

NKFI 124497
The changing role of karst national parks
in human-environment relations: a regional comparison

FINAL REPORT

We achieved all of the goals set at the beginning of the project. A special situation was caused by COVID, which made field investigations impossible for about a year. Nevertheless, it allowed us to spend more time processing and publishing the results.

In terms of content, our analyses was slightly expanded compared to the original goals. Recognizing that our topic is closely related to the topic of geoheritage, we also devoted significant emphasis to this topic in our research. In addition, our analyses were also enlarged spatially, because we also carried out part of the investigations for the surroundings of Vikos Gorge (Northern Pindos NP, Greece).

The project greatly helped the expansion of our professional relationships, as we met several foreign researchers at each study locations and they could join our project in data collection, analysis and publication. Some BSc theses and the PhD dissertation of a Serbian colleagues were also related to our project.

During the project, we published 2 Q1 journal articles, 10 Q2 journal articles, 8 additional journal articles, and 5 other scientific publications in which the fact of NKFI support is indicated. The cumulative impact factor of these articles is 23.91. Among the papers, 5 Q2 articles were published in a special issue of the Hungarian Geographical Bulletin dedicated completely to the topic of karst national parks. Here we note that according to Scopus, the Hungarian Geographical Bulletin was already considered Q1 in 2021 ([LINK](#)), but the Scimago (and consequently mtmt.hu) database does not mark it as such yet (but presumably it will be Q1 in 2022, which implies that 5 of our articles advance from category Q2 to Q1). In addition, we published more than 10 papers in conference proceedings and some articles in popular geographic magazines about the topic of the project.

All of these articles, as well as related maps, are available from the project website (<https://karst.elte.hu/knp/>).

RESEARCH QUESTIONS

The main questions of our investigations were:

- How has the idea of "national parks" developed over the past one and a half century?
- Is it true that karst areas represent a significant proportion of protected areas?
- What influence do the specific natural features of karst areas have on the lives of those who live there?
- How do the park managers interpret the goals of the park? What conflicts do they perceive?
- How do local residents see the goals of the park? What conflicts do they perceive?
- Does the park contribute to the socio-economic development of local communities?
- How do tourists see the park? What do they like/dislike? What developments would they support?
- What knowledge do local residents and visitors have about the concept of "karst" and "geotourism"?

RESEARCH METHODS

During our research, in addition to exploring the literature, we used the following methodology:

1) Based on various databases, we examined how the number and spatial distribution of national parks and geoparks developed in European countries, and within this we classified national parks and geoparks containing karst areas into a separate category.

- 2) We examined the similarities and differences of protected area categories in the countries studied in this project, and statistically analysed the proportions they represent within the given country.
- 3) With the help of GIS tools, we analyzed how the demographic indicators of the studied karst regions changed in relation to the surrounding non-karst areas.
- 4) Questionnaire surveys were conducted in the examined areas, with the help of which we were able to know the opinions of the park's employees, the residents of the surrounding settlements, and the visitors.
- 5) Finally, we conducted long interviews with prominent actors, such as the park managers, external experts, and the mayors of the settlements in or around the studied parks.

STUDY AREAS

The analysis using the first method described above was carried out in a European context. The other methods were applied to selected national (or nature) parks at the following locations: Aggtelek National Park (Hungary), Slovak-Karst National Park (Slovakia), Krka National Park (Croatia), Tara National Park (Serbia), Apuseni Nature Park (Romania) and, not completely, but certain analyses were also carried out in relation to the Northern Pindos National Park (Greece).

