the loss of jobs in productive sectors – agriculture, forestry, fishery and industry. Protected territories are often attractive for tourism. However, in the case of mass tourism development, just tourists could devalue original natural beauties. Moreover, tourism could hardly substitute the loss of jobs in productive branches. All these factors increase the sensitivity of the protected territories in natural, economic and social sense.
To understand present development in such kind of territories, two case study areas were selected: The Moravian Karst in Czech republic and Devetashko Plato in Bulgaria. Both of them represent similar natural conditions but different territories from the viewpoint of the geographical position in terms of peripherality, different traditions and roads of social economic development and differences in the politics of protection and control over the karst territories. The paper is aimed at comparison of two sensitive karst areas in different geographical positions and under different legal and economic development to expose common and different aspects of the problem and to indicate possible future development.

ECOLOGICALLY SENSITIVE KARST AREAS AND THEIR SOCIAL DEVELOPMENT

Karst may be defined as the terrain characterized by the specific surface and underground landforms and features (karens, dolines, ponors, channels, closed depressions, dry valleys, caves, etc.) essentially developed in carbonate rocks (limestone, dolomite, marble) and also in other soluble rocks (e.g. anhydride, gypsum, salt rock quartzite), by a particular type of groundwater circulation and regime, and by the occurrence of springs that usually have large capacity (Kaçaroğlu, 1999). Karst areas are among dynamic and the most ecologically sensitive (LaMoreaux et al., 1997). Their sustainability depends on keeping a careful balance among all three factors: natural, economic and social. From it follows that none of these factor can be developed without paying attention to its effect on the other. Karst areas cover relative large areas worldwide. According to their geographical positions and historical development they have different needs concerning sustainability. For example, in the peripheral areas of south-west China karst areas fight with the problem of exclusion and poverty and the question is how to develop the territory not damaging its natural values (Zhang Dian-fa et al., 2001). On the other side, the Caribbean karst is unsustainable due to the mass exploitation. Additionally it feels to be endangered with the consequences of the climatic change (Day, 2010).

Van Beynen and Thowsed (2005) developed a disturbance index for karst environment trying to measure level of human impact and searching for some risk limits. Their method was later slightly modified by de Waele (2009). Later, a sustainability index for the karst environment has been involved also by van Beynen et al. (2012).

Factors, influencing the farming in ecologically sensitive areas were described by Wilson (1997) on the example of Cambrian Mts. in Wales. The author introduces factors like age, education and residency length of farmers as decisive for active participation in the development (ESA scheme in the case). Thompson (2004) argues that even knowledgeable, well-intentioned people frequently fail to adopt pro-environmental behaviours.

Tourism impacts on the karst landscape not only in the case of its mass character but also by insensitive behaviour of tourist to the karst landscape. Clark et al. (2001) describe possible activities in a comparable area of the Slovakian karst (region Gecmer, district Rožňava). However the support of tourism – not its sustainability was the aim of the mentioned study. One of its conclusion was that the karst areas are often a subject of a half day trips with accommodation out of the territory.
METHODOLOGY AND DATA

The territory of karst areas is often investigated from the viewpoint of physical features like karst formation and their development, caves and their importance, hydrology of karst flows, biogeography and development of individual species on the limestone bedrock etc. Using of the karst elements for tourism is also an aim of various investigations. But complex management in karst areas and its impact on social system is almost on the periphery of interest. In Moravian karst, a relatively compact study analysing both physical and social features was elaborated in 1980s (Přibyl et al., 1983). However this work is outdated from the viewpoints of methodology, data and reality of the central planned system. Methodologically, an analysis of secondary sources, evaluation of statistical “hard” data and field research were used.

Evaluations of the natural potential of the karst landscape are made for the Devetashko Plato for objectives of the agriculture (Petrov, 1980; Petrov et al., 1992). Also in some research projects interdisciplinary and geosystems methods for studying the karst territories including in the social economic aspect are developed (Petrov, 1980; Petrov et al., 1992; Ninov, 2009; Stefanova, 2013; Stefanova et al., 2009; Yordanova et al., 2013). Comparative analysis represents the final step.

