Proceedings of 27th Central European Conference

(Teaching) Regional Geography

17th October 2019, Brno

Darina Mísařová & Jana Petráková (eds.)

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CONTENT

INTRODUCTION

On 17th October 2019, the 27th Central European Geographical Conference took place at the Faculty of Education of Masaryk University in Brno. The conference was organized by the Department of Geography, Faculty of Education, Masaryk University in partnership with the Department of Geography and Regional Development, Faculty of Natural Sciences, Constantine the Philosopher University in Nitra and the South Moravian Branch of The Czech Geographical Society. The main theme of this year's conference was focused on teaching regional geography at various levels of the education system.

The October meeting was attended by Czech, Slovak, Polish and German experts with experience from all spheres of geographical education. Together, they sought after answers to the question of how it is possible in geographical education at primary, high school and university education successfully incorporate the ideas of so-called „new regional geographies".

Like previous years, this year was no exception – instead of the traditional model of presentation of linearly arranged papers in thematic sections, preference was given to a panel discussion with the moderator and thus the opportunity for a deeper reflection on current issues of geography. At the same time, the need for the exchange of experiences (not only) from university teaching and debate on the topic of the analysis of the current state of regional geography in the Czech Republic and other Central European countries pervaded the whole conference.

The beginning of the conference was dedicated to a moderated plenary session, where keynote speakers discussed the past, present and future-changing visage of regional geography and its forms of teaching.

This was followed by a moderated panel discussion, which discussed the issue of linking regional geography with the teaching of physical or socioeconomic geography, trying to find the inspiration in some innovative foreign approaches, controversy over the unhappy situation of availability of regional geography textbooks or sharing experiences with real implementation of new regional geography and examples of good and bad practice.

The conference also included a poster section. The presented posters were available for viewing throughout the day, and a two-hour block was reserved for their presentation by researchers and subsequent short discussion between the participants of the section.

In total, more than 65 geographers went through actual geographical topics, shared information and experiences and gave another point of view to the others, which I believe will lead to progressive innovations in teaching regional geography.

Editors

LANDSCAPE FRAGMENTATION AROUND US – INTEGRATING THE ISSUE INTO EDUCATIONAL PROCESSES AT PRIMARY AND SECONDARY SCHOOLS

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Abstract: The steadily increasing landscape fragmentation and the reduction of permeability for wildlife are among the most negative impacts of human activity on the environment. In terms of education, theseproblems appear to be rather demanding, withthe difficulty corresponding tosecondary school standards. Considering the multiple interdisciplinary connections, the entire process cannot be sufficiently understood without a relevant amount of preliminary knowledge. Such a corpus of information is acquired especially through biology/ecology, geographyand history classes, but links to other subjects can be found too.

The paper presents didactic methods facilitating the actual presentation of the theme to pupils/students; in this context, authors discuss the possibilities of integrating the given problems into applicable schoolsubjects andoutline the risks arising from the proposed modification and/or expansion of the teaching procedures. Also the links to data and supporting methodological materials are included that will allow the teacher to obtain enough information on the topicsto comprehend all the aspects and complexities of the innovated classes. In the corresponding sections, the papercharacterizes individual topics to be combined with

selected teaching methods, especially as regards worksheets, project-oriented education, anda case study relating to afield trip targeting one of the areas of high importance for wildlife migration in the Czech Republic.

Key words: landscape fragmentation; education; didactical methods

INTRODUCTION

One of the most negative human-made impacts on wild life and landscape is the increasing fragmentation of territory and decreasing permeability. The barriers created by anthropogenic activity in landscape limitlong-distance animal migrationson which many species are existentially dependent. In Central and Eastern Europe, the brown bear (*Ursusarctos*), wolf (*Canis lupus*), European lynx (*Lynx lynx*), red deer (*Cervus elaphus*), and moose (*Alces alces*) must be mentioned in this respect. Also everyday movements of common game species are affected. Major barriers are linear transport infrastructure, water courses with regulated banks, fences, built up areas and large forest-less areas (often blocks of arable land). Biotopes suitable for the sustenance of populations are splitin to progressively smaller parts, and the landscape is thus formed from isolated areas that lack sufficient communication with the surroundings; such a trend can then even cause the extinction of the local population (Anděl et al., 2010). The phenomenon of landscape fragmentation was known already before the end of the last century, especially in western European countries (EEA, 2011); in Central and Eastern Europe, the problem gained attentionas a result of the rapid socio-economic changes after the year 1990 (Patru-Stupariu et al., 2015). In addition to the development of the core transport infrastructure, the fragmentation generally accompanied urban sprawl, suburbanisation (Dostál, Havlíček, & Huzlík, 2010; Izakovičová et al., 2017), and, in mountain areas the development of recreational infrastructures (Havlíček & Dostál, 2019). The severity of the problem is also recognised by the responsible authorities, and the requirements for limiting landscape fragmentation have been integrated into strategic documents on spatial planning at the national and international levels (Finka et al., 2018; Semančíková et al., 2020). Conversely, the efforts to reduce fragmentation seem to be very weak, as only between 2000 and 2016 the non-fragmented territory was lost in the Czech Republic, corresponding to approximately 7.5% of the entire country (Dostál, Anděl & Havlíček, 2018).

DIDACTICAL METHODS

From the educational perspective, the problem of landscape fragmentation and relevant changes caused by transport infrastructure is a demanding topic whose difficulty corresponds primarily to high school standards; however, significant portions of the information corpus can be delivered to younger students (pupils) as well. The theme is included inthe more basic subjects, biology/ecology and geography in particular, but links to the subjects such as history, informatics, or mathematics, can be found too. The classic frontal instruction methodis applicable based on data from many different materials available in Czech (Anděl et al., 2010; Dostál et al., 2015; Hlaváč et al., 2019) or English (Iuell et al., 2003).Older students, above all, may be able to convey basic information about landscape fragmentation, in lieu of the classic interpretation, through a 12-minute video[1]; the material, titled “Fragmentacekrajiny”,was produced within the project”Complex

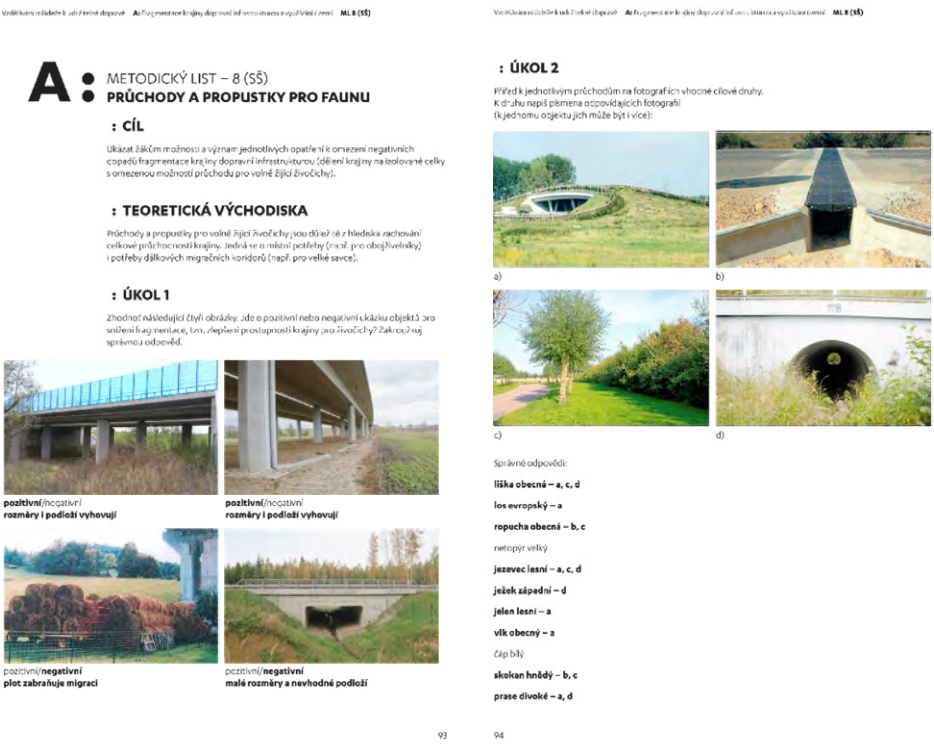
1 https://www.youtube.com/watch?v=ZNMgvfOposU

Approach to the Protection of Fauna of Terrestrial Ecosystems from Landscape Fragmentation in the Czech Republic" (EHP-CZ02-OV-1-028-2015).

To verify the obtained knowledge its understanding, including the broader context, a set of worksheets is available to provide an opportunity for the pupils and students to work independently. The worksheets are created to raise aspects or connections, including intercurricular ones of all, which closely relate to the problem of landscape fragmentation. The topic is well-suitedfor independent work, regardless of whether a gifted individual or a smaller group of pupils is targeted. From the didactic point of view, two specific approaches (with smooth transition in-between) can be defined:

a. Application of selected principles of scientific work: These principles are practised separately or in groups, according to the context and discussed topic. Thus, it is possible to address, for example, data acquisition in one topic and the formulation of a hypothesis in another. The procedure is relatively undemanding and can be easily included in the teaching process, targeting all pupils (see Topics for project-oriented education, topic #1).
b. Independent implementation of the entire research project: In this case, the pupils work separately, and the role of the teacher is based onmethodical supervision. The pupils experience the whole scientific cycle, from topic selection to the final presentation of the results. The procedure is very demanding in terms of the time, material(s), and funds required, with the focus being on talented pupils. (see Topics for project-oriented education, topic #3).

For science subjects, geography and ecology in particular, field teaching is a natural and necessary form ofeducation. Činčera and Holec (2016) analysed a number of studies aimed at research into the effectiveness of field environmental education, concluding that although much of the work illustrates the relatively higher effectiveness of field programs compared to classroom teaching, there are also external barriers (such as time and funding-related issues, the stereotyped school environment, and the teacher's ability to prepare an interesting programme) to its implementation. When implementing individual projects and during field education, it should be remembered that pupils will need to move outside the school building and thus have to be familiar with and adhere to – strictly, where applicable – diverse safety rules. For instance, particular risks are associated with activities near busy roads.



A METODICKÝ LIST – 8 (SŠ)
PRŮCHODY A PROPUSTKY PRO FAUNU

: CÍL

Ukázat žákům možnosti a význam jednotlivých opatření k omezení negativních dopadů fragmentace krajiny dopravní infrastrukturou (dělení krajiny na izolované celky s omezenou možností průchodu pro volně žijící živočichy).

: TEORETICKÁ VÝCHODISKA

Průchody a propustky pro volně žijící živočichy jsou důležité z hlediska zachování celkové průchodnosti krajiny. Jedná se o místní potřeby (např. pro obojživelníky) i potřeby dálkových migračních koridorů (např. pro velké savce).

: ÚKOL 1

Zhodnoť následující čtyři obrázky. Jde o pozitivní nebo negativní ukázku objektů pro snížení fragmentace, tzn. zlepšení prostupnosti krajiny pro živočichy? Zakroužkuj správnou odpověď.

pozitivní/negativní
rozměry i podloží vyhovují

pozitivní/negativní
rozměry i podloží vyhovují

pozitivní/**negativní**
plot zabraňuje migraci

pozitivní/**negativní**
malé rozměry a nevhodné podloží

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: ÚKOL 2

Přiřaď k jednotlivým průchodům na fotografiích vhodné cílové druhy.
K druhu napiš písmena odpovídajících fotografií
(k jednomu objektu jich může být i více):

a)

b)

c)

d)

Správné odpovědi:

liška obecná – a, c, d
los evropský – a
ropucha obecná – b, c
netopýr velký
jezevec lesní – a, c, d
ježek západní – d
jelen lesní – a
vlk obecný – a
čáp bílý
skokan hnědý – b, c
prase divoké – a, d

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Fig. 1: A sample worksheet representing animal passages (a methodical version for teachers, with comments and correct answers).

Source: Dostál et al., 2015

WORKSHEETS

The set of worksheets constituted one of the main outputs of the previously implemented Project "Youth Education for Sustainable Transport" (Dostál et al., 2015). Two sets were prepared, namely, working (for the pupils) and methodical (for teachers, including the goals, theories, and the correct answers for each task) sheets. Each sheet comprises two to three tasks for the selected topic (Tab. 1, Fig. 1).

Tab. 1: Working and methodical sheets for elementary and high schools

Elementary schools	
1	Perception of landscape
2	Biodiversity and habitat requirements of various fauna species
3	Road-kills, traffic safety, measures to reduce animal mortality, and animal injuries; treatment procedures
4	Monitoring measures to protect landscape permeability
High schools	
1	Landscape definition and functionality; ecosystem services
2	Natural and anthropogenic elements in landscape; landscape typology and character
3	Landscape fragmentation, habitat loss, and their interconnection
4	Connectivity protection concepts; theTerritorial System of Ecological Stability; European green infrastructure
5	Polygonal anthropogenic barriers (settlement, agriculture);natural barriers (watercourses, unsuitable biotopes)
6	Linear anthropogenic barriers (transport), accumulation of barriers, and overall landscape permeability
7	Spreading of invasive species; management of green areas; linear greenery in the vicinity of roads
8	Animal passages andculverts for aquatic and semiaquatic species
9	Secondary environmental effects of transport; history of anthropogenic barriers; preservation of landscape character
10	Strategic level – Strategic Environmental Assessment (SEA), spatial planning; mapping of barriers, migratory studies
11	Project level – Environmental impact assessment (EIA) of individual projects, designing measures to protect landscape permeability

TOPICS FOR PROJECT-ORIENTED EDUCATION

Topic 1: Barriers in the landscape

A topic is to suit smaller groups (ideally 3 pupils/group). The aim is to preparea map output of selected parts of landscape, showing favourable elements for individual categories of species. The pupils should also monitor existing barriers that restrain their free movement through given landscape. During the processing, the participants will learn to distinguish between individual elements in the landscape, their origins, and fitting into an overall frame. Thepupilswill improve in working with topographic maps (or aerial images) and comparing the map content with reality. The output of each group's activity is mainly a map with barriers; in addition, a simple presentation in PowerPoint should be prepared.

Topic 2: Developing a city (municipality)

The second proposed topic lies within the border area between geography and history, and it is also intended for application in smaller groups. The project is focused on the

long-term development of the landscape, with special attention to build-up aselected location by analysing available historical documents. The aim will be to process the historical topographic maps and, where appropriate, aerial images and to compare the development of the built-up area of the municipality in different periods. The output of the entire effort will be a set of maps showing the extent and consequences of urbanization in each period, and an analytic map, colour-coded to indicate the gradual growth of the build-up areas. Similarly, the development of road and rail networks can be processed.

Topic 3: Monitoring of the permeability of passage(s) on selected road/ railway

A topic is suitable for talented students with an advanced interest in sciences, focusing on ecology, geography, and biology. It is not convenient for an entire group of students. The nature of project is monitoring a selected section of a road (or a major railway line) from the perspective of wildlife permeability. The task should include longer-term monitoring of the selected passage in the road by using phototraps, sand bed, and, when weather permits, also snow tracking. Analyses of the results will include evaluation of the images from the phototraps and implementation of the statistics related to the use of the passage by different species of animals. Further, the temporal distribution in relation to the time of the day with regard to the sunset and sunrise may be added. The occurrence of different fauna species can be compared with the "nDOPdatabase"[2] managed byNature Conservation Agency of the Czech Republic.

CASE STUDY – A FIELD EXCURSION FOR STUDENTS TO THE MORAVIAN GATE

A field excursion to a suitably pre-selected area has the potential to illustrate landscape phenomena and relationships that are extremely important for the topic of fragmentation, assuming the right choice of sites and complementary explanations. One of such regions the western part of the Moravian Gate in the vicinity of Lipník nad Bečvou and Hranice, on the migratory route between Jeseníky Mts. and Beskydy Mts. (Jedlička et al., 2019). This area is particularly significant in view of the dispersion migration of individuals living within the core of Beskydy Mts. The Beskydy Mountains is the only territory in the Czech Republic included in the Natura 2000 system with priority protection of all three species of large carnivores. In the Moravian Gate, however, the permeability of the landscape is very limited, because the favourable terrain attracted routes both road and rail, and the spatial development plans include the "Danube-Odra-Labe Canal" and a high-speed railway (Ministry of Transport, 2017).