HUMAN-ENVIRONMENT RELATIONS IN KARST TERRAINS

In the case of karst regions, several factors can be mentioned that have a serious impact on society. The availability of water, for example, is limited on the karst plateaus (where water collection is possible via cisterns), so they are limited in terms of human settlement. On the other hand, karst springs with abundant water offer good opportunities for settlement mainly at mountain foot areas. Due to the poor and thin nature of karst soils, the ploughing opportunities are less good, therefore karst areas are more suitable for animal husbandry and the preservation of forests. Steep, rocky mountain slopes mean obstacles for traffic. Because of all the above factors, the karst regions are mostly sparsely populated areas (*Telbisz et al. 2014*). For all these reasons, and taking into account the special calciphil plants, we can say that karst areas often have high biodiversity (*Gorjanc et al. 2022*). Furthermore, the karsts have special landforms (dolines, collapse sinkholes, caves, gorges). All of these may contribute to the establishment of protected areas in karst regions, and may have a role in the boom in nature-based tourism. *Figure 1* summarizes the relationships between the above factors.

In recent years, a number of articles have been published, which quantitatively proved that the population density is not only low in the area of many European karst regions, but in the last half to a century the population has mostly been decreasing: for example, in the Velebit Mountains (Croatia; *Pejnović, Husanović-Pejnović 2008*), the Gömör-Torna-karst (Hungary, Slovakia, *Telbisz et al. 2015*), the Apuseni Mountains (Romania, *Telbisz et al. 2016*), the **Tara Mountains (Serbia, *Telbisz et al. 2020b* – this project)**, and the wider environment of the **Krka National Park (Croatia, *Telbisz et al. 2022* – this project)**. The process of depopulation must of course be interpreted in a broader context. In the broadest sense, we can speak about rural depopulation. But by further narrowing the circle we can establish that the depopulation of the mountainous regions is faster (*Milošević et al. 2010, 2011; Kohler et al. 2017*), and in several cases in the above examples, it was also proven that the depopulation of the karst areas is even faster within the group of mountain settlements. Direct causes of depopulation are: lower incomes in agriculture, lack of employment, weaker infrastructure (roads, electricity, internet), fewer social institutions (schools, shops, entertainment, etc.). All of this leads to depopulation and the ageing of society. These processes cannot be stopped, but the benefits associated with protected areas can somewhat alleviate the problems (*Grau, Aide 2007; Gretter et al. 2017*).