Table 1

<table>
<thead>
<tr>
<th>Sector</th>
<th>Sustainability Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government engaged in sustainability</td>
<td>Several measures of government sustainability such as incentives for green redevelopment</td>
</tr>
<tr>
<td>Agriculture</td>
<td>Green practices, availability of organic food, humane animal husbandry, access to affordable food</td>
</tr>
<tr>
<td>Building and development</td>
<td>Presence of benchmarking, access to green building technology, sustainable approaches to development and redevelopment, preserving historic buildings, access to affordable housing</td>
</tr>
<tr>
<td>Economic Development</td>
<td>Green industry, green energy development, green job availability, green real estate</td>
</tr>
<tr>
<td>Tourism</td>
<td>Ecotourism, green hotels</td>
</tr>
<tr>
<td>Energy</td>
<td>Use of green energy, conservation availability, education on green energy and conservation</td>
</tr>
<tr>
<td>Natural Resource Management</td>
<td>Preserve lands for future generations, provide access to out of doors, provide outdoor exercise opportunities, protect habitat of endangered species</td>
</tr>
<tr>
<td>Transportation</td>
<td>Provide green public transportation, develop green fuels and vehicles, build for walking and biking</td>
</tr>
<tr>
<td>Waste</td>
<td>Reduce waste generation, promote reuse and recycling, eliminate hazardous wastes</td>
</tr>
<tr>
<td>Education</td>
<td>Teach about sustainability in public schools, higher education options, informal education efforts</td>
</tr>
<tr>
<td>Water</td>
<td>Conserve water, fresh water access to public, storm water management, appropriate sewage management</td>
</tr>
<tr>
<td>Greenhouse Gas Management</td>
<td>Plan in place for greenhouse gas management, inventory complete</td>
</tr>
</tbody>
</table>

Source: van Beynen et al. (2012)
There is hardly any possibility to use quantitative data for a comparison of two territories which do not create any administrative units within the NUTS system in different countries – except of very simple data like number of inhabitants. That is why we would rather discuss qualitative indicators. Of all possible activities, two manifest themselves expressively concerning their impact on the karst landscape: agriculture and tourism. As concerns the mentioned disturbance index for karst environment of van Beynen and Thowsed (2005), they try to measure level of human impact and searching for some risk limits. The authors stated that it is hardly possible to develop one quantitative indicator and propose a hierarchical and standardized environmental disturbance index as a tool to measure regional impacts and highlight the areas of the karst system that require more protection or study. They suggest an evaluation of sustainability measures mentioned in the table 1. The level of fulfilment of these indicators will be discussed in the paper.

Although Van Beynen et al. (2012) speak about sustainability indicators, they suggest more or less environmental sustainability indicators only. There is hardly anything concerning social or economic sustainability in their system. Even when they mention economic development they mean economy subordinated to the environment not asking whether such economy could be sustainable. That is why additional discussion concerning social stabilization and economic prosperity of the karst areas under study will be involved in our paper. Especially a balance among all three pillars of sustainability is usually the key question.

**RESEARCH FINDINGS**

**MORAVIAN KARST**

Protected Landscape Area Moravian Karst (92 km²) is the largest karst area in Czech Republic. It is a fairly hilly landscape dissected by deep valleys built up of the limestone of Devonian age. The area is situated north of Brno in Drahanská vrchovina Highland (Fig. 1 – appendix). There are ca. 1,100 caves here, of which currently five cave systems are open for public tours. The Macocha Abyss is the most known attraction of the territory. It is a gorge 138 m deep, which was formed when the ceiling of an underground cave chamber collapsed. Macocha Abyss is also the place where the Punkva River begins to run underground through the Punkevní jeskyně cave system, and two small pools of water are visible at the surface.