2 https://portal.nature.cz/nd/

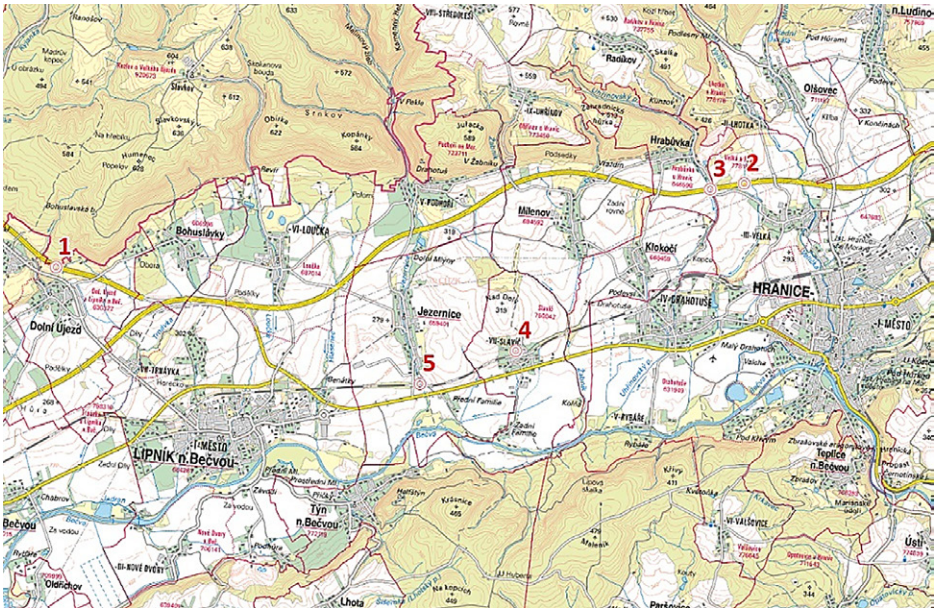

Fig. 2: A survey map of the fieldtrip sites (1 – green bridgeat Dolní Újezd; 2 – landscape bridge near Velká; 3 – bridge Hrabůvka; 4 – the Slavíč tunnel; 5 – viaducts of Jezernice). Background: Base map of the Czech Republic 1 : 50 000

In such a varied and exposed area, a relatively small area has a large number of objects on which various aspects of the subject matter can be illustrated. The following selection (Fig. 2) shows some of the selected sites together with illustrative photographs from practically realized excursions in 2015 with students of the I. German Provincial Gymnasium in Brno and in 2019 with foreign experts from the Enverosinternational project (programme Erasmus+).

Fig. 3: An ecoduct on the D35 expressway, north of Dolní Újezd.

Photo: I. Dostál.

1. The Dolní Újezd green bridge (Fig. 3): the Czech Republic's oldest green bridge was completed in 1999 as a part of the R35 expressway.
2. The landscape bridge near Velká: The bridging of valley formed by the Splavnáwaterstreamis locatedat motorway D1, km 306.8, section Lipník and Bečvou-Bělotín (commissioned in 2008).

Fig. 4: Students near object nr. 2.

Photo: I. Dostál

Fig. 5: Abandoned tunnel in Slavíč.

Photo: I. Dostál

3. The bridge with an aqueduct near Hrabůvka: on the southern outskirts of the Hrabůvka village, a cut-and-cover bridge was built at km 306.1; the structure is used by road III/44023, a gas pipeline, and the Uhřínovskýstream. Functionally, the bridge is associated with the aqueduct, its main role being to transfer locally significant road traffic to minimise disruption of the water regime near the large cut of the highway.
4. The abandoned tunnel in Slavíč village (Fig. 5): Remnants of the original route of the Emperor Ferdinand North Railway (KFNB) from the years 1845–46. Commissioned in 1847, served its purpose until 1895, when a new route was completed only several dozen meters to the south.
5. The viaducts of Jezernice (Fig. 6a, 6b): A technical monument well integrated into the surrounding landscape. A pair of parallel viaducts bridging the broad valley of the Jezernice stream using 42 vaults with a luminosity of 5.7 and 7.6 meters and having a total length of more than 400 meters; the individual components of the structure were completed in 1842 and 1873.

Fig. 6a a 6b: Students near the viaducts of Jezernice.

Photo: I. Dostál

CONCLUSION

Education for sustainable transport, where one of the major components is also landscape fragmentation, is intended to inspire pupils/students to be interested in events that accompany them throughout their lives. Above all, in the upcoming years, the present young generation will already have to deal intensively with transport sustainability from the perspective of fragmentation, generally because if the problem begins to be disentangled only when the population has started to vanish, it will obviously be too late for a successful solution.

It is therefore necessary to raise overall awareness of the issue and to incorporate the topics of landscape fragmentation and wildlife permeability in elementary and high school education. With increasing pressure on landscape, which is becoming evident through the constant expansion of built-up areas and the development of transport infrastructure, the problems will remain critical. The topics are merged with other curricular elements of some basic subjects, prominently including natural history, biology/ecology, and geography; however, links to other subjects can be foundas well. Despite the advantages, the integration of teaching methods other than the frontal approach into the educational process also involves certain risks, especially during outdoor education in close vicinity of transport communications. In addition to safety issues, the conservative management attitudes adopted by some schools, inadequate methodological training of teachers, and, importantly, time and financial difficulties embody significant obstacles to successful implementation. Specific topics for individual teaching approaches are useful especially in the form of methodological and working sheets, and thematically oriented field excursions are also very desirable.

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Shrnutí

Rostoucí míra fragmentace krajiny a snižování průchodnosti pro volně žijící živočichy patří k nejvýznamnějším negativním vlivům lidské činnosti. V rámci vzdělávání patří toto téma k těm náročnějším, svou obtížností odpovídající spíše úrovni střední školy. Má spoustu mezioborových vazeb a celý proces nelze dostatečně pochopit bez širokého spektra znalostí. Téma se prolíná do vice základních vyučovacích předmětů, zejména přírodopisu, biologie/ekologie a zeměpisu, ale lze hledat i vazby na další předměty.

Článek rozebírá jednotlivé didaktické metody vhodné pro prezentaci tématu žactvu, možnosti integrace do výuky jednotlivých předmětů a zdůrazněna jsou také rizika, která při jednotlivých formách výuky na pedagoga či studenta mohou číhat. Zároveň poskytuje odkazy na jednotlivé informační a metodické opory, které umožní pedagogovi načerpat dostatek informací k tématu a uvědomit si všechny vazby ke zvládnutí výuky. Druhá část příspěvku pak představuje možná témata jako konkrétní náměty pro jednotlivé formy výuky, zejména s ohledem na pracovní listy, projektové vyučování a navíc případovou studii realizace tematicky zaměřené terénní exkurze do jedné z oblastí ČR, která má zásadní význam jako migrační koridor.

MAPPING OF URBAN GEOHERITAGE IN CITY OF LIBEREC USING PARTICIPATORY RESEARCH

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Abstract: Urban geoheritage is a phenomenon that is present in almost every city, but so far, only some cities use it as a tourist product. In May and June 2019, in order to create an urban geoheritage trail in Liberec, it was mapped in the wider city centre. Considering the vastness of the area, mapping was carried out by volunteers who were interested in the topic of popularization of geology but did not have the expertise of geological knowledge. This lack of expertise may seem to be a significant limiting factor, but in fact, it is a positive thing, as the knowledge of the mapping volunteer is at a similar (low) level to the future user of the educational trail. Thus, in the evaluation of geosites, the expert-layman barrier is eliminated and the benefit is the feedback of the future user. However, participatory research has its own specifics, which must be adapted to the methodology used. First, it is to ensure the homogeneity of the data that is collected by a large number of volunteers and which can be influenced by subjective influences. Furthermore, it is their professional value and practical application. Finally, yet importantly, the technical parameters of data that will be further processed in GIS. This paper describes the research methodology used and summarizes the experience with the use of participatory research for the purpose of mapping urban geoheritage in Liberec.

Key words: urban geotourism, educational trail, geoheritage, participatory research, GIS, geosites

INTRODUCTION

In recent years, more attention has been paid not only to the protection of biodiversity but also to the protection of geodiversity. While geopark networks are expanding gracefully, geoheritage in urban areas has remained rather in the background. Given the richness of natural habitats in cities, the number of interesting buildings on which various rocks were used, and the many works of art that take advantage of the beauty of rocks, it was only a matter of time when urban geoheritage began to receive appropriate attention. At present, many studies present various examples of the use of urban heritage for tourism and education purposes (e.g. in Mexico City: Palacio-Prieto, 2015; Shiraz, Iran: Habibi et al., 2018; Belgrade, Serbia: Petrovic et al., 2017; Ljubljana, Slovenia: Ticar et al., 2017; Brno, Czechia: Kubalíková, Kirchner, & Bajer, 2017; Liberec, Czechia: Drápela, & Büchner, 2019). Urban geoheritage is also research subject of many theoretical studies that note the differences in the conservation and presentation of geoheritage in the open countryside and in the city (Reynard, Pica, Coratza, 2017; De Wever et al. 2017; Gorska-Zabielska, & Zabielski, 2017; Kubalíková et al., 2019; Pica et al., 2017).

With increasing interest in geoheritage, its recognition as a tourist product has also grown, especially when it is located in attractive areas like parks and gardens (Portal & Kerguillec, 2018). Due to the specifics of urban space, there is often no place for classic educational boards, so geological trails through cities often use modern technologies, especially smartphones (Pica et al., 2018; Reynard et al., 2015). An interactive nature trail with the use of smartphones was planned in the city of Liberec (Czechia), but first, it was necessary to map geosites in the area of the wider centre, where tourists are usually present. For this purpose, participatory research was conducted in which volunteers be involved. The main idea of participatory research was that the mapping should be carried out by people who are not experts in geology but who are interested in it and are mindful of the environment. They are both researchers, but also future users of the educational trail, as it will be designed for the same target group (people interested in knowledge-based tourism).

DATA AND METHODS

Data collection was conducted using community-based participatory research. This method assumes specific work with people using their strengths and weaknesses, with the main strength being the amount of information that volunteers are able to gather in a short time (see O'Fallon & Dearry, 2002; Pain & Francis, 2003; Pain, 2004; Israel et al., 2005). Data were collected for this study in May and June 2019; during this time, the volunteers were able to collect more than 350 different records from an area of about 13 km^2. However, the collection of data through participatory research also brought pitfalls that had to be solved in order for the data to be reliable and usable for further processing.

First of all, although the aim of the work was a mapping, the online input of information into the GIS was not used universally. Although this workflow model is ideal, unfortunately not all volunteers were able to use GIS or were able to learn it. Another problem

was that not all volunteers have smartphones and mobile data. For this reason, for some volunteers, paper maps of the territory were printed where they recorded the geosites they discovered.

Volunteers recorded the following data: geosite code, geosite name, type of object (building or part thereof, natural geosite or quarry, work of art), GPS coordinates, type of rock, geosite description, geosite accessibility, subjective evaluation of the geosite on a 1–5 scale, photo of the geosite and other notes (like history of object, author etc.). Two variables deserve a closer comment: type of rock and subjective evaluation of the geosite on a 1–5 scale.

The type of rock volunteers determined only approximately. At the introductory training, they were explained how to identify igneous rocks from sedimentary and metamorphic rocks, they were shown the most common rocks from the surroundings and they were given identification keys. As it turned out later, this procedure was absolutely sufficient, as the error rate of rock determination was almost zero. The exact determination of the rock must then be carried out by an expert geologist, as it is not in the power of laymen.

A potentially problematic indicator was the subjective evaluation of the geosite when it was necessary to unify the evaluation into a generally applicable scale. This scale is shown in Tab. 1.

Tab. 1: Scale for indicator "subjective evaluation of the geosite"

1	Geosite is one of the main attractions of Liberec, it is worth travelling across the city
2	Geosite is very attractive, it's worth seeing if you're nearby
3	Geosite is moderately attractive, it's worth seeing if you're nearby
4	Geosite is moderately attractive, it's worth seeing if you're interested in geology
5	Geosite isn't very attractive, but it's worth seeing if you're interested in geology

Source: Own processing

Although this scale is fairly clearly defined, there were significant differences between some volunteers. It was necessary to record these differences and subsequently revalidate the attraction in the field. On the other hand, these were mostly exceptions, and most volunteers assessed consistently.

The obtained data were subsequently cleared: multiplicities, different designations for the same things and less attractive sites of the same species (e.g. different boulders in parks, curbs, etc.) were discarded. The final set contains 147 geosites.

RESULTS AND DISCUSSION

The following section describes the most interesting results from the participative research described above. As mentioned, the aim of the research was to map geosites for the purpose of building a virtual educational trail with the theme of geology around the city of Liberec. It was, therefore, necessary to find such geosites, which would be suffi-

ciently representative in terms of expertise and at the same time aesthetically valuable, should include both natural sites and the use of stone by man. The type of object was the first thing we focused on – results are in Fig. 1.

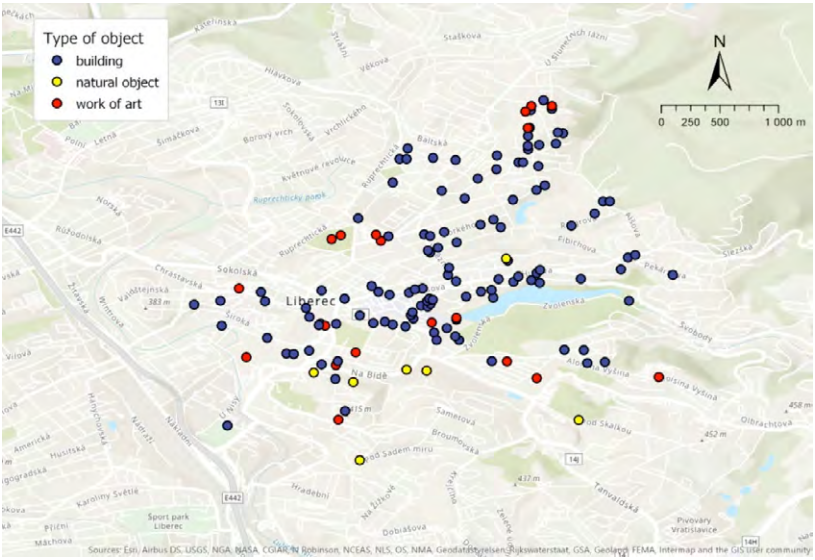

Fig. 1: Urban geoheritage in the wider centre of Liberec – type of objects

Source: Own processing, background map by Esri

As can be seen from Fig. 1, most geosites (80%) are represented by buildings, followed by works of art (14%) and natural objects (6%). Fortunately, less identified categories contain sufficiently interesting objects, which are also located at an acceptable distance from the centre. The planned trail can thus use all types of geosites.

Fig. 2 shows a subjective assessment of geosites. As you can see, the most interesting objects are relatively evenly distributed in the area of interest, while some parts of the area (e.g. around the Harcov water reservoir) contain a number of moderately interesting sites, which also hides the tourist potential. The most interesting geosites were generally considered the most beautiful city buildings and sculptures, only exceptionally natural objects. This is due to the fact that there are a number of even more attractive geosites around the city with which those in the city cannot compare.