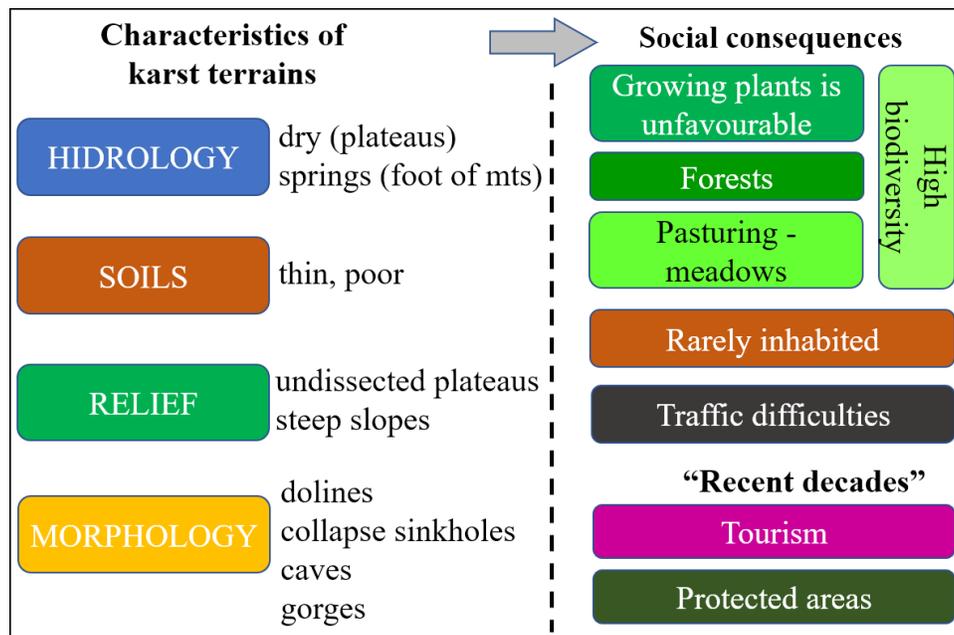


Figure 1. Impact of karst on society

It is worth examining how the system of goals of national parks has changed since the foundation of the first national park (Yellowstone, 1872) until now. In addition to the preservation of "wild nature" and the protection of endangered species, the original goals (of the first national parks in the USA and its followers) also included the promotion of tourism and the expression of national identity (*Frost, Hall 2015*). Much later, in the 20th century, when the idea of the „national park“ arrived to Europe, there were already more densely populated regions and much less „wilderness areas“, thus the idea arose that "cultural landscapes" also deserve protection, and that the national park should also provide opportunities for recreation. As a result of new ecological scientific knowledge in the second half of the 20th century, the original aim to preserve individual species was enlarged to preserve biodiversity and whole ecosystems. It was also recognised that national parks (or protected areas in general) are excellent locations for education and also have a special role in terms of research. It was relatively lately, from the 2000s, that the approach that protected areas should also contribute to the promotion of regional development became emphasized (*Mose 2007*). Today, all of these goals are formulated in the IUCN recommendations for protected areas.

RESULTS

Based on the analysis of European national parks and geoparks, we found that there are currently 106 partially or fully karstic national parks in Europe, which is 23% of all national parks. As for geoparks, 49% of them are partially or completely karstic (*Telbisz, Mari 2020*). Therefore, we can say that within the protected areas in general, but especially from the point of view of the geoheritage, the karst areas are very important. Their spatial distribution naturally corresponds to the spatial distribution of karst terrains, i.e. the British Isles as well as Central and Southern Europe have a significant number of partially or fully karstic national parks or geoparks (see our map at <http://karst.elte.hu/maps/EuKarstMap.html>). Regarding the establishment of national parks, we can see a gradual acceleration. From 1950 to 1990, an average of 4.2 national parks were established annually in Europe, and from 1990 to 2010, the growth rate was 11.5 national parks per year on the average. In the most recent decade, however, the rate has already slowed down significantly (*Telbisz, Mari 2020*).

Table 1 highlights some important points of view, and it qualitatively presents how significant are the different processes (or factors) in the studied national (or nature) parks. According to our analysis, depopulation is characteristic of all the examined karst regions without exception, and even the establishment of the national park could not really stop this process. From a demographic point of view, in most places only a few settlements show demographically positive signs, these are the settlements that benefit most directly from the positive social effects of the national park (job opportunities, participation in hospitality). The infrastructure (e.g. road network) is in an improving condition everywhere, and in comparison to the surroundings of these parks, the infrastructure is generally of better quality, which is due to the fact that the opportunities to apply for funding are better for the national (nature) parks, so more support comes to these places. In terms of job opportunities, we can talk about direct job opportunities (when the national park is the employer) and indirect opportunities (which can be linked to tourism, for example). Among the examined national parks, the Krka NP is the one that provides direct employment to the most people, while the number of jobs directly connected to the park is negligible in the case of Slovak-Karst NP and Apuseni NP. In the case of Tara NP and Aggtelek NP, we can speak of a medium value, and in the case of Aggtelek NP, we can emphasize that the national park is the largest employer in the subregion. It is also interesting to examine which sector provides most of the national park's revenue. In the case of Krka NP, where the number of annual visitors is currently well over 1 million, tourism is of course the main source of income. In the case of Tara NP, interestingly, the sector with the most revenue is forestry, which strictly takes into account the aspects of nature conservation, and can operate with significant economic benefit in the territory of the national park. In other cases, state budget support is the most important item. Finally, we categorized the investigated national parks in terms of the importance of tourism, its international character, and the type of main natural attractions (see *Table 1*).