Climatic conditions are characterized with average temperature 6.5–8.4 °C and 550–700 mm of precipitations. However, due to rugged relief, microclimate of individual parts of the area can be different. The soils are heavier, shallow, poor of water, rich of minerals. Flora and fauna are impacted with special natural conditions and with the fact that Moravian karst is situated on the border of Hercynian, Pannonian and Carpathian biogeographic regions.

Two thirds of the territory of Moravian karst are covered by forest (coniferous in the north part and deciduous on the south); only 17% of the territory is used as arable land. Current economic activities include primary branches: forestry (5,345 ha): *Picea abies* in the North, *Fagus sylvatica* in the Middle and *Carpinus betullus* with *Quercus* in the South. Forest Enterprise Masarykův les Křtiny is the educational unit of the Mendel University in Brno. Agriculture is directed more to the crop production, less to the animal husbandry (Fig. 2 – appendix). Mining includes one mine of the limestone
directly on the territory, the second (big) one can be found just on the border. All the territory is protected since 1956 when it was declared as Protected Landscape Area.

Agricultural cooperative farms were transformed into usual legal bodies. These companies farm mostly on a leased land. In the territory under study five big agricultural companies operate. They are oriented on cultivation of cereals (wheat, barley) and oilseed rape as well as hay from permanent grassland, corn for silage. Milk production and production of beef and pork also occurs. Only 29 family farms are in the territory. It is only one narrow specialization - goat breeding and goat cheese production farm. Almost all arable land is cultivated.

The population is engaged mostly in industry and services. About 36% of employees commute to work. Big industrial plants were situated on the fringe of the area in Blansko (mainly electrical engineering), Adamov (machinery), Boskovice (machinery and textile) and also in the regional capital Brno. Rural development is supported by the Local Action Group Moravian Karst.

On the protected landscape area or on its border there are 22 settlements with 23,058 residents (2011). The density of population is relatively high – 121 persons per km². The population number increased by 18% since 2000 (Fig. 3). The only town Adamov lost a relative big number of residents as a consequence of shortening the main industrial plant - Adamovské strojírny Engineering. On the other side, a majority of rural settlements grew as a consequence of the suburbanization process. On the whole, 54% of the population is with lower than secondary education, 32% with secondary and 13% with higher education in 2011. Aging is manifested by the share of young people (age 0-14) and seniors (age 65+) which is 0.92. However, some municipalities have a progressive age structure.

![Fig. 3. Population development 2001–2011](image)

*Source: Czech Statistical Office. Elaboration: J. Zapletalová*
The settlements are connected by the South Moravian Integrated Public Transport System. The transport accessibility is excellent. For tourist purposes an ecological (electric) train and the cableway were introduced. On the other hand, two roads going through deep and narrow valley were closed for the automotive transport. As concerns technical infrastructure, the majority of settlements is connected with gas, the share of connection with public water conduit does not decrease under 85% and share of population equipped with the sewerage system connected to wastewater treatment plant is about a half.

The villages have residential, partly agricultural and/or touristic character, Jedovnice, Křtiny, Ostrov u Macochy and Sloup being the most important (Korábová, 2007). Tourism develops quickly with 400,000 visitors annually (mostly one-day tourist). Schneider and Lorencová (2015) used questionnaires responded by 275 visitors in August and October 2013. The portion of foreign tourists is ca. 25% in the summer season and ca. 13% in autumn. The Macocha Abyss and the Punkevní caves were the most frequently visited places. Natural beauties were often completed by visits of architectonical heritage like castles and churches. A new tourist trend – geotourism has occurred in Moravian karst in the last time as Migoń (2011) shows.

DEVENTASHKO PLATO

The territory of the Devetashko Plato (340 km²) is situated to east of Lovech (a city approximately ten times smaller than Brno) and belongs also to two other districts – Veliko Tarnovo and Gabrovo. Devetashko Plato is relatively comparable territory to the Moravian Karst in terms of natural conditions (Fig. 4 – appendix). It is situated among valleys of rivers Rositza, Osam, Gostinka and Magara in the southern periphery of the Danubian plain.