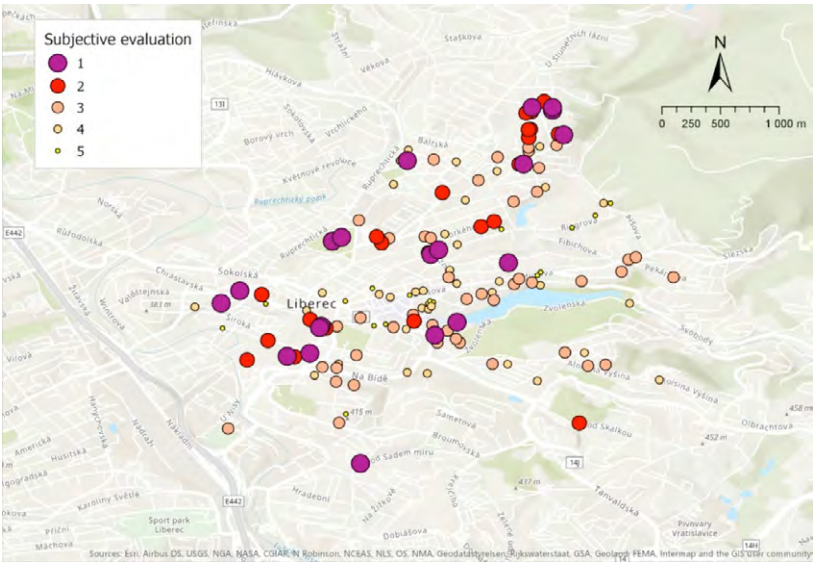

Fig. 2: Urban geoheritage in the wider centre of Liberec – subjective evaluation of objects by participants (legend: see Tab. 1)

Source: Own processing, background map by Esri

An important factor in terms of the planned educational trail is the sufficient diversity of rocks. The situation here is similar to that of the type of object – granite (63%) predominates, followed by sandstone (23%) – see Fig. 3. Other rocks are represented only in units of cases. This is due to the availability of rocks in the area when by far the most popular building material was the local Liberec granite, and decorative elements of the buildings were usually made of sandstone from quarries south of the Ještěd ridge. Basalt was usually used as paving because it is durable but hardly workable. Limestones and marbles are not very common in the area, so although these are generally popular rocks, we do not find much in Liberec. Various metamorphic rocks were used in rare cases as building cladding, roofing material, etc.

It may be interesting to note that while up to World War II the Liberec granite was clearly the dominant material in buildings, after World War II the new brick and concrete structures complement almost exclusively sandstone. This phenomenon can be seen in Fig. 3 in the south-eastern part of study area, where the housing from the 1950s and 1960s is located. Even on this phenomenon can be seen how the newly arrived population did not have such a strong relationship with the region and instead of the local "geological gold" preferred uniform construction product.

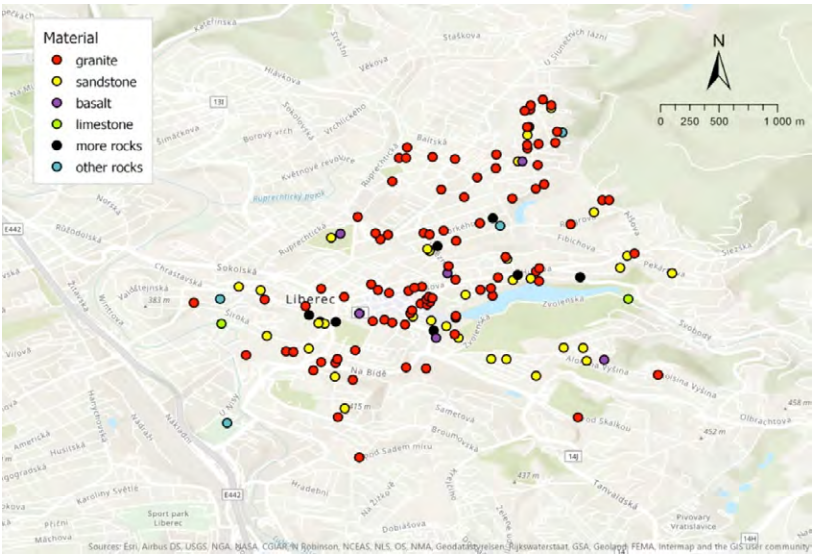

Fig. 3: Urban geoheritage in the wider centre of Liberec – rock used

Source: Own processing, background map by Esri

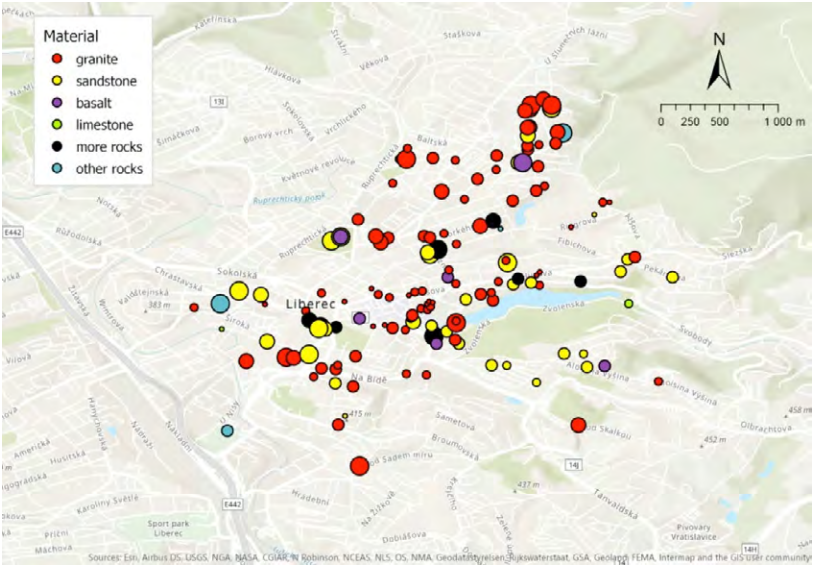

Fig. 4: Urban geoheritage in the wider centre of Liberec – combination of rock used and subjective evaluation of objects by participants (diameters: see Tab. 1 and Fig. 2)

Source: Own processing, background map by Esri

The last map (Fig. 4) shows the combination of rock used and subjective evaluation of objects by participants. The map shows that many granite objects are not as attractive as sandstone or limestone ones. This is because granite cannot be treated as easily as sandstone or limestone, so most decorative elements that the public perceives as aesthetically valuable are made of these rocks. On the other hand, each type of rock has its own geosite, which is highly valued, which is good in terms of creating an educational trail.

CONCLUSION

The presented participatory research is the first stage of more extensive research on the use of urban geoheritage for tourism purposes. This is the first result, which will be followed by the stage of realization of the geological virtual educational trail. The use of this trail will then be monitored and evaluated, which should form a set of recommendations for the implementation of similar activities.

Our experience with participatory research can be assessed as positive. Although there were some hitches during data processing (inability to use GIS for all volunteers, variations in subjective evaluation, etc.), the overall involvement of volunteers saved time for key researchers. It was positively influenced by the fact that this was not the first experience with participatory research for the research team: in 2015–2018 it was used for mapping the springs in the cities of Liberec and Jablonec (Zágoršek et al., 2018), then in 2017–2018 when counting traffic on selected road sections along the border of the Liberec Region (Drápela & Bašta, 2018; Drápela & Kárníková, 2018). This experience has enabled us to plan the research very effectively, prevent misunderstandings and create a geodatabase in advance that has been gradually filled. The city of Liberec has proved to be an area in which a large number of valuable geosites are located. In the coming months, we would like to introduce this high geodiversity to the public in the form of an interesting, fun and interactive educational trail.

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Shrnutí

Urbánní geodědictví je fenomén, který je přítomný prakticky v každém městě, avšak doposud jen některá města jej využívají jako turistického produktu. Za účelem tvorby naučné stezky po urbánním geodědictví ve městě Liberci bylo provedeno v květnu a červnu 2019 jeho mapování v širším centru města. Vzhledem k rozsáhlosti území mapování prováděli dobrovolníci, které téma popularizace geologie zaujalo, avšak neměli odborné geologické znalosti. Tato neznalost se může zdát jako významný limitující faktor, ve skutečnosti však jde o pozitivum, neboť znalosti mapujícího dobrovolníka jsou na podobné úrovni jako budoucího uživatele naučné stezky. Při evaluaci geostanovišť tak odpadá bariéra odborník-laik a přidanou hodnotou je zpětná vazba budoucího uživatele. Participativní výzkum však má svá specifika, kterým je nutno přizpůsobit použitou metodologii. Jednak to je zajištění homogenity dat, která sbírá velký počet dobrovolníků a která mohou být ovlivněna subjektivními vlivy. Dále je to jejich odborná hodnota a využitelnost v praxi. A v neposlední řadě jde o technické parametry dat, která dále budou zpracována v GIS. Tento článek popisuje použitou metodologii výzkumu a shrnuje zkušenosti s využitím participativního výzkumu pro účely mapování urbánního geodědictví v Liberci.

REGIONAL AND GEOGRAPHIC FEATURES OF PRO-POOR GROWTH IN AFRICA

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Abstract: The paper focuses on regional and geographic features of pro-poor growth in African countries. The concept of pro-poor growth interconnects and examines mutual relationships between income growth, income poverty and income inequality. Using the World Bank's income data, we calculate and interpret indicators of pro-poor growth for individual African countries. Then we analyze the results in terms of African regionalization and we investigate possible associations between pro-poor growth categories and selected geographic factors such as location, population size or population density. We show that higher pro-poorness of growth is typical for countries of Northern and Western Africa. The results also indicate that some of the geographic factors are significantly associated with pro-poor growth across African countries.

Key words: pro-poor growth, poverty, Africa, geography and growth

INTRODUCTION

Economic growth is one possibility for the poor people in developing countries to escape poverty. However, growth is often unequally distributed across households or individuals in societies. From this reason, the average growth rates presented in statistical databases do not usually tell the whole story. We should pay more attention to how much or whether the poor people benefit from growth (Kakwani & Pernia, 2000). This is exactly what the concept of pro-poor growth does. It helps researchers to evaluate the impacts of growth on different parts of a society, or in other words, to examine how growth affects poverty and inequality (Lopez, 2004).

This paper is focused on pro-poor growth in Africa and its main objective is to find out whether the pro-poorness of growth is to any extent associated with geographic factors such as location, population size, population density and others. To achieve that, we start with the definition of pro-poor growth, its measurements and interpretations. Then we describe the geographic variables we work with. Subsequently, we conduct the analysis of associations between pro-poor growth and geographic variables and we present the results, findings and conclusions.

PRO-POOR GROWTH: DEFINITIONS, MEASUREMENTS

Pro-poor growth is defined as economic growth that benefits the poor population of a country. According to the *weak absolute approach*, growth is pro-poor if incomes of the poor grow. Since increasing incomes of the poor always lead to poverty reduction, this approach is also called poverty reducing growth. However, if incomes of the poor grow less than incomes of the non-poor, inequality rises. The *relative approach* focuses on the (relative) inequality between the poor and the non-poor. For growth to be pro-poor, it requires that incomes of the poor grow relatively more or decline relatively less than incomes of the non-poor, i.e. that the inequality falls. Note however, that in the latter scenario the poor become absolutely poorer (i.e. poverty increases) because their incomes decrease, which is not plausible under the weak absolute approach. Therefore, a stricter version of the relative approach requires both (relative) inequality and poverty to decrease. The *strong absolute approach* to pro-poor growth is the strictest since it requires that incomes of the poor increase more in *absolute terms* than incomes of the non-poor, i.e. that the differences in incomes (absolute inequality) fall. However, this rarely happens with incomes and therefore, the last definition is used more frequently with other than income dimensions of pro-poor growth (the approaches are discussed more for example in Klasen, 2004 or in Lopez, 2004).

Based on the changes of incomes, poverty and inequality, it is possible to distinguish six categories of (pro-poor) growth to more accurately classify and interpret the three fundamental approaches. Moreover, these six categories can be ranked according to the benefits they bring to the poor population, thereby creating an ordinal variable, which can be used in more detailed analyses of pro-poor growth. The following combinations of changes in incomes, poverty and inequality can occur:

1. While incomes of the poor grow, the mean income of an economy declines. Both poverty and (absolute) inequality decrease, which corresponds to the strong absolute approach. This category is called *strong pro-poor growth*.
2. Incomes of the poor grow relatively faster than the mean income. Both poverty and (relative) inequality decrease, which corresponds to the relative approach. We denote this category as *relative pro-poor growth*.
3. Incomes of the poor grow, but less than the mean income. This leads to poverty reduction, while inequality increases. This is the *trickle-down growth* that corresponds to the weak absolute approach.
4. Incomes of the poor decrease, but less than the mean income. While poverty increases, inequality declines. This category is called *pro-poor decline*, because the relative situation of the poor improves (even though they are poorer in absolute terms).
5. Incomes of the poor decrease more than the mean income. Both poverty and relative inequality increase. We denote this situation as *anti-poor decline*.
6. Incomes of the poor decrease, while the mean income increases. Therefore, the (absolute) inequality increases and so does the poverty rate. This is called *immiserizing growth*.

Because the six categories are ordinal, it holds that while only the first category meets the requirements of the strong absolute approach, both categories 1 and 2 satisfy the stricter version of the relative approach (the softer version is satisfied also by the fourth category). Similarly, all three categories 1, 2 and 3 meet the requirements of the weak absolute approach. On the other hand, categories 4, 5 and 6 are anti-poor in substance as they always imply increase in poverty.

The classification and interpretation derived above is applicable to all indicators of pro-poor growth, which are used to operationalize and measure the concept. There are at least six indicators that have been frequently used in pro-poor growth literature: (i) pro-poor growth index (Kakwani & Pernia, 2000), (ii) poverty equivalent growth rate (Kakwani & Son, 2008), (iii) poverty growth curve (Son, 2004), (iv) average growth rate of incomes of the poor (Kraay, 2006), (v) growth incidence curve (Ravallion & Chen, 2003), and (vi) rate of pro-poor growth (Ravallion & Chen, 2003). These indicators are discussed and compared in detail in Harmáček et al. (2017) or in Deutsch and Silber (2011).

In this paper, we work only with the poverty equivalent growth rate (PEGR). This indicator is derived from the multiplication of the mean income in an economy and the pro-poor growth index, which is computed as a ratio of the total elasticity of poverty and the growth elasticity of poverty. The total elasticity of poverty (with respect to growth) is interpreted as the percentage change of poverty when the mean income changes by one percent. The growth elasticity of poverty is defined as the proportional change in poverty when the mean income changes by one percent while inequality remains constant. Both elasticities and therefore also the pro-poor growth index as well as the PEGR can be calculated from the distributional data on income.

PEGR is interpreted as the rate of growth that has the same effect on poverty as the actual growth rate, provided that the growth process had not been accompanied by any change in inequality (Kakwani & Son, 2008). In other words, it is the rate of growth if everyone in the society had received the same proportional benefits of growth. PEGR addresses both the magnitude of growth and the benefits of growth for the poor population. It also satisfies the basic monotonicity condition: the proportional reduction in poverty is a monotonically increasing function of PEGR. It means that the larger is the PEGR, the greater is the reduction in poverty, i.e. maximization of PEGR implies a maximum reduction in poverty (Kakwani & Son, 2003). PEGR can take any value and its interpretation depends on its comparison with the growth rate of the mean income (g) and with the value of zero (see the second column of Table 1 below).

To calculate the PEGR for an individual country, we start with data on aggregate income distribution. Such data are available in the World Bank's PovcalNet database (World Bank, 2018a). Using a specialized statistical software (Araar & Duclos, 2007), we first disaggregate the data to a households' level and then we multiply the disaggregated data by the corresponding mean income. Thus, we estimate the actual income distribution for one particular country in one particular point in time (year). To calculate PEGR for a country, we need to know the income distribution for at least two different points in time (years). Then we can estimate the PEGR using our software (this procedure is described in a more detail in Harmáček et al., 2016).

The time-period between the two years is called a growth spell (for example Kraay, 2006). Here we construct the long growth spells meaning that we take only the first year and the last year with available data for an individual country.[3] This also limits our sample to African countries with at least two available data points in the PovalNet database. Such a condition is satisfied for 47 out 54 African countries: data are entirely missing for Equatorial Guinea, Eritrea, Libya and Somalia; only one data point is available for Sudan, South Sudan and Zimbabwe.