Table 1. Significance of different factors in the studied national (nature) parks

factor	Krka NP	Tara NP	Aggtelek NP	Slovak-Karst NP	Apuseni Nature Park
depopulation	in each of them – not stopped by the presence of NP; except few developing settlements closest to the main attractions				
infrastructure (roads)	improving in each case (but still not perfect everywhere)				
job possibilities	many	medium	medium	few	few
most significant income source of the NP	tourism	forestry	state	state	state
tourism significance	very high	medium	medium	medium	medium
internationality	international	domestic	domestic	domestic	domestic
natural attractions	waterfalls, lakes	forests, gorges	caves, forests	caves, forests, gorges	caves, forests, gorges

By examining the different goals of the stakeholders, we can make the following conclusions. In most cases, we can observe that the **state budgets** are in a difficult situation everywhere, so they are trying to reduce their costs for nature conservation, specifically for the maintenance of national parks. Therefore, the expectation is communicated to the park managers that if they want to maintain the system (including the employees), they should try to obtain as much independent income as possible through tourism and tenders. At the same time, it can be observed that significant resources are available for the development of the infrastructure (partly through state and partly through EU funds). The **managers of the national parks** are mostly committed to nature conservation, but the current financial situation poses serious limitations for them. Their primary task is to achieve nature conservation goals, and they would like to leave business to local entrepreneurs, but partly due to historical reasons (e.g. socialist regime), the local entrepreneurial layer is weak in many cases. In most places, **local residents** would be happy to welcome more tourists than at present, as they hope that this will lead to job opportunities and more income. Also, in most places they agree (although not everywhere) that the national park should take a significant part in the management of tourism. At the same time, they do not like certain restrictions related to protected areas (e.g. restrictions on construction, agricultural activities, forest gatherings). In

most places, **tourists** are satisfied with the opportunities offered by national parks. Most of them support developments that are considered environmentally friendly (new panorama points, new educational paths), and the majority of current visitors oppose environmentally less friendly developments (such as adventure parks, swimming pools, entertainment facilities).

Based on the above, the **conflicts** that exist between the individual actors can be roughly outlined. The main problem in the relationship **between the state and the park managers** is the decreasing budget, and thus there are often not enough jobs for the park to fulfil its required tasks. The conflict **between the park and the forestry** is the management of the forests, during which nature conservation and economic aspects are taken into account to varying degrees. In this regard, the situation of Tara NP seems to be conflict-free, where the forestry is actually part of the national park. However, a sort of conflict exists between the NP management and local residents, because the locals are those who tend to obtain wood in protected areas. The Apuseni NP seems to be the most burdened, where the opposite is true, the nature park is actually subordinated to the state forestry. In the relationship **between the park and the local population**, there are the following conflicts in most places: the park managers are mostly not from the area of the national park; furthermore, the restrictions related to nature conservation are often resented by local residents; finally, there are in some places disputes about the distribution of the benefits from tourism between the park and the local residents. Thus, the majority of local inhabitants have "supportive attitude", but the proportion of opponents is also relatively significant in some cases. As for the relationship **between the park and the visitors**, the issue of seasonality is a problem. In the summer period, there are crowds and congestion, while in the rest of the year there is too much "silence" (but this varies greatly from park to park). Solving seasonality in the studied parks seems quite difficult. In addition, tourism is spatially highly inhomogeneous, tourists usually concentrate on one or two prominent sites. In this issue, most of the examined parks try to do something in order to make the distribution of visitors more uniform in space. However, the location and number of the most spectacular natural attractions are difficult to modify. Garbage is currently not a serious problem in most of the investigated parks (exception: Apuseni NP). The carrying capacity is also well above the current level in most of the examined parks (exception: Krka NP). There are mostly no significant conflicts between tourists and the local population, as there are no disturbing crowds in the examined parks for most of the year (with the exception of Krka NP), so the local residents are rather happy about the tourists who contribute to their livelihood.