The predominance of limestone is the cause for development of a typical karst relief (Jakucz, 1977). Morphological karst complexes with classical forms – superficial and underground as the sinkholes (dolines) are predominant in the relief. Their number is several thousands.

Sixty eight karst caves with total length of 18 km are studied on the territory of the Devetashko Plato. The longest one is the Boninska cave (Popova cave) near Krushuna village – 4,530 m. It is connected to the spring cave Vodopada (Maarata, 1,999 m) as this is one of the longest studied water cave system in Bulgaria (over 6.5 km). In the cave Vodopada is and the longest underground lake in Bulgaria - 800 m. The largest cave hall in Bulgaria is formed in the Devetashka cave - area of 20 thousand m² and a volume of 440 thousand m³ at height up to 48 m.

The climate of the Devetashko Plato is moderate continental with average annual temperature around 10.5 °C. Average annual amount of the precipitations is between 650 and 700 mm with spring-summer maximum (May-June). Around 33% of precipitation form underground water flow which is typical for karst regions.

The forests occupy around ⅓ of the territory of the plateau. The broad-leaved forests consist mainly from oak (Quercus cerris), hairy-oak (Quercus pubescens) and vergilian oak (Quercus virgiliana). At some places they are mixed with silver lime (Tilia tomentosa), hornbeam (Carpinus orientalis) and flowering ash (Fraxinus ornus) (Bondev, 1991). Semi-dry grasslands and shrubs can be seen here.
Part of the territory of Devetashko Plato has been established as a territory of ecological network of Natura 2000 – in the categories Bird Directive (7,894.78 hectares) and Habitat Directive (14,997.07 hectares), which are partially overlap. Two natural monuments and six protected sites with the area of 55.64 hectares are situated in the territory of the Plato.


On the whole, 58.4% of the population is with lower than secondary education, 34.2% with secondary and just 7.4% with higher education in 2011. Aging is very typical for the settlements (Fig. 6). The economic inactive population for 2011 (68.47%) prevail over the economic active part (31.53%). In some settlements – Tepava, Devetaki, Brestovo and Gostinya, the economic inactive population is over 90% (Fig. 7).

Agricultural land covers nearly 60% of the territory (Fig. 8). The agriculture is realised mainly by leaseholders. Local farmers form a minority. In general, the leaseholders settle outside of territory and have no relationship to the area. The EU subsidy for direct payments stimulates the farmers to increase the size of the utilized agricultural area (UAA) (Tabl. 2). There is also an effort from the side of the farmers to change the way of the use of the cultivated land – towards larger areas with cereal plants and towards smaller fruit gardens compared to the period before 1989. The most

Fig. 5. Population development 2001–2012 in Devetashko Plato

*Source: NSI – Bulgaria, Elaboration: D. Stefanova*
Fig. 6a: Age structure of the population 2001 (%)
*Source: NSI – Bulgaria, Elaboration: D. Stefanova*

Fig. 6b: Age structure of the population 2011 (%)
*Source: NSI – Bulgaria, Elaboration: D. Stefanova*
Fig. 7a. Economic activity structure of the population 2001 (%)  
Source: NSI – Bulgaria, Elaboration: D. Stefanova

Fig. 7b. Economic activity structure of the population 2011 (%)  
Source: NSI – Bulgaria, Elaboration: D. Stefanova
cultivated cereals are: wheat, barley, corn, sunflower and plumbs, cherries, peaches are planted in the gardens. Vine plantations are typical traditionally in Suhindol and less in Krushuna. Because of the established system of purchasers of the berry fruits, the cultivation of strawberries, raspberries, blackberries is permanently increasing.

There is also a tendency of restoration of old fruit gardens (mostly plumbs), because there is an opportunity of receiving additional agro-ecological payments.

The stock-breeding is connected mostly with the breeding of caws, sheep and goats on pastures, and with preparing hay and straw. It belongs to the small, mostly family sector where there are no conditions for breeding of a large number of animals (Fig. 9). The milk is produced in 73 farms with 1,523 cows (03.02.2015). There is a tendency towards the development of the bee-keeping which is a principal part the National program of bee-keeping.