Table 1 summarizes the possible interpretations of PEGR as well as the results for African countries. Out of the 47 growth spells (countries), only two are not statistically significant. This means that the 95% confidence interval of the PEGR-estimate and the 95% confidence interval of the g-estimate overlap. Therefore, it is not possible to decide the growth category for such spells. The results further indicate that most of the spells belong to the relative pro-poor growth category, closely followed by the trickle-down growth. Eleven spells are denoted as anti-poor because poverty increases (consisting of categories of pro-poor decline, anti-poor decline and immiserizing growth). From the perspective of the weak absolute approach, 34 spells are evaluated as pro-poor because

3 It is obvious that the span of the growth spells varies a lot. While the largest span is 25 years (for Egypt 1990-2015), the shortest ones are 6 years (e.g. Cape Verde 2001–2007). While the length of the growth spells could matter in general, it is not a substantial issue in our paper because most of the geographic variables do not change much over time, and moreover, we are only interested in the simple bilateral associations.

poverty decreases. These correspond to the strong pro-poor growth, relative pro-poor growth and trickle-down growth categories. Finally, the stricter version of the relative approach is observed in 19 spells, for which both poverty and inequality decline (the strong pro-poor growth and relative pro-poor growth categories).

Tab. 1: Interpretations and results of PEGR

Ordinal categories of (pro-poor) growth	Interpretation	Counts (%)
1. Strong pro-poor growth	PEGR > 0 > g	1 (02.13%)
2. Relative pro-poor growth	PEGR > g > 0	18 (38.30%)
3. Trickle-down growth	g > PEGR > 0	15 (31.91%)
4. Pro-poor decline	0 > PEGR > g	5 (10.64%)
5. Anti-poor decline	0 > g > PEGR	1 (02.13%)
6. Immiserizing growth	g > 0 > PEGR	5 (10.64%)
Results not significant		2 (04.26%)
Total		47 (100.0%)
Weak absolute interpretation (categories 1+2+3): 34 (72.34%)		
Strict relative interpretation (categories 1+2): 19 (40.43%)		

Source: Authors. Note: The calculations of PEGR have been performed for the poverty headcount (incidence of poverty) as the relevant poverty measure.

The three interpretations above also define our 'dependent' variables that we use in our analysis of associations with geographic features. For the weak absolute and the (strict) relative pro-poor growth across African countries, we create binary variables that are equal to one in cases of pro-poor growth. For the ordinal interpretation we create an ordinal variable consisting of six categories. This variable is also used in Figure 1 that illustrates how African countries fared over their long growth spells in terms of pro-poor growth.

AFRICAN REGIONS AND GEOGRAPHY VARIABLES

The World Bank (2018b) divides Africa into only two parts: the Sub-Saharan part contains 48 countries (including Sudan or Mauritania), while the five North African countries plus Djibouti are included into the MENA (Middle East and North Africa) region. A more common approach divides Africa into five sub-regions: Southern, Central, Eastern, Western and Northern Africa. However, the definitions of these regions differ substantially as well. According to African Development Bank (2018), Southern Africa is an extensive region that embraces also Angola and São Tomé and Príncipe. Conversely, the UN approach (UN, 2019) defines Eastern Africa as a large area that spreads from Sudan to Zambia, Zimbabwe and Mozambique, thereby making Southern Africa region much smaller. Moreover, besides the competing definitions, there are regional integration groupings in Africa that further obfuscate the delineation of regions. To solve this confusion and to be

able to project the pro-poor growth results into African regions, we have decided to work with the UN approach to regionalization of Africa (see Figure 1).[4]

The issue of geography and its influence on economic growth and development has been present in development economics (and development studies) for a long time (Sachs, 2003; Naudé, 2007). Therefore, it is interesting to look at the possible associations between some selected geographic features and pro-poor growth across African countries. We examine whether the following variables have some effect on pro-poor growth in Africa: (i) total land area (km^2), (ii) population size, (iii) population density (pop/km^2), (iv) country is landlocked (excluding islands), (v) country is an island or belongs to a group of the Small Island Developing States (SIDS), (vi) the closest air distance to a major port (km), (vii) proportion of land within 100 km from coast (%), (viii) proportion of population within 100 km from coast (%), (ix) proportion of land in geographical tropics (%), (x) proportion of population in geographical tropics (%). While data for the first three variables (i-iii) have been obtained from the World Bank (2018c), data for the last five variables (vi-x) are from Gallup et al. (2001).

GEOGRAPHY AND PRO-POOR GROWTH IN AFRICA

Figure 1 illustrates the distribution of pro-poor growth across African countries (for the long spells). We have emphasized the borders of different regions according to the UN approach discussed above. Shades of green are used for the weak absolute pro-poor growth, while shades of red are used for the anti-poor growth. It can be seen from the figure that higher pro-poorness of growth is concentrated in Northern and Western Africa. For example in the Western Africa region, 11 out of 16 spells are strict relative pro-poor growth and two more are trickle-down growth. Only in Benin and Guinea-Bissau the growth is immiserizing. In Northern Africa, 3 out of 5 spells are strict relative pro-poor growth and one more is trickle-down (there are no data for Libya). In Central and Southern Africa, the trickle-down growth prevails. The worst results have been observed for Eastern Africa, for which also the highest proportion of observations is missing.

4 According to UN approach, there are 5 countries in Northern Africa, 16 in Western Africa, 9 in Central Africa, 19 in Eastern Africa and 5 in Southern Africa.

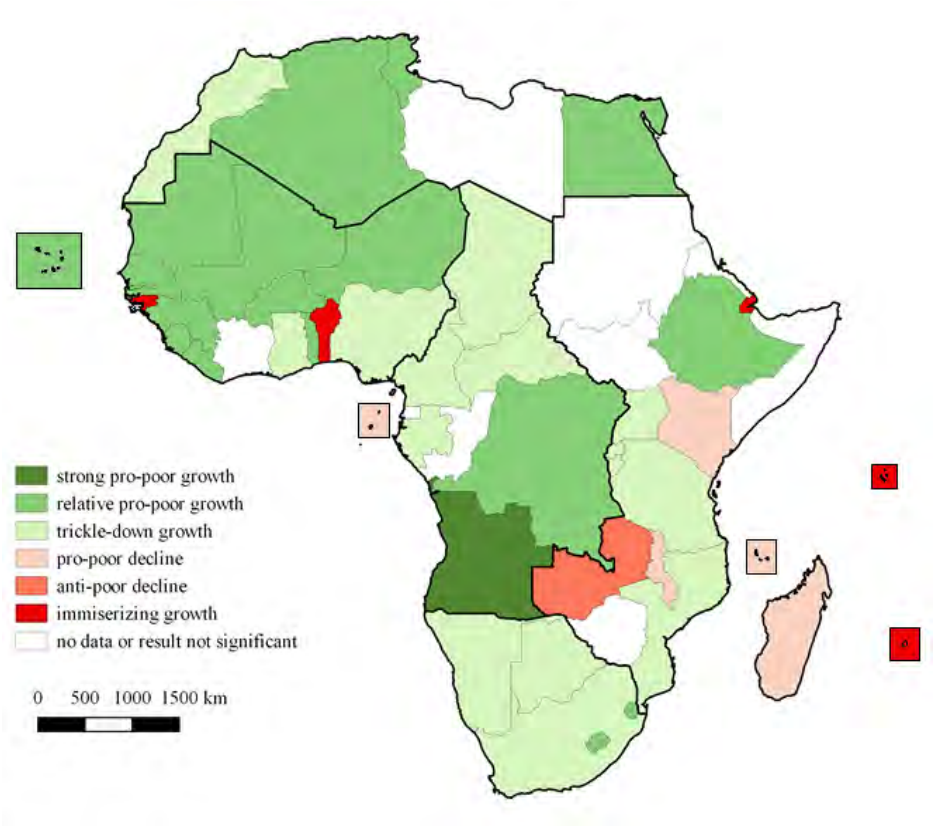

Fig. 1: Pro-poor growth in African countries and regions

Source: Authors.

To investigate the associations between pro-poor growth and selected geographic features, we work separately with three pro-poor growth variables. For the weak absolute and the (strict) relative pro-poor growth we use the binary variables defined above. They act as our 'dependent' variables in the simple logit regression framework, which we employ to examine the associations with geographic features. The six categories of (pro-poor) growth are used as our ordinal 'dependent' variable in the last set of regressions, which we perform under the (simple) ordinal logit models. The word simple refers to the fact that there is always only one 'independent' variable in each model. In all these simple regressions we are interested only in the significance of the bilateral associations between the pro-poor growth variables and the geographic variables. The results are presented in Table 2.

Tab. 2: Associations between pro-poor growth and geography in Africa

PPG Variables ⟶ Geographic variables ⟶	Number of obs.	Weak absolute PPG	Strict relative PPG	PPG: six ordinal categories
land area	45	2.24**	1.50#	-2.60***
population	45	1.48#	0.22	-0.91
population density	45	-2.01**	-2.07**	3.41***
country is landlocked (excl. island countries)	38	-0.15	-0.42	0.45
country is an island (or belongs to SIDS)	45	-3.08***	-1.48#	2.95***
closest air distance to a major port	39	-2.03**	-2.14**	2.41**
% of land within 100 km from the coast	45	-2.93***	-1.08	2.48**
% of population within 100 km from the coast	45	-2.32**	-0.24	1.57#
% land in geographical tropics	45	-1.53#	-1.39	1.94*
% of population in geographical tropics	39	0.13	-0.64	0.21

Source: Authors.

*Notes: Since we are interested only in statistical significances of associations, only values of the z-tests for logit and ordinal logit regression coefficients are presented. The following signs are used to indicate statistical significance (***) at the 1% level, (**) at the 5% level, (*) at the 10% level and (#) at the 15% level.*

Firstly, it is apparent that there are significant associations between pro-poor growth and some geographic attributes, which presumably correlate less with the strict relative pro-poor growth. However, this could be a consequence of the fact that there are less relative pro-poor growth spells when compared to the weak absolute approach. Secondly, in all but one case, the geographic factors maintain the same direction of the relationships across the regressions. The seeming contradiction of the ordinal regression is just artificial. It is the consequence of the lowest number (1) being assigned to the best category (strong pro-poor growth) and vice versa. Thirdly, we did not have complete data for some geographic variables (the closest air distance to a major port and the proportion of population in the geographical tropics), and therefore some observation could not enter our regressions.

The results indicate that a higher probability of achieving pro-poor growth and reaching a higher pro-poor growth category (in terms of benefits for the poor) is associated with a larger land area, lower population density, lower distance to a major port, lower proportion of land and population within 100 km from coast, lower proportion of land in the geographic tropics and with being a non-insular country. Surprisingly, being a landlocked

country and also the proportion of population in the geographical tropics are never significant. While most of the associations follow theoretical expectations, a more thorough analysis should be performed, in which also socio-economic and other factors are controlled in a more elaborate multiple regression framework.

CONCLUSIONS

In this paper, we have focused on the concept of pro-poor growth and its regional and geographic features in Africa. We have presented three possible universal interpretations of pro-poor growth and illustrated their use on the poverty equivalent growth rate (PEGR). We have shown that in terms of African regions a higher pro-poorness of growth is concentrated in Northern and Western Africa. We have also examined associations of pro-poor growth with selected geographic variables and found out that a larger land area, lower population density, lower distance to a major port, lower proportions of land and population within 100 km from coast, lower proportion of land in the geographic tropics and being a non-insular country are associated with pro-poor growth.

While these results are certainly informative, a more elaborate framework needs to be applied to test the possible associations of pro-poor growth properly. Firstly, more variables that approximate not only geographic factors, but especially socio-economic, institutional (Rodrik & Subramanian, 2003) development aid allocation (Opršal et al., 2017) or even environmental aid allocation factors need to be employed.[5] Secondly, a more advanced multiple regression framework must be used to properly examine the causality in associations between these variables and pro-poor growth. Thirdly, focusing on short growth spells instead of long ones would mean more observations and it would also bring variability over time within countries. While such an analysis would be much more time-demanding, it is certainly feasible. And lastly, in this paper we have worked only with one indicator of pro-poor growth (PEGR). As shown, there are at least five or six other indicators, which have been frequently used. These could also be employed within similar analytical and interpretational frameworks. This would allow researchers to directly compare the outcomes of the different indicators as well as to test the robustness of regression results.

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Shrnutí

Koncept pro-poor růstu, který lze do češtiny přeložit jako růst přínosný pro chudé, se zaměřuje na analýzu vzájemných vztahů mezi růstem, chudobou a nerovností. Nejčastěji bývá aplikován na příjmovou dimenzi, ale lze jej použít také na analýzu nepříjmových ukazatelů. Předkládaný článek se zabývá regionálními a geografickými souvislostmi příjmového pro-poor růstu v afrických zemích. Za použití příjmových dat Světové banky byla nejdříve odhadnuta rozdělení příjmů v jednotlivých afrických zemích vždy pro první a poslední rok s dostupnými daty (tzv. dlouhá růstová období). Následně byl pro tato období pro jednotlivé státy Afriky vypočítán vybraný indikátor pro-poor růstu (chudobě ekvivalentní míra růstu, PEGR), který byl interpretován za použití tradiční i nově zavedené univerzální klasifikace. Získané výsledky byly poté analyzovány z hlediska regionalizace Afriky a vybraných geografických proměnných. Bylo zjištěno, že vyšší míra prospěšnosti růstu pro chudé je vlastní zejména zemím západní a severní Afriky. Výsledky dále naznačily, že vyšší pravděpodobnost relativního i (slabého) absolutního pro-poor růstu a současně také vyšší míra prospěšnosti růstu pro chudé jsou asociovány s některými geografickými faktory, například s větší rozlohou území, nižší hustotou populace, nižším podílem území v geografických tropech či neostrovním charakterem země. Naopak vnitrozemskost zemí nehraje z hlediska pro-poor růstu významnou roli. Uvedené vztahy však nelze považovat za kauzální – k potvrzení kauzality je totiž nutné pracovat s více proměnnými a s pokročilejšími metodami vícenásobné regresní analýzy.

COMPARISON OF STATIC PERSPECTIVE VIEWS AND 2D MAPS – THE ROLE OF AGE, SPATIAL ABILITIES, AND TASK NATURE

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Abstract: In this study, we focus on the usability of pseudo-3D thematic maps (static perspective views) compared with their conventional 2D equivalents. A total of 105 study participants were divided into two groups (12–19 years old and 20–27 years old). A Perspective Taking Test measured their spatial abilities and each participant solved 15 tasks using four thematic maps. We compared map variants to determine which is more suitable for individual tasks. We then examined the differences between the two age groups and tried to find any relationship between the user's spatial abilities and the number of correct answers. We observed a significant difference regarding the map's visualization dimension only in one particular task and significant differences between the age groups when they worked with 2D maps. We found a positive correlation between the participant's level of spatial ability and the number of correct answers.

Key words: 3D cartography, spatial abilities, thematic 3D map, user testing

INTRODUCTION

In general, thematic maps and geospatial visualizations are used frequently in the field of geographical or environmental education (Bandrova and Konečný, 2014). The 3D space is usually represented by 2D methods. However, students have difficulty switching between 2D visualization and real-world 3D space, especially when interpreting the relief representation or identifying the dependence of displayed phenomena on altitude (Carbonell-Carrera et al., 2017).

3D visualizations thus penetrate various sub-areas of geographical education. For example, Sieber et al. (2016) described utilization of 3D thematic maps in modern atlases, Kubíček et al. (2019) analysed the effectiveness of stereoscopic 3D visualization of digital terrain models, Juřík and Šašinka (2016) presented the possibilities of immersive 3D geovisualizations and Šašinka et al. (2019) focused on the investigation of user aspects of geo-collaboration using 3D visualizations. We sought to verify the above-mentioned studies concerning the potential benefits of using 3D thematic maps in geographical education by user testing with the appropriate target audience.