Finally, in relation to the **attitude towards "karst" and "geotourism"**, we can say that for local residents, "nature" primarily means the surrounding forests, which they often visit. Caves, which are usually the biggest attraction for tourists in karstic parks (except: Krka NP, Tara NP), are less important for the daily life of local residents (except for those who are connected to caves by their work). In some places, but not everywhere, the national parks provide special programs for the surrounding schools, through which the children living there can learn about the goals, tools and important locations of the national park, or nature conservation in general. Local residents have a certain "field knowledge" about karst processes, as it affects their everyday life. However, we mention that the number of people who come into daily contact with the land through agriculture is gradually decreasing. Most of the local residents have not yet heard of "geotourism". Tourists' knowledge of karstification is generally not very deep. In most of the investigated places, less than half of the visitors claimed to know the meaning of the word "karst", and only about a quarter could correctly define the meaning of this word or list some typical karst landforms. At the same time, according to their own admission, more than half of the visitors knew the word "geotourism" in most places, and an average of 20-25% of the respondents declared themselves to be geotourists "to some extent".

A more detailed description of the above results can be found in the articles published during the project.

REFERENCES

- Brankov, J., Micić, J., Čalić, J., Kovačević-Majkić, J., Milanović, R., & Telbisz, T., 2022. Stakeholders' Attitudes toward Protected Areas: The Case of Tara National Park (Serbia). *Land*, 11(4), 468.
- Frost W, Hall CM, 2015. *Tourism and national parks: international perspectives on development, histories and change*. Routledge, New York
- Gorjanc, S, Simončič, T, Poljanec, A, Kuslits, B, Arany, I, Tanács, E, Vári, Á, Aszalós, R, Drasovean, A, Mosr, A, Maeso Velasco, L, Reuter, A Gattenlohner, U., 2022. A new ecosystem services approach to enable identification of pro-biodiversity businesses of protected karst areas in Central and South-Eastern Europe. *Hungarian Geographical Bulletin*, 71(2), 181-195. <https://doi.org/10.15201/hungeobull.71.2.6>
- Grau HR, Aide TM, 2007. Are rural–urban migration and sustainable development compatible in mountain systems? *Mountain Research and Development* 27:119–124. <https://doi.org/10.1659/mrd.0906>
- Gretter A, Machold I, Membretti A, Dax T, 2017. Pathways of Immigration in the Alps and Carpathians: Social Innovation and the Creation of a Welcoming Culture. *Mountain Research and Development* 37:396–405. <https://doi.org/10.1659/MRD-JOURNAL-D-17-00031.1>
- Imecs, Z, Máthé, A, Kohán, B, 2022. Attitudes of local people towards Apuseni Nature Park, Romania. *Hungarian Geographical Bulletin*, 71(2), 133-148. <https://doi.org/10.15201/hungeobull.71.2.3>
- Karst and National Parks 2022. Budapest, ELTE Eötvös Loránd Tudományegyetem. Online project content description. Available at <https://karst.elte.hu/knp/>
- Kohler T, Elizbarashvili N, Meladze G, Svanadze D, Meessen H, 2017. The demogeographic crisis in Racha, Georgia: Depopulation in the central Caucasus mountains. *Mountain Research and Development* 37:415–425. <https://doi.org/10.1659/MRD-JOURNAL-D-17-00064.1>
- Kőszegi, M, Gessert, A, Nestorová-Dická, J, Gruber, P, Bottlik, Z. 2022. Social assessment of national parks through the example of the Aggtelek National Park. *Hungarian Geographical Bulletin*, 71(2), 149-162. <https://doi.org/10.15201/hungeobull.71.2.4>