There are many ways of using the forest - pasture of cattle and sheep or goats, production of hay from the treeless areas, production of fodder, picking herbs, wild berries, mushrooms and nuts.

There are no industrial enterprises on the territory of the Devetashko Plato. In its periphery only in Suhindol town food, wine and tobacco industries (wine-production, grain-producing, sunflower-seed oil, soft drinks, confectionery) and small enterprises from the metal industry are developed. The big industrial companies in the close situated municipal centers Lovech (Great Wall Motors, etc.) and Sevlievo (“Ideal standard – Bulgaria”, “Ideal standard – Vidima”, etc.) give an opportunity for employment. The question is whether the villages in Devetashko Plato are able to use this activity for commuting due to the age and professional and educational structure of their population and existing transport conditions.

Fig. 8. Landscape in the vicinity of Gorsko Slivovo village (Photo: P. Stefanov)
### Table 2

**Utilized agricultural area of holdings (2011-2015)**

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Settlements</strong></td>
<td><strong>Beneficiaries / number</strong></td>
<td><strong>Utilized Agricultural Area / ha</strong></td>
<td><strong>Beneficiaries / number</strong></td>
<td><strong>Utilized Agricultural Area / ha</strong></td>
</tr>
<tr>
<td>v. Koevci</td>
<td>9</td>
<td>1,452.7</td>
<td>9</td>
<td>839.1</td>
</tr>
<tr>
<td>v. Dimcha</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>v. Gorsko Slivovo</td>
<td>11</td>
<td>3,266.3</td>
<td>15</td>
<td>3,113.9</td>
</tr>
<tr>
<td>v. Karpachevo</td>
<td>4</td>
<td>750.3</td>
<td>2</td>
<td>628.6</td>
</tr>
<tr>
<td>v. Devetaki</td>
<td>6</td>
<td>1,969.9</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>v. Tepava</td>
<td>2</td>
<td>632.5</td>
<td>2</td>
<td>515.3</td>
</tr>
<tr>
<td>t. Suhindol</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>v. Varbovka</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>v. Agatovo</td>
<td>1</td>
<td>1,758.6</td>
<td>1</td>
<td>1,876.6</td>
</tr>
<tr>
<td>v. Kramolin</td>
<td>7</td>
<td>1,673.6</td>
<td>9</td>
<td>1,355.4</td>
</tr>
<tr>
<td>v. Krushuna</td>
<td>6</td>
<td>941.9</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>v. Brestovo</td>
<td>3</td>
<td>1,631.6</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>v. Gostinya</td>
<td>4</td>
<td>498.2</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>v. Smochan</td>
<td>8</td>
<td>601.8</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>v. Chavdartsi</td>
<td>9</td>
<td>782.9</td>
<td>8</td>
<td>844.5</td>
</tr>
</tbody>
</table>

Source: Department of Agriculture Veliko Tarnovo regional office, Department of Agriculture Lovech regional office, Department of Agriculture Gabrovo regional office. Elaboration: D. Stefanova

The Devetashko Plato gives an opportunity for development of different forms of tourism: ecotourism, sports, cognitive tourism and cultural tourism. The karst objects - caves and waterfalls are very attractive. In separate parts of the plateau there are suitable trails for hiking, cycling and horse riding, hunting and fishing in the different parts of plateau. There is an increased tourist interest towards:

Natural Monument “Marata - Karstovi Obrazuvania” is part of Krushuna karst geosystem. It is the calcareous tuffs (bigors) cascade with waterfall (Fig. 10) and three water caves situated very close (Krushuna village). In holidays the visits are up to 3,000 people daily. Tourist infrastructure is in the process of construction funded by municipal and private resources.