In this paper, we focus on the user aspects of thematic 2D and 3D maps. A 3D map is understood to be a pseudo-3D or real-3D (stereoscopic) depiction of the real world and its natural or socio-economic objects and phenomena using a mathematical basis and cartographical processes (Herman et al., 2018). In this case, we compared the usability of 2D maps with static pseudo-3D maps that are perspective views depicted on a piece of paper or on a computer screen (without any interactive functions).

RELATED WORK

Scientific studies that deal with the issues addressed in this paper can be divided into several dimensions. 3D thematic maps, specific cartographic methods, as well as the general creation and application of 3D maps describe, for example, Jobst and Germanchis (2007), Shepherd (2008), Bleisch (2011), Zsoldi (2013), Sieber et al. (2016) and Charvát et al. (2018). On the other hand, Savage et al. (2004), Popelka and Brychtová (2013), Rautenbach et al. (2014), Preppernau and Jenny (2015) and Popelka and Doležalová (2016) verified user aspects of thematic 3D maps through user testing based on a comparison between 3D maps and their 2D equivalents.

Studies focused on students or pupils are a specific area of user evaluation. Hegarty et al. (2009) proved that students sometimes prefer 3D maps over 2D versions based on their appearance rather than their information content and real effectiveness. Niedomysl et al. (2013) compared 2D and 3D thematic maps depicting population distribution. Their results showed statistically significant differences in learning benefits between the two formats, largely in favour of the 2D map.

One of the most important variables in user testing, if the results are to be relevant to geographic education, is the age of the participants. Two age groups were compared in the user testing of Herman and Stachoň (2018), which focused on interactive 3D maps

and their control through a touch screen. In addition to the age of the participants, their spatial abilities were also a significant variable. According to some studies (Piaget, 1957), these variables are related. Spatial abilities are measured by various psychological tests or standardized questionnaires. For studies dealing with geo-information, Herman et al. (2018) used Object-Spatial Imagery and Verbal Questionnaire (OSIVQ), though they did not find any correlation between the cognitive styles identified in the questionnaire and the correctness of user responses when study participants worked with 3D geovisualizations. Also, Kubíček et al. (2018) used Mental Rotation Test (MRT), proving a low and insignificant correlation between the results of MRT and correct user responses in the case of male participants. Because of these unclear results, we decided to use the Perspective Taking Test (PTT) (Kozhevnikov & Hegarty, 2001).

EXPERIMENTAL STUDY

The main aim of this study is to analyse differences in effectiveness (correctness in information retrieval) when working with pseudo-3D and 2D thematic maps. We addressed three research questions (RQ), which were defined based on our literature review:

- RQ1: What are the differences between the use of pseudo-3D and 2D thematic maps in the correctness of participant responses on given spatial tasks?
- RQ2: What are the differences between the two participant age groups working with pseudo-3D and 2D thematic maps?
- RQ3: Is there any relationship between level of spatial ability and the number of correct responses in tasks with pseudo-3D maps?

PARTICIPANTS

107 participants in total volunteered to take part in our study. Two groups were defined according to the age of the participants: 11–19 years and 20–27 years. 76 students from the Secondary Grammar School Žamberk took part in testing as representatives of the first age category (first, second, sixth and seventh year of an eight-year grammar school; 38 females and 38 males). The second (control) group comprised 31 students from the Department of Geography at the Faculty of Science, Masaryk University, Brno (15 second-year undergraduate students and 16 first-year undergraduate students; 12 females and 19 males).

PROCEDURE

A between-subject design was chosen for this study. Participants were randomly divided between two variants of test (I and II). Each participant performed the entire test via the interactive web-based application Hypothesis, which was designed to aid in creating and administering effective visual perception tests (Šašinka et al., 2017). The test started with a Perspective Taking Test made up of 12 tasks. This was followed by a second stage

during which participants worked with thematic 2D and pseudo-3D maps (4 maps, 15 tasks). The test ended with a short questionnaire requesting personal information (basic demographic data, previous map skills and subjective rating of evaluated thematic maps). For detailed information, see Fig. 1.

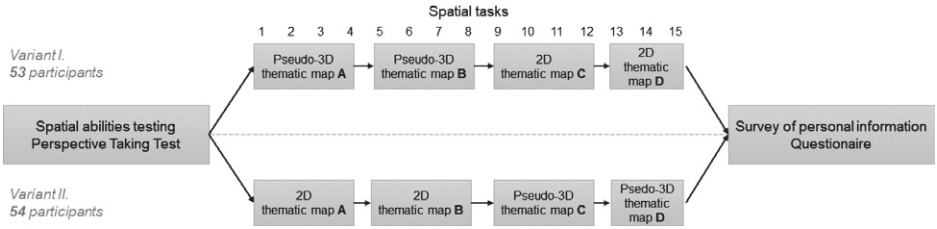

Fig. 1: Design of the experiment.

A computer classroom at the Secondary Grammar School Žamberk was used for testing. Each student was tested on an LCD monitor, the HP 21.5" model with 1920 x 1080 px resolution. Participants from the second age group were tested in the computer room of the Department of Geography, MUNI. The test was displayed on 21.5" AOC LCD monitors with the resolution 1920 x 1080 px.

STIMULI

The four thematic maps (both in pseudo-3D and 2D variant) used as stimuli depict the territory of the Czech Republic (see Table 1 and Fig. 2). Esri ArcGIS software (v. 10.6) was used to create the maps (ArcMap for 2D and ArcScene for pseudo-3D). Data from the ArcČR 500 database (ARCDATA PRAHA, ZÚ, ČSÚ (2016) was used for creation of the base maps.

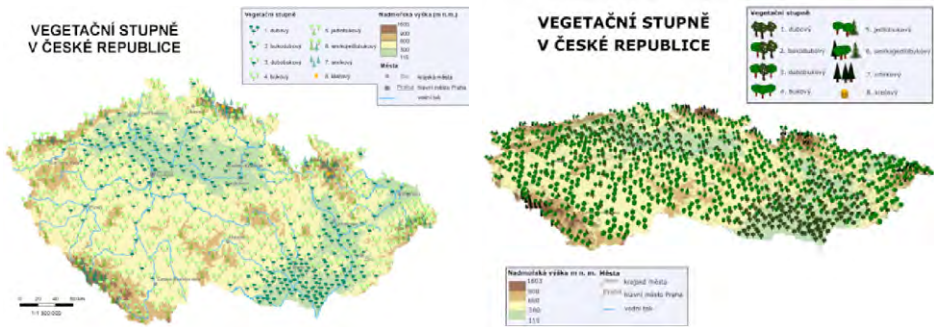

Fig. 2: Examples of the thematic map C (left – 2D variant; right – pseudo-3D variant).

RESULTS

The difference between the 2D and pseudo-3D thematic map tasks was first compared as a percentage of correct answers. The average correctness for tasks on 2D maps was 79.75% (std = 20.07%; med = 87.17%) and for pseudo-3D, 80.40% (std = 17.92%; med = 86.84)

Tab. 1: List of thematic maps used and related spatial tasks.

Thematic Map		Task	
A	Selected animal species in the Czech Republic	1	How many species are depicted on the map?
		2	Choose from the options: Where is the "Bee-eater" (Merops apiaster) depicted?
		3	Choose which species live at the highest altitude.
		4	Which animal species live on the largest area of the Czech Republic?
B	Agricultural production areas in the Czech Republic	5	How many agricultural production areas are depicted on the map?
		6	Choose from the given options: Where is the beet area located?
		7	Choose the agricultural production area located at the highest elevation.
		8	Which agricultural production area occupies the largest area of the Czech Republic?
C	Vegetational zonation in the Czech Republic	9	How many vegetational zones are shown on the map?
		10	Choose from the given options: Where is the spruce-beechwood zone located?
		11	Choose the vegetational zone at the highest altitude.
		12	Which vegetational zone can be found in the largest area of the Czech Republic?
D	Average annual precipitation for the period 1981-2010 in the Czech Republic	13	At which of the marked point (A, B, C, D or E) was the highest annual rainfall?
		14	At which of the marked point (A, B, C, D or E) was the lowest annual rainfall?
		15	How does the precipitation amount change with increasing altitude?

However, because the tasks differed considerably, both in terms of their assignments (selection from 3, 4, or 5 options) and found results, the differences between 2D and pseudo-3D were analysed at the level of individual tasks. The Mann-Whitney U test was used to determine if these differences are statistically significant. The Mann-Whitney

U test was chosen because the analysed data did not have a normal distribution, which had been verified by the Shapiro-Wilk test.

Participants should be able to solve tasks that involve determining the areal distribution of symbols on the map (tasks 4, 8 and 12) with higher accuracy using 2D maps. This claim was confirmed only for task number four, which was answered correctly by 82.7% of the participants using a 2D map, while 79.2% of the participants solved the task with the pseudo-3D map. This difference, however, was not statistically significant. For the remaining two tasks (8 and 12), a greater number of correct answers was recorded using pseudo-3D maps (see Fig. 3).

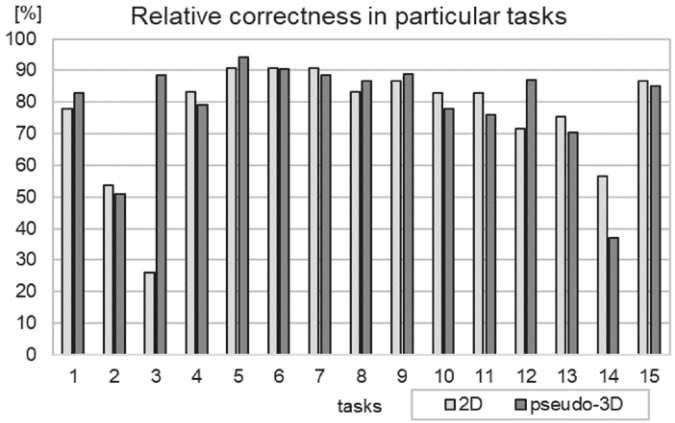

Fig. 3: Differences in relative correctness of user responses between two types of thematic maps for particular tasks.

Tab. 2: Differences in the correctness of user responses between two types of thematic maps and two age groups.

Age group	12–19 years			20–27 years		
Type of stimuli	M (%)	std	Med (%)	M (%)	std	Med (%)
2D	70.70	23.20	81.58	88.81	10.17	87.50
pseudo-3D	77.02	15.57	84.21	83.78	19.41	87.50

Participants solving tasks 2, 3, 6, 7, 10, 11, 13, 14 and 15 should benefit from using pseudo-3D visualizations that give a better idea of terrain and altitude. This assumption was confirmed only for task 3, where the success rate was 26.9% for 2D and 88.7% for pseudo-3D ($\alpha = 0.05$; $U = 549$; p-value <0.001), demonstrating a statistically significant difference. On the other hand, higher correctness was assumed with the 2D variant of maps for tasks 1, 4, 5 8, 9 and 12 (these tasks were focused, for example, on area estimation). This assumption was confirmed only in tasks 1 and 2, but the difference was not statistically

significant. A greater percentage of correct answers when using 2D maps was also found for tasks in which the use of pseudo-3D visualizations should be more advantageous. The extreme case was task 14, where the difference was 20.1% in favour of 2D, although this result was not statistically significant.

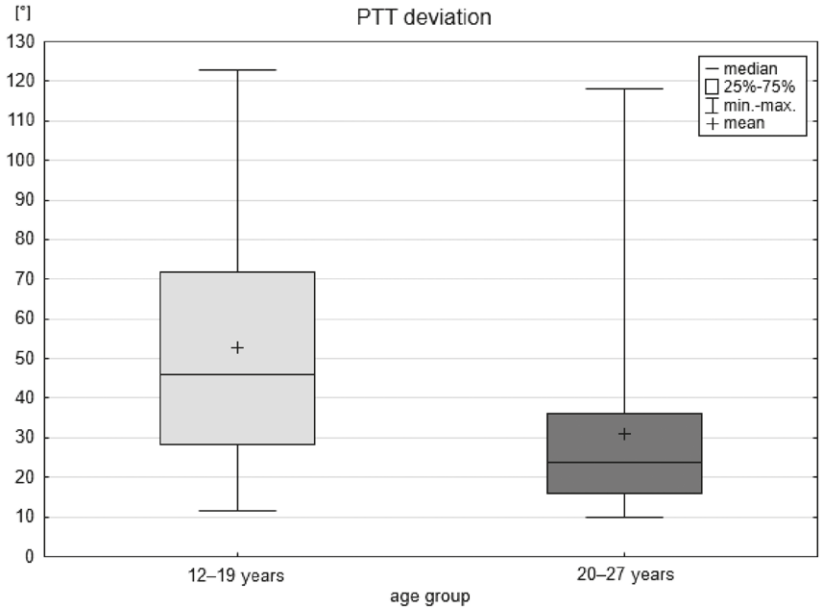

Fig. 4: Differences in PTT deviations between the two participant age groups.

When we analysed the difference between age groups (Figure 4), the p-value was higher than the selected significance level for pseudo-3D maps ($\alpha = 0.05$; $U = 934.5$; p-value = 0.095). It is therefore clear that there is no statistically significant difference in the correctness of answers between age groups. In the case of 2D maps (see Table 2), a statistically significant difference was attained between the analysed age groups ($\alpha = 0.05$; $U = 524$; p-value = 0.000007).

Responses recorded in PTT were compared to the correct answers, and the average deviation in degrees for each participant was then calculated. The lowest average deviation was 10 and the highest recorded value was 123. Figure 4 shows the range of average deviations for the two compared age groups.

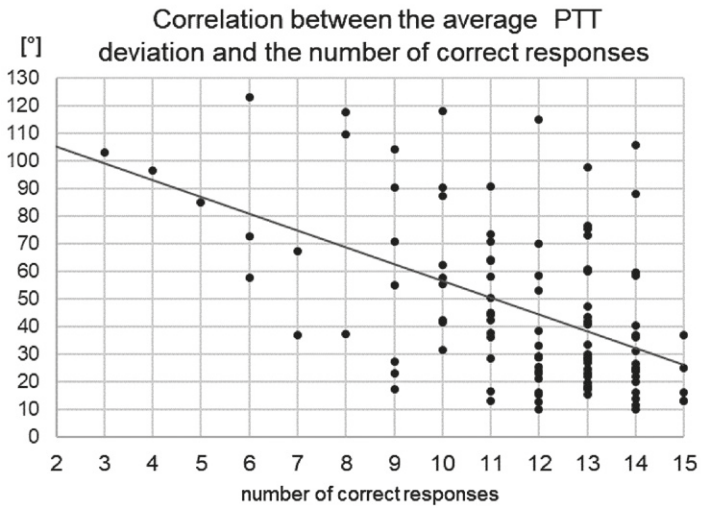

Fig. 5: Correlation between average PTT deviation and the number of correct user responses.

Spearman's rank correlation coefficient was used to determine if there was a mean deviation in PTT and the number of correct answers when working with thematic maps. In this case, the correlation coefficient was -0.462 (p-value = 0.001). Thus, it is evident that there is a linear regression between the compared indicators (see Fig. 5). If we focus on the two defined age groups, participants in the younger age group who achieved better results in PTT solved the tasks better using pseudo-3D maps (p-value = 0.013). A similar result was also achieved in the older age group (p-value = 0.010).

DISCUSSION

In addition to the quantitative results described in the previous section, we also examined the subjective opinions of participants regarding their use of pseudo-3D/2D maps and their previous experience evaluation in the final questionnaire. Interestingly, we found that more participants preferred 2D thematic maps than their pseudo-3D equivalents. This finding is contrary to the conclusions reached by Hegarty et al. (2009). In evaluating how thematic maps help in solving given spatial tasks, similar results have appeared for both 2D and pseudo-3D maps.

When comparing different map variants, task type also has a significant impact on the results. An overview of task typologies when working with 3D maps is given by, for example, Juřík et al. (2018). More extensive user testing would be required to identify more precisely the role of spatial tasks (type and difficulty).