- Kovačević-Majkić, J, Čalić, J, Micić, J, Brankov, J, Milanović, R, Telbisz, T, 2022. Public knowledge on karst and protected areas: A case study of Tara National Park, Serbia. *Hungarian Geographical Bulletin*, 71(2), 163-179. <https://doi.org/10.15201/hungeobull.71.2.5>
- Mari, L, Tábori, Z, Šulc, I, Radeljak Kaufmann, P, Milanović, R, Gessert, A, Imecs, Z, Baricz A, Telbisz, T, 2022. The system and spatial distribution of protected areas in Hungary, Slovakia, Romania, Serbia and Croatia. *Hungarian Geographical Bulletin*, 71(2), 99-115. <https://doi.org/10.15201/hungeobull.71.2.1>
- Mercier G, 2009. Vidal de la Blache, P. In: Kitchin R, Thrift N (eds) *International Encyclopedia of Human Geography*. Elsevier, Oxford, 147–150.
- Milošević MV, Milivojević M, Čalić J, 2010. Spontaneously abandoned settlements in Serbia, Part 1. *Journal of the Geographical Institute "Jovan Cvijić" SASA* 60/2:39–57. <https://doi.org/10.2298/IJGI1002039M>
- Milošević MV, Milivojević M, Čalić J, 2011. Spontaneously abandoned settlements in Serbia, Part 2. *Journal of the Geographical Institute "Jovan Cvijić" SASA* 61/2:25–35. <https://doi.org/10.2298/IJGI1102025M>
- Mose I, 2007. *Protected Areas and Regional Development in Europe: Towards a New Model for the 21st Century*. Ashgate Publishing Ltd., Aldershot, UK.
- Nestorová Dická, J., Gessert, A., Bryndzová, L., & Telbisz, T., 2020. Behavioural survey of local inhabitants' views and attitudes about Slovak Karst National Park in Slovakia. *Sustainability*, 12(23), 10029.
- Pejnović D, Husanović-Pejnović D, 2008. Causes and consequences of demographic development in the territory of Velebit Nature Park, 1857–2001. *Periodicum biologorum* 110:195–204
- 1Telbisz T, Bottlik Z, Mari L, Kőszegi M, 2014. The impact of topography on social factors, a case study of Montenegro. *Journal of Mountain Science* 11:131–141. <https://doi.org/10.1007/s11629-012-2623-z>
- Telbisz T, Bottlik Z, Mari L, Petrvalská A, 2015. Exploring relationships between Karst terrains and social features by the example of Gömör-Torna Karst (Hungary-Slovakia). *Acta Carsologica* 44/1:121–137. <https://doi.org/10.3986/ac.v44i1.1739>
- Telbisz T, Imecs Z, Mari L, Bottlik Z, 2016. Changing human–environment interactions in medium mountains: the Apuseni Mts (Romania) as a case study. *Journal of Mountain Science*, 13(9), 1675–1687. <https://doi.org/10.1007/S11629-015-3653-0>.
- Telbisz T., Stergiou, C., Mindszenty A., Chatzipetros, A., 2019: Geological and Geomorphological Characteristics of Vikos Gorge and Tymphi Mountain (Northern Pindos National Park, Greece) and Karst-Related Social Processes of the Region. *Acta Carsologica*, 48(1),29-42. <https://doi.org/10.3986/ac.v48i1.6806>
- Telbisz T, Mari L, 2020. The significance of karst areas in European national parks and geoparks. *Open Geosciences*, 12(1), 117–132. <https://doi.org/10.1515/geo-2020-0008>.
- Telbisz T, Gruber P, Mari L, Kőszegi M, Bottlik Z, Standovář T, 2020a. Geological Heritage, Geotourism and Local Development in Aggtelek National Park (NE Hungary). *Geoheritage*, 12(1), 5. <https://doi.org/10.1007/s12371-020-00438-7>.
- Telbisz, T., Brankov, J., & Čalić, J. 2020b. Topographic and lithologic controls behind mountain depopulation in Zlatibor District (Western Serbia). *Journal of Mountain Science*, 17(2), 271-288. <https://doi.org/10.1007/s11629-019-5861-5>
- Telbisz T, Čalić J, Kovačević-Majkić J, Milanović R, Brankov J, Micić J, 2021. Karst Geoheritage of Tara National Park (Serbia) and Its Geotouristic Potential. *Geoheritage*, 13(4), 88. <https://doi.org/10.1007/s12371-021-00612-5>.
- Telbisz, T, Šulc, I, Mari, L, Radeljak Kaufmann, P, 2022. Attitudes and preferences of visitors of Krka National Park, Croatia. *Hungarian Geographical Bulletin*, 71(2), 117-132. <https://doi.org/10.15201/hungeobull.71.2.2>