Natural Monument “Devetashka Peshtera” (Devetashka cave, Fig. 11) is and an archeological monument of culture. The natural monument is interesting for tourists.
Fig. 9. Grazing around the cave Golyama Garvanica – v. Gorsko Slivovo
(Photo: P. Stefanov)

Fig. 10, 11. Natural monuments “Marata - Karstovi Obrazuvania”
and “Devetashka peshtera” (Photo P. Stefanov)
during the whole year. The highest attendance is in the summer months - June-September. Around 50,000 visitors visited the place in 2014.

Because of the low economic level of the settlements situated in the Devetaki Plateau and in its periphery the karst tourism is seen like a good opportunity to raise the quality of life. From this point of view the karst objects are included in the municipal plans for economic development of Lovech, Letnitsa, Suhindol, Pavlikeni and Sevlievo municipalities.

The main part of the road network in the territory of Devetashko Plato is formed by municipal roads of poor quality with the exception of those in Letnitsa municipality. A smaller part belongs to the national road system of the third category. The settlements are served by public bus transport based on the existing road schemes. The most attractive tourist sights – Natural Monument "Marata" and Natural Monument „Devetashka Peshtera” are easy accessible by transport.

THE COMPARISON

Some comparison of two protected karst areas was made by Duval (2006) who paid her attention to the Škocjan caves in Slovenia and the Ardèche Gorge in France. It was found that the differences in the ways the two sites are managed can be traced through a diachronic approach to the history of their tourism development. Is it possible to use similar idea for the comparison of Moravian karst and Devetashko Plato?

In the case of the Moravian Karst and the Devetashko Plato, the first big difference between the two areas can be seen in the recent population development. Whereas rural settlements in Devetashko Plato lose inhabitants, rural settlements in Moravian Karst gain population. The main cause of such a development can be seen in the geographical positions of both areas. Moravian karst is situated in the vicinity of the regional capital Brno and the middle-size district town Blansko. Thus the villages are subjects of suburbanization. On the other hand regardless that part of the territory of the Devetashko Plato is situated close to the district center Lovech, the city is not able to provide employment and to keep the population by everyday work trips. The other two district centres Veliko Tarnovo and Gabrovo, and municipal centre Sevlievo are more distant from the settlements in south and southeast parts of the plateau and they are not able to keep the population by commuting. Another neigh-bouring district center Pleven has no relationships to the study area.

The difference leads to quite opposite set of problems. In the Devetashko Plato there are several problems: migration of young people to the cities or abroad, closing schools and pre-school institutions, difficult access to medical cares, high level of morbidity and death-rate caused by aging, abandoning and self-destroying of the house fund, limited public transport, difficult administrative services, high level of criminality (thefts), unemployment, etc.

On the other side, villages in Moravian karst are losing their rural character, depend more and more on commuting for jobs, education, services and thus on individual and/or public transport. The tourism is developed, although Vajčnerová (2009) point out that there is no overreaching agency organizing tourism activities.

The landscape protection is more or less similar in both territories. There is a large-scale protection and within it there are some small-scale protected areas (8 in
the Devetashko Plato and 17 in Moravian karst). However differences in the approach of communes to the landscape protection were observed. Both of the territories have different development and karst politics for protection of the landscape. Whereas municipalities in Moravian Karst collaborate with the landscape protection agency in a narrow way, municipalities in Devetashko Plato prefer economic benefit. The cause could consist in the different role of agricultural production for the surviving of localities.

In Moravian karst, 36% of economic active people commute for work and only 17% of the territory is formed by arable land. Earlier, the share of arable land was much higher but the land use has been changed after 1997 mostly for meadows (Balák et al., 1999). The landscape protection contributes to the creation of positive image of the area and thus to the tourist development which is another important economic branch. The municipalities have rather residential character with which the landscape protection is not in big contradiction.

On the other side, about 60% of the territory of Devetashko Plato is formed by the agricultural land. From it follows that productive pressures to the land are much stronger there which probably impacts on the standpoints of municipalities. There are no coordinate actions in the service of managing the karst resource executed to the Devetashko Plato and there are no real measures for protection of the karst resource. The main reason for this are serious gaps in the legislation about the karst and the caves in Bulgaria but also because in the territory of the Plato there is no park administration with functions like keep, protect and control.