A significant difference between pseudo-3D and 2D maps was observed in task 3 (user selects which species live at the highest altitude). A similar difference, although not sta-

tistically significant, was also observed in task 12. Both of these tasks are based on the identification of qualitative map symbols (e.g. for animal species), so their identifiable appearance plays an important role. The results may be related to the fact that some of the pseudo-3D/3D symbols are visually more prominent.

On the other hand, a significant difference in the number of correct answers in favour of the 2D thematic map was observed in task 14 (determining which of the marked points has the lowest annual rainfall). Similar results were obtained in tasks 13 and 15 with only minor relative differences. These tasks are based on reading and comparing the values of the quantitative colour scale of the texture. The better results obtained for the 2D thematic map are most likely related to the fact that 2D maps are not affected by shading, an important depth cue used in pseudo-3D visualizations. Texture on the terrain in the form of a quantitative colour scale is also often used in interactive 3D visualizations (e.g. Herman & Řezník, 2015; Charvát et al., 2018), and it would therefore be appropriate to evaluate these visualizations by user.

In addition to the used phenomena representations, the results of the user testing of pseudo-3D maps are largely influenced by the character of the terrain and the depicted area. In our case, we selected the area of the Czech Republic, which was a well-known territory for all participants. This could possibly affect the results. In the future, it would be appropriate to perform similar user testing with data from randomly chosen unknown territory.

In general, used perspective views (pseudo-3D visualizations) show terrain models that are slightly rugged. If a smaller area characterized by a higher relative height segmentation had been depicted, the results of user testing would probably be more favourable to pseudo-3D maps. Also the static perspective views suffer from disadvantages (an overview of which is given by Shepherd, 2008), such as a variable scale within a pseudo-3D/3D map, which can make it difficult to estimate and compare distances on a map.

CONCLUSIONS

We evaluated pseudo-3D maps and their 2D equivalents. 107participants in this study were divided into two groups based on their age. A Perspective Taking Test measured participants' level of spatial ability; the participants subsequently solved 15 tasks using four different thematic maps. We observed a significant difference between the visualization's dimension only on task 3, where there was a 51% higher correctness for pseudo-3D. We found a significant difference between the established age groups (12–19 and 20–27 years) when working with 2D thematic maps. The control (older) group scored an average of 12% higher correctness. We also demonstrated a positive correlation between the participant's level of spatial ability and the number of correct answers.

While we have not found any generally significant advantages for using pseudo-3D thematic maps, neither have we found any obvious disadvantages to their use in geographic education. However, the evaluation of pseudo-3D thematic maps, both static and interactive, is a prospective topic for future research. We tend to think that the advantages of pseudo-3D/3D maps will be fully realized in the case of interactive visualization.

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Shrnutí

V příspěvku se zaměřujeme na uživatelské testování pseudo-3D tematických map (tj. statických perspektivních pohledů) ve srovnání s jejich 2D ekvivalenty. Studie se účastnily dvě skupiny studentů (ve věku 12–19 a 20–27 let), celkem 107 osob. Jejich prostorové schopnosti byly testovány pomocí tzv. Perspective Taking testu a dále účastníci řešili 15 prostorových úloh pomocí čtyř tematických map. Následně jsme porovnávali, která varianta map (pseudo-3D a 2D) je pro tyto zadané úlohy vhodnější. Poté jsme zkoumali rozdíly mezi oběma věkovými skupinami a také jsme se pokusili nalézt souvislost mezi prostorovými schopnostmi uživatelů a počtem správných odpovědí. Signifikantní rozdíl mezi 2D a pseudo-3D mapami jsme identifikovali pouze v jediné prostorové úloze. Významný rozdíl mezi srovnávanými věkovými skupinami jsme zjistili jen při práci s 2D mapami. Byla odhalena pozitivní korelace mezi prostorovými schopnostmi účastníků a počtem správných odpovědí. Obecně můžeme prohlásit, že jsme sice nenašli žádné zásadní výhody pseudo-3D tematických map, ale nenašli jsme ani žádné zjevné nevýhody pro jejich použití v geografickém vzdělávání.

COMPARISON OF MAP READING SKILLS AND GEOGRAPHICAL KNOWLEDGE OF FUTURE OFFICERS AND GEOGRAPHY TEACHERS

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Abstract: Map reading is an important skill of the human population which varies from person to person depending on the age, education and many other circumstances. It is expected that some groups of adult population have higher skills in this area. Soldiers, architects, geography teachers and others belong to this group of people. The skills in reading paper maps are disappearing in current digital world. This is also observed in the case of students of the University of Defense in Brno. 228 students were tested in map reading and geographical knowledge of the Czech Republic to verify this fact. The examination of the map reading skills took place over a standard topographic map at a scale of 1 : 25 000 from the production of the Geographic Service of ACR. Testing of geographical knowledge of the Czech Republic was focused on drawing the map of district towns, rivers and geomorphological units of the Czech Republic. The results confirmed the initial assumptions about the decreasing level of these skills. In addition, there were also significant differences between individual groups of students caused mostly because of previous education as well as the currently studied specialization. The same testing was done on students of the Faculty of Education of Masaryk University in Brno to confirm these conclusions. This group of students achieved worse results in map reading, but on the other hand, they have better knowledge of the geography of the Czech Republic.

Key words: map reading, geographical knowledge, cartography literacy, university students

INTRODUCTION

Map reading is one of two parts of cartographic literacy (Voženílek, 2002). Even though the ability to read a map is for many people inherent, the other one has to learn it like the other types of literacy (Pravda, 2001). Within the framework of the educational process in the Czech Republic, cartographic literacy education can be included in a broader group defined by the concept of science literacy (RVP ZV, 2012). Science literacy is being developed at primary education especially in the following educational areas (Učitelské listy, 2011)

- Man and his world;
- Mathematics and its applications;
- Man and nature;
- Man and society.

The achievement of cartographic literacy is mostly a question of primary education, because teaching of geography and topics related to use of maps during secondary education is included only in some types of schools (usually grammar schools). Nevertheless, the ability to read maps varies widely in the adult population. Various studies confirm or refute differences according to gender (Kitchin, 1996; Beatty, 2002; Dabbs, Chang, Strong, & Milun, 1998; Rybanský & Svatoňová, 2013), cultural, social and professional differences (Stachoň et. al., 2019; Svatoňová & Kolejka, 2017; Liao, Dong, Peng, & Liu, 2017; Murakoshi & Higashi, 2015). However, there is a general belief that in some professions the level of map work and spatial perception should be higher. These professions include architects, builders, geography teachers, sailors, firefighters and soldiers. This paper is based on several years of experience in working with maps for students at the University of Defense in Brno (UoD).

INITIAL CONDITIONS

Teaching work with the map is a part of the subject Applied Military Technology. All students regardless of their specialization have to go through this subject during their second year at UoD. This subject improves their knowledge and skills acquired during primary and secondary education. These are renewed and expanded for UoD students as a part of a military basic training course that each student completes before joining the Armed forces and UoD. Teaching block has 25 hours and one half is devoted to work with the map. Based on the testing at the end of the subject, there are significant differences in map reading between students of both faculties of UoD.

The requirements of the General Staff of the Armed forces of the Czech Republic (ACR) for future officers in the field of cartographic literacy are increasing. For this reason, in connection with the change of the study program, the education of geography was increased to 72 hours divided into whole study. In order to make the teaching as effective as possible, a detailed examination of the students' knowledge of map reading and geographical knowledge of the Czech Republic was carried out.

Tested groups were formed from students of the second year of the Faculty of Military Leadership (FML) and the Faculty of Military Technology (FMT) of UoD after completing the subject Applied Military Technology. Students of the Faculty of Education of Masaryk University in Brno focused on teaching geography at primary and secondary schools were elected as a control group. This group of students also took part in classes focused on reading and interpreting maps to the same extent as UoD students. Therefore, both groups should have comparable knowledge. The number of tested students is shown in Table 1.

Tab. 1: The number of tested students, divided by region from where students come

Region	Prague	South Behemian	South Moravian	Karlovy Vary	Hradec Kralove	Liberec	Moravian-Silesian	Olomouc	Pardubice	Plzen	Central Bohemia	Usti nad Labem	Vysocina	Zlin
UoD	7	9	23	2	3	5	20	20	12	2	14	5	7	13
MU	0	0	41	0	0	0	4	6	8	0	0	0	10	17

The examination of the map reading skills took place over a standard topographic line map at a scale of 1 : 25 000 from the production of the Geographic Service of ACR. Both tested groups were familiar with this map, because they usually use this map during their lessons. The examined questions were focused on:

- coordinates (planar and geographic);
- work with altitude;
- work with map scale;
- interpretation of map information.

There were several questions from each area and some of them also combined two branches together (interpretation of information and position).

Testing of geographical knowledge of the Czech Republic was focused on drawing the map of district towns, rivers and geomorphological units of the Czech Republic. All the students had to fill in a blind map of the Czech Republic.

MAP READING RESULTS

After dividing of the testing questions among nine groups, it is possible to determine the success rate of answers for each group of students. The groups of questions are:

- What are the MGRS coordinates of an object?

- What are the UTM coordinates of the object?
- What are the geographic coordinates of the object?
- What's higher?
- What is the difference in altitude?
- What is the distance between two objects?
- Where is the object located?
- What are the properties of the object?
- Calculate the distance by scale.

All questions had only one correct answer. For questions about coordinates and altitude, the correct answer tolerance was set as:

- 100 m for planar coordinates;
- 30" for geographic coordinates;
- 5 m above sea level for altitude.

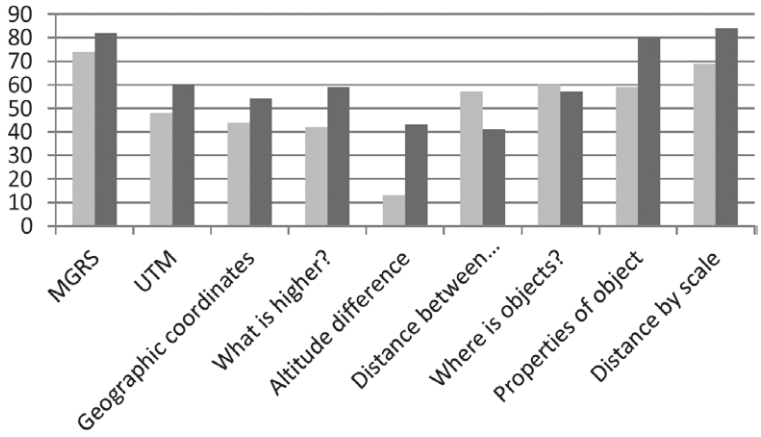


Fig. 1: Percentage response rate divided by faculties of UoD, green - FML, blue – FMT

Responses outside the given tolerance were assessed as incorrect. The percentage of the success rate for each question group was calculated from the results. FMT students achieved significantly better results in most of the groups compared to students of FML (Figure 1). FML students were better only in questions concerning the distance on the map and finding the object on the map. However, in the case of finding an object, the higher success rate was achieved in conflict with the questions to determine the properties of the object, because these two questions were interconnected. This is confirmed by percentage success rate of FML students, which is 60 % for the question of the object's position and 59 % for the question of the object's properties. Upon closer examination of the answers to the question "Where is the object located?" FMT students answered less accurately if the question was not focused directly on determining coordinates. They

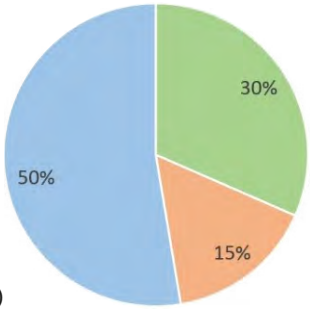
usually set only kilometre square and thus, their responses were outside the established tolerance and were therefore assessed as incorrect. For this question, they focused especially on the interpretation of the map content.

Another curiosity is the 20 % difference in the percentage success rate of the answers to the questions "What is higher?" And "What is the difference in altitude?" This difference can be explained in two ways. First, students only guessed their answers to the question "What is higher?" and the answers were correct. The second explanation is based on the assumption that the students worked on the map from the area of the city in which they have been studying for the second year. Therefore, they were able to deduce some connections based on real knowledge of the terrain. Despite uncertainties in some questions, it can be considered as proven that FMT students of UoD have greater cartographic literacy.

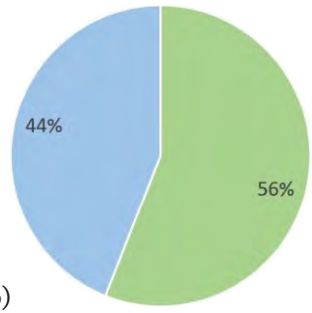
Considering the differences between the students of both faculties of the UoD, the authors proceeded to find their causes. Both groups spent the same time working with the map during military basic training course and the lessons of the subject Applied Military Technology so the attention was focused on the area of secondary education before the study at the UoD. Students can be divided into three important groups (Figure 2):

- students of grammar schools – GRAM (FML and FMT);
- students of technical schools – TECH (FML and FMT);
- students of economic schools – ECO (FML only).

The outcomes of this comparison can be found in Table 2. The results show that the worst cartographic literacy is among students of economic schools. In the case of grammar schools, FMT students achieved better results, but the differences in results between faculties are not so significant. For technical schools, the difference already significant is. Overall, the best results are achieved by students of technical branches of UoD (FMT) who studied at technical schools (TECH). The results show considerable differences between students of both faculties. Despite the fact that FMT students have generally higher cartographic literacy, it was also possible to identify areas where more attention should be focused in further education.



a)



b)

Fig. 2: Division of students by type of secondary school a) students of FML b) students of FMT, blue – GRAM, green – TECH, red – ECO.

Tab. 2: The success of UoD students in the test divided by the type of studied secondary school [%]

Question groups	FML			FMT	
	GRAM	TECH	ECO	GRAM	TECH
What are the MGRS coordinates of an object?	74	75	70	80	83
What are the UTM coordinates of the object?	56	42	30	56	62
What are the geographic coordinates?	51	45	20	58	50
What's higher?	48	35	33	56	61
What is the difference in altitude?	11	19	7	44	43
What is the distance between two objects?	64	42	60	39	42
Where is the object located?	68	52	53	58	55
What are the properties of the object?	64	61	33	72	86
Recalculate the distance by scale.	78	62	50	76	88

Although the percentage success rate for a number of questions did not reach even the value of 50 % (which can be considered as an unsatisfactory result), whole testing was also performed on an independent group of students. As mentioned in the previous chapter, the group was made up by students of Masaryk University (MU) – future geography teachers. The assessment criteria were set in the same way as for UoD students. Questions related to the determination of coordinates in the MGRS system have not been evaluated because it is primarily a military coordinate system. It was remarkable that the cartographic literacy of this group was significantly worse than of the UoD groups. MU group achieved better results only for questions comparing the altitude of two objects (Table 3). Since almost all MU students are graduates of grammar schools, the dependence of success on the type of the secondary education has not been determined. The students were therefore divided into two groups according to their specialization. One group was made up by students specialise in social sciences, the other one consisted of students who focus on natural science. The idea was that natural science students would achieve better results similar to the FMT students of UoD. As can be seen in Table 3, the differences between groups are not significant and in some issues, social science students achieved better results. Thus, the initial assumption was not confirmed.

Tab. 3: Comparison of success rate of UoD and MU students [%]

Question groups	UoD FML	UoD FMT	MU soc	MU nat
What are the UTM coordinates?	48	60	17	13
What are the geographic?	44	54	15	17
What's higher?	42	59	71	88
What is the difference in altitude?	13	43	6	4

What is the distance between two objects?	57	41	11	4
Where is the object located?	60	57	9	17
What are the properties of the object?	59	80	30	21
Recalculate the distance by scale.	69	84	84	77

RESULTS OF GEOGRAPHICAL KNOWLEDGE

The second part of the examination was aimed at verifying the geographical knowledge of the Czech Republic. Testing was done by drawing objects into a blind map and there were two kinds of tasks. First task was zero in the knowledge of settlements (the size of the district towns). Students drew settlements on a blind map showing only state borders, the main river network and regional and district cities. As part of the test, students were asked to identify 13 cities, each located in one of the thirteen regions of the Czech Republic. The second task was focused on knowledge of physical-geographical objects. Students plotted the course of the main watercourses and geomorphological units in a blind map containing only boundaries of the districts. The responses were assessed as follows:

- 1 point – correct drawing;
- 0.5 point – drawing within 30 km from correct location.