Karst areas are generally the most environmentally sensitive of terrains, and among the most complex and least understood hydrologic and geomorphic systems (Veni, 1999). Among common problems of both karst areas under study are: sewage
of untreated waste water from settlements to the underground space, infiltration of fertilizers and pesticides to underground spaces during torrential rains, washing away the topsoil into the underground space. For example, a main characterisation of the Devetashko Plato is its strong vulnerability to pollution which, on one hand, is caused by the wide development of karst sinkholes (dolines) and on the other hand by a long anthropogenic loading (mainly agricultural) on the territory of the plateau and repeated pollution. Very often the sinkholes (dolines) are used as illegal dung-hill. There is no canalization and purifying of the water from the settlements in the plateau. Because of this the karst water in the plateau is very pollute and the main part of it is not good for drinking.

Flora and fauna are engaged by a high tourist arrivals. Due to the big number of visitors in the tourist seasons, overcrowding and lack of parking places occur.

**DISCUSSION AND CONCLUSIONS**

The first results show that the main difference between both the areas could consist in their geographical positions. Moravian karst is in the vicinity of a large regional centre, it uses its social infrastructure and job offer and is served by a relatively dense and frequent network of integrated public transport. Lovech is much weaker centre. Palang et al. (2006) show the importance of a strong centre for the development of a karst area on example of the Slovenian karst. Development and decline of the Slovenian karst is connected with the separation or penetration of the state border to Trieste (Italy) in different periods.

Moravian karst is under pressure of tourism, its southern part also under the pressure of suburbanization. Improper agricultural methods in karst areas may lead to a huge water erosion. So, the territory has to defend its ecological sustainability. On the other side, Devetashko Plato is abandoned by its population step by step. The soil lies partly fallow. The territory is not socially sustainable. During the last years external users (leaseholders) are doing deep plough up of the cultivate lands in the karst areas including abandoned ones. The economic objectives of these land users are not always connected to the ecological regulations due to the karst specific of the areas. Some changes in the traditional land keeping have also occurred. Moreover on the background of the global climate changes and increasing number of extreme climatic phenomena during the last years, especially torrential rain and fast snow melting, there is an intensive erosion close to the negative karst forms (dolines, entrances of precipice caves).

There are also differences in the management of protected territories. In both the cases, protected areas were declared by the law. However, Moravian karst is managed by the administration of the protected landscape area which is an institution within Ministry of Environment of the Czech Republic. It assesses a harm for worsening of agricultural and forest economic management. (For example, the biggest forest entrepreneur in the area – Mendel University in Brno obtained 6.4 Million of CZK – about 235.000 EUR in 2015). The caves are managed by the Cave Administration of the Czech Republic which ensures tourism and related protection of caves. Municipalities (more exactly their associations), entrepreneurs, education institutions, churches and other subjects are organized in the LAG Moravian karst. Thus, the problem on
the Czech side consists more in relations and competences among individual stakeholders.

Devetashko Plato is not a protected area due to the Low of the protected territories in Bulgaria. Only some parts of the plateau are declared as Protected site and Natural monuments without administrative management. This puts Devetashko Plato in a completely different position compared to the Moravian kras. For both categories of protected territories in Devetashko Plato there are official regimes of activities which are abided by the regional administration of the Ministry of Environment and Water, here Regional Inspection of Environment and Water, Pleven, which should guarantee their protection.

Two of the natural monuments in Devetashko Plato – “Devetashka peshtera” and „Marata “ are popular tourist attractions that provoke high interest. This interest modifies some specifics in their management. With decision № 943 from 15.11.2012 of the Council of ministers of the Republic of Bulgaria, Natural monument “Devetashka peshtera” is left for management to Lovech municipality under some conditions as: all the activities in the area of the Natural monument should be coordinated by the Ministry of Environment and Water and the Regional Inspection of Environment and Water, Pleven; implementation of plans, programs, projects and investment offers, connected to the activities for development of sustainable forms of tourism within the borders of the Natural monument should be in correspondence with the ecological legislation for protected territories and biological diversity. After gaining the right of management the Lovech municipality initiated development of the Plan for management of natural monument “Devetashka peshtera” which is in procedure of accepting.

An ecotrail “Maarata” is built within the borders of natural monuments “Marata” (situated in the territory of the municipality). It is maintained by Letnitsa municipality together with Regional Inspection of Environment and Water, Pleven. The municipality manages also a part of the tourist infrastructure around the natural monument (parking, info centre, souvenir shop, swimming pool and etc.)

As a result these two popular natural monuments in Devetashko Plato which are developed like tourist objects bring some economic and social benefits to the local community. But the preservation of the karst phenomena is a national priority which make the searching of rational balance between the interests of all concerned parties a real necessity.

Moreover, Czech administrations of protected landscape areas are professional institutions with necessary scientific background whereas Bulgarian municipalities are more or less elected local politicians.

Ančić and Perica (2003) highlight (in the case of the Mediterranean) that karst landscapes form unique agricultural land-use patterns constituting one of the most valuable spatial heritages. On the other side, social and economic changes have generated a situation, in which survival of this land as a cultural landscape becomes hardly possible. Current trends are directed often towards re-naturalization. However, karst landscape without any agriculture may increase biodiversity but the landscape could lose its authenticity. Of course, in our cases taking into account the changes in landscape micro-structures during the collectivization it is a question whether the return to the original arrangement is realistic.

Brinkmann and Parisé (2012) state that man must make a strong effort to learn to live “in harmony with” karst, rather than to live “on” karst. Many problems the au-
When interacting with karst environments are best solved through changes in human systems rather than through alterations of karst environments. This is because subtle changes in fragile karst systems change them significantly.

What can be suggested to improve the situation in the sensitive karst areas in post-socialist Europe? The land use should be modified to sustainable forestry and agriculture (see, e.g. Bárány-Kevei, 1999). However, the economic and social sustainability should be ensured as well. Alternative ways of economic development (in the sense of prosperity – not necessarily in the sense of a quantitative growth) should be found out. As Cigna and Forti (2013) mention: Caves were the first and, for a long period, the single geologic item for tourism. In the last few tens of years, with the creation of “Geo-Parks”, new geomorphological items started to become touristic targets. So, the karst manifests some heritage which should be used. However, the attention has to be paid to the sustainability of this kind of tourism taking into account the sensibility of karst areas.

Moreover, both tendencies (natural and social improvements) must be in an equilibrium. The land degradation (desertification) in some karst areas (for example in the largest world karst area in south-western China; Wan, 2003) may lead to one-sided preference of the landscape rehabilitation before economic and social prosperity. In such a case, karst areas may remain empty of productive people which could probably impact on the land use in a negative way.

To find an equilibrium between the protection of fragile karst features and ensuring their accessibility for public is another big task. The regulation should be solved within respective management plans (Hamilton-Smith, 2002). Georgiev-Leonidov (2010) sees the potential in the development of alternative tourism. It means that it is very suitable to avoid constructions of large tourist facilities but to disperse the tourists across the territory, to support small tourist enterprises. It may allude into the shortage of family farms in Czech Republic and lack of local capital and entrepreneurship in Bulgaria.

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Fig. 1. Protected Landscape Area Moravian Karst is situated to the north of Brno, in the Drahanská vrchovina Highland

Sources: Nature Conservation Agency of the Czech Republic https://gis.nature.cz/arcgis/services/UzemniOchrana/ChranUzemii/MapServer/WmsServer?, the geographic base data of the Czech Republic (ArcČR® 500, ZABAGED®) Drawn by P. Dvořák
Fig. 2. Land use in Landscape Protected Area Moravian Karst in the year 2014

Source: Czech Statistical Office, Elaboration Jana Zapletalová

Fig. 4. Devetashko Plato


Drawn by E. Tcherkezova