The percentage of correct answers was calculated on the basis of points. Geographical knowledge was in direct contrast with the results of cartographic literacy (Table 4). MU students achieved nearly twice as good results in both areas as UoD students. Both groups of students also achieved better results in knowledge of settlements compared to physical-geographical objects. The difference of knowledge among students depending on their specialization is negligible. Likewise, insignificant are differences in knowledge depending on previous education (secondary schools).

Tab. 4: Test results of geographical knowledge [%]

	UoD FML	UoD FMT	MU soc	MU nat
Knowledge of settlements	36	39	69	59
Knowledge of physical-geographical objects	14	18	27	28

Since all students' domicile was known, it was analysed whether the knowledge of geographical objects from the region in which students live is higher than from other regions of the Czech Republic. As the number of students living in individual regions is not the same (Table 1), the obtained results can be considered as indicative only. The results are also influenced by the fact that MU students are mainly from the eastern part of the Czech Republic. This predominance of students from Moravian regions is caused by the existence of faculties of education also in other regions of the Czech Republic. On the contrary, UoD students have their residence more evenly distributed in all regions of the Czech Republic, because UoD is the only military university in the Czech Republic. De-

spite these limitations, it was possible to confirm the initial assumption that knowledge of geography is strongly tied to the place where students live. An example of the correct answer distribution is shown in Figure 3.

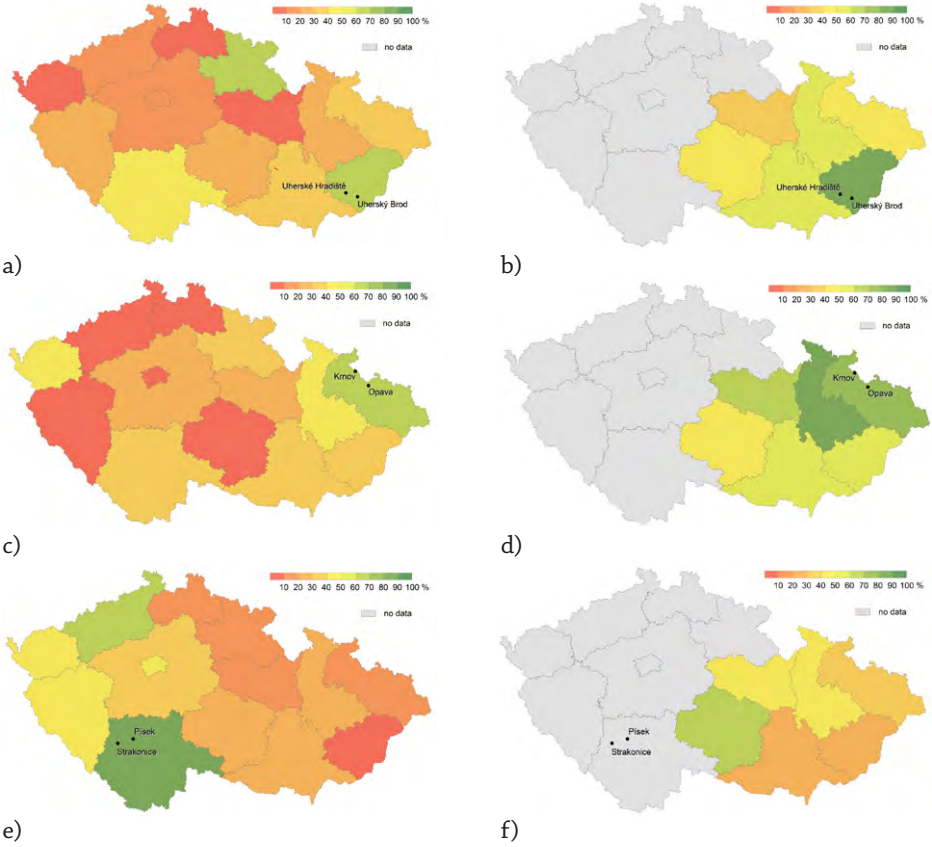


Fig. 3: Differences in the knowledge of the location of cities depending on the region of origin, a), c), e) – results of students UoD, b), d), f) – results of students MU

CONCLUSION

The testing of cartographic literacy and geographical knowledge of the Czech Republic was firstly focused on verifying the knowledge of UoD students. The test group and the focus of the test questions were different from the research conducted in the Czech Republic (Rybanský & Svatoňová, 2013; Stachoň et. al., 2019; Svatoňová & Kolejka, 2017). Its aim was to obtain background materials for improving the teaching of geography for future officers of the Army of the Czech Republic. Based on the results, there have been identified problematic areas. These are mainly involved in altitude and general geograph-

ical knowledge. Despite the fact that the results of map reading and geographical knowledge were not convincing, the comparison with the group of future teachers of geography turned out well for UoD students in the part of cartographic literacy. The results show that the existing knowledge is highly dependent on the secondary education and the specialization of university studies. Technical-oriented students achieved better results. The area of geographical knowledge of UoD students is very low. Due to the low knowledge of geography, it will be necessary to focus some of the lessons on the regional geography of the state territory and crisis areas.

Since the improvement of students' initial knowledge cannot be expected in the foreseeable future, an increase in lessons for teaching in this area is the only way to meet the military's demands for increasing the cartographic literacy of UoD graduates. As the results of future teachers of geography have shown, unflattering results can be considered as caused also by geographical education standards during secondary education.

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Shrnutí

Čtení mapy patří k důležitým dovednostem lidské populace a je součástí přírodovědné gramotnosti. Tyto dovednosti se u jednotlivých lidí liší zejména v závislosti na jejich věku, vzdělání a dalších okolnostech. U některých skupin dospělé populace očekáváme, že jejich schopnosti v těchto dovednostech jsou vyšší. Takovými skupinami osob jsou například vojáci, projektanti, učitelé zeměpisu a další. V současném digitálním světě se většina lidí stále častěji orientuje na digitální produkty a schopnosti spočívající v práci s papírovou mapou se vytrácejí. Tato skutečnost je pozorována i v případě studentů Univerzity obrany v Brně, budoucích důstojníků Armády České republiky. Pro ověření této skutečnosti bylo otestováno 228 studentů ve schopnostech čtení mapy a geografických znalostech České republiky. Ověření dovedností čtení mapy proběhlo na standardní topografické mapě v měřítku 1:25 000 z produkce geografické služby AČR. Testování geografických znalostí ČR bylo zaměřeno na zakreslení okresních měst, řek a geomorfologických jednotek do slepé mapy České republiky. Zjištěné výsledky potvrdily výchozí předpoklady o snižující se úrovni těchto schopností, ale ukázaly i významné rozdíly mezi jednotlivými skupinami studentů. Ty byly zjištěny jak v závislosti na předešlém vzdělání, tak i na aktuálně studované specializace. Pro potvrzení těchto závěrů bylo provedeno stejné testování na studentech pedagogiky, specializace zeměpis, Masarykovy univerzity v Brně. Tato skupina studentů dosáhla v případě interpretace map horších výsledků, má ale lepší znalosti v geografii České republiky. Na základě provedeného testování se připravuje změna ve studiu topografie a geografie pro studenty Univerzity obrany v Brně.

ANTHROPOGENIC RELIEF TRANSFORMATIONS – THEIR KNOWLEDGE AND EVALUATION WITH REGARD TO THE UNIQUENESS AND CULTURAL IDENTITY OF REGIONS

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Abstract: Within the development of new regional geography, the role of human geographic research in the study of regions is emphasized. Regional uniqueness, a consciousness of belonging to a particular region and regional identity also play an important role in the definition of regions. However, physical geography disciplines, e.g. geomorphology, can also contribute to the knowledge of these aspects with regard to the definition of regions. Currently, within the framework of geomorphology, attention is paid to the diversity of anthropogenic landforms. The knowledge and evaluation of these anthropogenic landforms, which are an important part of the historical elements of the landscape and are also referred to as cultural artefacts of the landscape, enables to supplement the cultural-historical values of the region and to specify the cultural identity of the region. On the example of sites – Staré Hradisko and Hostýn – we will present the specifics of secondary geodiversity with respect to the cultural identity of the sites.

Key words: anthropogenic relief transformations, cultural heritage, region

INTRODUCTION

Within the development of new regional geography, the role of human geographic research in the study of regions is emphasized. Regional uniqueness, regional consciousness and identity also play an important role in the definition of regions (Chromý et al., 2014; Semian, & Chromý, 2014). Geomorphology - one of the disciplines of physical geography – can also contribute to the knowledge of these aspects with regard to the definition of regions. The knowledge of the cultural identity in relation to the cultural heritage in contemporary landscape presents one of the directions of the project called NAKI II – Cultural heritage of the landscape of Archdiocese of Olomouc – research, presentation and management (DGB16P02B014).

In the presented contribution, the attention is paid to the knowledge of the specifics of the two chosen sites - Staré Hradisko west of Prostějov and Hostýn, with the use of historical anthropogenic transformations of the relief (secondary geodiversity). The knowledge of cultural-historical values (cultural artefacts) of the sites contributes to a specification of the cultural identity of these sites and their surrounding region.

Conceptual backgroud, Metholodical approach

Cultural heritage is an integral part of the culture for the given region or community. Cultural heritage can be divided into material and non-material. Material cultural heritage includes monuments and other material products of a human being. Sites with artefacts or pieces of work created both by nature and a human being, places of archeological finds of particular world importance in terms of historical, aesthetical, ethnological or anthropological aspects are all a part of material cultural heritage (https://www.mkcr.cz/kulturni-dedictvi-1121.html).

The methodical approach towards the given issue is based on a consideration that even the anthropogenic landforms created by a human being are part of material cultural heritage. The origin of anthropogenic (technogenic) landforms is often related to the historical driving forces of the development, cultural periods, war events, technical and scientific growth. The relief preserves the fundamental memory of the landscape (Cílek, 2002b), and this authentic memory of the landscape is modified by the following anthropogenic changes and we can discover the former anthropogenic changes and interventions in the relief. Therefore, within the historical approach towards the research of the development of relief (Trenhaile, 2007) the identification of sequences or stages of the development caused by changes of controlling developmental factors (denundation chronology) is being solved. The so called palimpsest of foms is studied – a research of landforms which bear traces of the development and provide us with proof of the effects of older climate, tectonic, anthropogenic and other factors, and they enable us to trace the history of the development of relief over the course of time. The relief contains palimpsest of not only natural but also anthropogenic transformations (Migon, & Goudie, 2012).

In the relief of the current landscape, there are anthropogenic landforms which modify and diversify the geodiversity (natural - according to Gray 2013). This is secondary – anthropogenic – (made by a human being) geodiversity (Cílek, 2002). Secondary geo-

diversity may be defined as a diversity of anthropogenic landforms, their components, relations, structures and processes that formed these forms (in more detail Kirchner & Kubalíková, 2013; Kubalíková et al., 2016). Anthropogenic landforms may be considered a part of material cultural heritage as there are strong bonds between natural heritage (geo-heritage) and culture (Panizza, & Piacente, 2005). The importance of anthropogenic impacts (e.g. archeological) as well as landforms within geomorphological heritage and possibilities of its evaluation are also emphasised by Coratza and Hobléa (2018). The assessed sites are then in accordance with the concept of Panizza and Piacente (2005) and Panizza (2009) described as geomorphological sites (geomorphosites). As far as our approach is concerned, the knowledge of historical as well as cultural-historical values of anthropogenic landforms (historical anthropogenic geodiversity) is significant. These forms become an essential part of material cultural heritage, which is part of the cultural identity of the region or locality. Cultural identity is related to the region (of various levels), the region is characterised by a specific natural environment and natural resources, work and people´s lifestyle over the course of the development. All is fixed by the awarness that the individual belongs to a specific community and region. The society in the given area perceives the relief and landscape also with respect to its genius loci. This term is used here as a concept from Vencálek (2005).

With the use of chosen sites (Fig. 1) – Hostýn and Staré Hradisko the basic geomorphological features are characterised emphasising the historical anthropogenic landforms (secondary geodiversity), and basic stages of the development and cultural-historical elements of the sites will be mentioned. The assessment due to the cultural identity and specifics of the chosen sites will be descriptive. Findings from the geomorphological field researches in the sites, including digital model of relief of the Czech Republic of the 5th generation (DMR 5G) will be used.

Fig. 1: Localization of the study sites in the Central Moravia. 1 – Staré Hradisko site, 2 – Hostýn site

Source: authors

SELECTED STUDY SITES – BASIC DESCRIPTION

Staré Hradisko site

The study site is located on the eastern border of Drahanská vrchovina Highland approximately 5 kilometres east of Protivanov town (within the cadaster area of Malé Hradisko municipality). It stretches across the distinct flat ridge which is separated from Malé Hradisko village by the valley of the river Okluka on its northern and eastern side, and by a nameless brook on its southern side. Only towards the west, the ridge is turning into mildly undulating relief of foreland of Drahanská vrchovina Highland. The down-valley slopes of the ridge are steep, the elevation difference over the valley bottom of Okluka reaches up to 100 and 120 metres. At the peak of the ridge, there are remains of Celtic oppida, representing one of the largest oppida in Moravia (with the area of 37 hectares). Based on archeological researches (Čižmář, 2002, 2008), there is evidence of settlements from the half of the second century B.C. (Celtic late La Tene period) until the half of the first century B.C., when the settlement disappeared. The oppidum was fortified by a massive wall (massive stone rampart reinforced by palisade) and a ditch. The wall was up to 4 metres wide. During the second phase of fortification, the first wall was pulled down and a new wall twice the size was built on the same spot. The oppidum is divided into three segments – inner area (22.5 hectares), western barbican (13.5 hectares) and quite small eastern barbican (1 hectare). The length of the outside fortification is approximately 2 800 metres, the inner fortification is approximately 550 metres. There were three gates discovered at the oppidum: southwestern gate, eastern gate and a gate intersecting the inner wall in the middle. The oppidum was covered with the farmstead and was a significant centre of manufacture, crafts and administration. Due to its location, it was also an important point on the Amber path running from Bohemia. Based on the analysis of the location of La Tene settlement sites along the valley of the river Hloučela, it is very likely that the original communication between the oppidum and the eastern lowland of Haná neighbourhood was running exactly through the valley of the river Hloučela (Čižmář, 2008).

At present, there are remains of stone walls from 3 to 4 metres high and approximately 2800 metres long, and also remains of the original gates. The ramparts are overgrown with bush and tree vegetation, other parts of the oppidum are covered with grass and partly with bushes, too. In some places, there are agricultural terraces covered with bushes. The accumulation walls that were built for military and defence purposes (similar purpose within the evaluation of cultural artefact is mentioned by Dohnalová et al., 2018) are the only significant evidence of prehistoric human activities. Further settlement (settlement continuity) has not been proved in the given site. The oppidum can be accessed via hiking trails. The site is protected as a Cultural Monument. There is an educational archaelogical path on (Celts) running from the municipality of Malé Hradisko to the sites. Unfortunately, the last part of the paths and the oppidum are part of grazing area and it is inaccessible.

In the valley of Okluka, approximately 400 metres from the oppidum, there is a newly renovated baroque chapel of Our Lady of the Rosary (the renovation was done in 2012),

which is frequently visited by people and annual pilgrimages are held here. There is also a nearby ruin of Čertův hrádek castle (approximately 1 kilometer from Staré Hradisko), which was founded at the turn of the 13th and 14th century and is a historical place. Unfortunately, there is no hiking trail coming to the ruin. To the south of Staré Hradisko and its surroundings, the site is bordering the wooded area of Military Training Area of Březina where human activities are restricted.

Hostýn site

Hostýn elevation is situated on the steep north-western border of Hostýnské vrchy Mts., southeast of the Bystřice pod Hostýnem town (cadaster area of Chvalčov municipality) - part of Hostýnsko-vsetínská hornatina Mountains. The dominant hill (735 meters above sea level) rises above the moderate undulating relief of Kelčská pahorkatina Hilly land and is visible from the wide neighbourhood (e.g. from the oppidum of Staré Hradisko as far as 80 kilometres away). The site itself covers the twin hill of Hostýn. The main hill reaches up to 735 metres above sea level and it is separated from the lower hill (718 m) by a saddleback with a baroque church. The site is bordered by steep wooded hillsides, with outcrops of bedrock in some places. The hilltop was settled as far back as in prehistoric time (for more details see Čižmářová, 2004; Parma, 2012; Tomášek et al., 2015). The massive fortification of the hilltop, which is formed by high ramparts, delimits an area of approximately 20 hectares. The beginning of the construction of the walls of the fortified settlement (hillfort) was approximately in 1200 BC in the Bronze Age, the reconstruction and raising of the walls were done in period of the Late Bronze Age after the year 1000 BC (settled by the people of Silesian culture). The fortified site was populated also in early Iron Age (Hallstatt period) (building of the walls with wooden and stone construction including pincer gate; Čižmář, 2004).

An important stage of the fortified site occurred in the Celtic late La Tene period when the Celtic population built an oppidum. The Celts apparently utilized old ramparts to build their fortifications. The Celtic settlement of Hostýn was not very intensive compared to the previous periods. However, the Hostýn Celtic oppidum was an important power, craft and business center of the Central Moravia. Hostýn site was also important as a strategic point guarding the long-distance trade route (the Amber path). Later on, only sporadic evidence of Slavic settlement in the period between the 10th and 14th centuries is known. Since the 17th century until the present day, Hostýn has been an important pilgrimage site (Tomášek et al., 2015). The first chapel on Hostýn was probably built sometimes in the late 16th century to serve the miners who were mining silver at Hostýn. The chapel was situated on the site of today's church. This period can be also attributed to the foundations of the Marian tradition surrounded by the legend of the miraculous rescue of the Moravians by the Virgin Mary when the Tatars invaded the Bystřice pod Hostýnem town and its surroundings.

Gradually, the importance of Hostýn as a pilgrimage place increased and was even more significantly developed in the baroque period. The baroque pilgrimage church of the Assumption of the Virgin Mary was consecrated in 1748 and the pilgrimages were banned on the basis of the imperial decree of 1754. Later in 1787, the pilgrimage church in

Hostýn was closed down. Once again, the temple was restored and consecrated only in 1891. Within the pilgrimage site, other monuments were gradually built – The Chapel of Jan Sarkander, the Chapel of the Holy Sepulcher, the Stations of the Cross built by Jurkovič, the Old Stations of the Cross, the Water Chapel with a spring. In 1897, the observation tower of the Saint Cross was built on a higher peak of Hostýn. Moreover, pilgrimage houses were built for pilgrims' accommodation in the 1930s. In 1993, a wind power plant was built near the observation tower, in a not really suitable place.

Currently, the remains of the ramparts from the prehistoric period in the total length of 1835 meters can be found in Hostýn (https://www.hostyn.cz/historie.html). The wall is approximately 4 meters high, even up to 8 meters on its southwestern side and with a ditch in front of it. The original entrances to the hillfort are also visible. In the southwestern part of the site, the Slavkovská pincer gate (from the early Iron Age) is located which belongs to the most massive gates of this type in Moravia (Tomášek et al., 2015). Nowadays, the ramparts are covered with deciduous forest. The ramparts were built as anthropogenic military defensive forms and are important evidence of prehistoric material cultural heritage. This heritage is further complemented by a large number of sacral cultural objects that make up the high cultural value of the place. In 2018, the Pilgrimage Site of Saint Hostýn with the Stations of the Cross and the Church of the Assumption of the Virgin Mary was declared a National Cultural Monument. Hostýn is easily accessible by asphalt road with parking possibilities. There are also hiking trails and two Education paths (Path of the Hostýnské vrchy and Path – Nature of the Hostýnské vrchy). The site offers accommodation in pilgrimage houses near the church, a visit to the Hostýn Museum and refreshment possibilities.

Discussion and Conclusions

In the selected sites (Staré Hradisko and Hostýn), our endeavour was to characterize the specifics of these important cultural-historical sites based on the knowledge of prehistoric and historical anthropogenic relief transformations (secondary geodiversity). We consider these landforms as part of the material cultural heritage that form the cultural identity of a place or region. Currently, there are methodological procedures for identifying these cultural objects (artefacts) in the landscape (in more detail please see Dohnalová et al., 2015), but no procedures were developed for exact comparison or evaluation of material cultural heritage (or cultural identity) in the sites. Therefore, our comparison will be only verbal with taking into account the basic characteristics and specifics of the selected sites. The comparison was based on prehistoric and historical specifics and current situation.

Defensive prehistoric walls on both study sites delimit large areas. Accumulation walls are still morphologically extensive and significantly visible in the terrain (fig. 2). Both belong to the most spacious sites in Moravia. Both the Staré Hradisko oppidum and the Hostýn forthill were significant dominant centres guarding the Amber trail. With regard to the next development, the Hostýn site has a much longer history (from the Bronze Age). Staré Hradisko originated and disappeared in the Celtic late La Tene period when it was important manufacture, craft and administrative center with a relatively densely

populated area (urbanistically delimited area (Čižmář, 2004) for a wider region including the adjoining Haná region). The Celtic population also built an oppidum at the Hostýn site in Celtic late La Tene period. The settlement of Hostýn was not very intensive in comparison with the previous stages of the development and also in comparison with Staré Hradiště. In the case of Hostýn, we can speak of reshaping the original anthropogenic landforms that originated in the prehistoric development and left traces while building the walls of the forthill and later the oppidum. We are talking about a palimpsest of anthropogenic landforms (secondary geodiversity). However, the oppidum at Hostýn was also an important power, craft and business centre of Central Moravia. However, the development of Hostýn also continued in the next periods. Significant development began in the baroque period in connection with the establishment of the Marian pilgrimage site. This development, with a decline in the period of socialism, continues significantly until the present time. The material cultural heritage is maintained and developed, and so the cultural identity of a place that has a characteristic genius loci is constantly strengthened.

Fig. 2: Ancient fortification walls at studied sites. A – Staré Hradisko site, B – Hostýn site

Source: authors

The continuity of the development of Staré Hradiště was terminated by the demise of the prehistoric settlement. Material cultural heritage (secondary geodiversity) was no longer replenished on the site. However, the site has its genius loci with huge walls proving Celtic settlement and the importance of the site in prehistory. Unfortunately, poor accessibility of the site (closed due to active grazing area) does not allow any contact with the site, even though there is a good quality of the educational archaelogical path called Staré Hradisko. Therefore, the nearby baroque chapel of Our Lady of the Rosary in the Okluka valley, where annual pilgrimages take place, is visited more frequently.

Historical anthropogenic landforms, which belong to the material cultural heritage, are an important cultural artefact (specificity) of the studied sites. However, they are only a small part of the issue when characterising the cultural identity of the selected sites. Therefore, for the characterization of this identity, it is necessary to supplement other cultural-historical artefacts, knowledge of non-material cultural heritage including characterization of the current state and its development possibilities.

By all means, knowledge of the historical development of anthropogenic relief transformations of the selected sites contributes to the identification of regional specificities, complementing the knowledge about the perception of the wider region. The sites can serve as suitable destinations for field trips within the framework of regional geography and the wider educational process.

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Shrnutí

S rozvojem nové regionální geografie se posiluje úloha humánně geografických výzkumů při studiu regionů. Při vymezování regionů hrají významnou úlohu i jedinečnosti regionů, regionální vědomí a identita. Právě k poznání těchto dílčích aspektů s ohledem na vymezování regionů může přispět i fyzickogeografická disciplína – geomorfologie. V současné době je v rámci geomorfologie věnována pozornost i diverzitě antropogenních tvarů reliéfu (vztahy, struktura a reliéfotvorné procesy). Tyto tvary, procesy a struktury lze chápat jako složky geomorfologického dědictví, které nabývají specifických hodnot (jde zejména o hodnoty přírodovědné, vzdělávací, estetické, kulturní), které se podílí na identitě místa (dotváří genius loci) a jsou pozitivně vnímány místními komunitami. K jedinečnosti regionů přispívá i charakter materiálního kulturního dědictví, jehož součástí jsou mimo jiné i člověkem vytvořené antropogenní tvary reliéfu, které často souvisí s hybnými silami vývoje, kulturními etapami, válečnými událostmi, technickým a vědeckým rozvojem daného území. Poznání těchto složek, které jsou významnou součástí historických prvků krajiny a jsou rovněž označovány jako kulturní artefakty krajiny, umožňuje doplnění kulturně-historických hodnot regionu a specifikování kulturní identity regionu. Na příkladě lokalit Staré hradisko (keltské oppidum) a Hostýn (prehistorické hradisko) jsou prezentována specifika sekundární geodiverzity s ohledem na kulturní identitu hodnocených lokalit. Hodnocené lokality s antropogenními tvary reliéfu se mohou stát vhodnou součástí terénních exkurzí v rámci regionální geografie.

PRE-INDUSTRIAL LANDSCAPE OF THE JESENÍKY REGION AS A NATURAL AND CULTURAL HERITAGE

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Abstract: Small parcels of agricultural land are rare in the present landscape of Czech Republic and become the subject of interests of the state protection of the nature, the landscape and the environment. At the same time, such areas represent interesting subjects for the local administration as attractive tourist object. In the historical territory of Moravia (the eastern 1/3 of the Czech Republic), a regional inventory of areas with preserved ancient land use structure was carried out on all individual cadastral territories (focused not only on small parcels, but also on large aristocratic estates on agricultural and forest land originated before the main wave of industrial revolution Moravia, before 1850. The sites are still subjects to topic economic pressure on land consolidation. Their existence in the future is under threat and is decreasing every year both in number and size. The inventory results are presented on example of the Jeseníky region.

Key words: terminology, regional specifics, inventory, geo-analysis

INTRODUCTION

The physiognomy, or appearance of the contemporary cultural landscape decisively determined by the relief and the land use of areas. These factors shape the landscape view together. This can then be additionally defined by other parameters, which, however, no longer have a strong visual character. The landscape view on the territory of today's Czech Republic has changed in various ways over the past historical times. Events of past times influenced the character of the landscape at that time. In the territory of the Czech Republic, a number of historical landscape zones have been designated, declared and protected, which are subject to special care and attention of the professional and general public. In addition to the so-called conceived landscape (e.g. parks, gardens and larger areas), these are often places of major historical events, battles, etc. However, the European Landscape Convention also obliges signatory countries to care for the "normal" landscape as well. However, the term "normal landscape" encompasses a very wide range of landscapes, both in terms of the appearance of the terrain and the appearance of the present land use, and also their innumerable combinations.

In addition to landscapes significantly influenced by large-scale collective and state owned agricultural and forestry management, by the socialist industrialization and rapid urbanization in the period after World War II (until about 1990) and by the phenomena associated with the return to the market economy, some preserved segments of ancient landscape survive without special attention and care. Under the conditions of the Czech Republic, these represents the remnants of the cultural landscape from the time before the key land reforms (division of large estates in the second half of the 19th century, after the establishment of independent Czechoslovakia, in the time of war emergency and after World War II). There is no doubt that even medieval landscape segments have been preserved in the Czech Republic. However, in order to identify and survey such landscapes, the necessary cartographic or at least pictorial documentation would have to be available. The oldest relatively reliable map documents describing the ancient use of the landscape come from modern times, when some owners of Baroque estates ordered such documents. The initial land use mapping in the Czech lands is related to the First military survey (Josephine) from 1764–1768. Due to the limited resolution given by the scale of approx. 1 : 28,800 and the absence of a reliable geodetic base, the detailed picture of the landscape at that time can only be relatively roughly documented. The following Second military survey (Franciscan) done in the years 1836–52 has partially corrected these problems due to the use of the high-quality geodetic base at that time. However, the resolution of 1 : 28 800 still remained insufficient for many practical and research purposes. The source of information included in this survey was based on the so-called Stable (Franciscan) Cadastre from the years 1826–1830 and 1837–1843 in Bohemia, respectively 1824–1830 and 1833–1836 in Moravia and Czech Silesia. Its map outputs at scale 1: 2880 have already provided location correct and factually detailed data on land use. Since this survey was carried out just before the onset of the main wave of the Industrial Revolution in the Czech lands, the landscape presented by these documents can be described as the pre-industrial landscape. Its segments, according to the comparison with the current land use, have been locally preserved in different sized areas and in

various quality due to the degree of similarity with the template registered in the Stable Cadastre.

The areas of cultural landscape with a preserved secondary (economic) structure that arose and developed in the period preceding the formation of industrial society in the Czech lands.can be considered as a pre-industrial landscape or as a segments of the pre-industrial landscape. While the primary landscape structure is the natural structure, it is given by the territorial distribution of homogeneous units with specific relief forms, rocks, soils, humidity conditions, biota and topoclimate. The secondary landscape structure is given by the territorial distributiom of various land use forms. Both structures are in deep interaction. It can be assumed that the pre-industrial landscape, respectively its smaller segments bear the signs of relatively uninterrupted technical, socio-economic and cultural development since the Thirty-years-war period, taking into account local natural conditions and the impact of pre-industrial agricultural innovations. The preserved areas found themselves on the periphery of the subsequent development for various reasons and become relics of the secondary landscape structure from the previous period. Consequently, such territorial segments of varying size and content avoided, or were only partially affected by socio-economic changes in following times. The nationwide inventory of preserved segments of the pre-industrial landscape has only been started in the Czech Republic.

The following areas can be considered as pre-industrial landscape segments in the Czech Republic, as these currently show:

1. a similar land ownerchip or usage as it was before 1850,
2. a similar land use structure as it was before 1850,
3. a similar appearance (view) to that territory as it did in the given past period.

In principle, the "similarity" is that the size, use, shape and location of typical plots of land have been preserved. Although their specific use varied from site to site within such parcels, they were merged and split (within the "local size standard"), the overall composition and mosaic of sub-area utilization in this segment remains unchanged.

CURRENT STATE OF RESEARCH OF THE ANCIENT LANDSCAPE

The identification and mapping of segments of the pre-industrial landscape is based on comparing the secondary structure of the landscape (land use) presented on old maps with current territorial documentation. The procedure is based on visual and contextual comparison of the ancient and contemporary secondary landscape structure in analogue or electronic form. In the optimal form the compared materials are available in mutually matched form (in terms of scale and projection).

Nowadays culturally well developed human society focuses its attention on natural and cultural, resp. historical heritage. In addition to protected areas and heritage sites, the industrial heritage is also in the center of interest. While post-industrial landscapes have

received more attention in the last two decades, landscapes created before the Industrial Revolution are inventoried and studied relatively less, usually due to the difficult access to old archival documents.

The increasing rate and scale of landscape changes have been observed in most of Europe over the last decades (Klijn & Vos, 2000). According to Antrop (2005), the earlier development of the European cultural landscape has experienced several interruptions, including the disappearance of former "landscapes". For example, van Eetvelde and Antrop (2005) recall the devastating transformations of ancient landscape structures. Similarly, Lipský (2010) states that the socialist collectivization of agriculture in the Central and Eastern Europe is a typical example of rapid changes in the landscape, reflecting political and economic changes in communist society. These "current" breaking transformations are characterized by the overlapping of the previous landscape structures with new ones. For example, landscapes of the Middle Ages were in many places gradually (sustainably) linked to the older landscapes and then integrated with the neighboring landscapes without extreme step changes in a short time. Many present landscape changes do not respect a continuation of development. Landscape changes are related to land-use changes, where urban growth is undoubtedly the most important feature (Pacione, 2001). The urban growth is clearly affecting directly and indirectly changes in the rural landscape, which, among other things, complicates the landscape management itself (see Brandt et al., 2001). In a broader sense, the growth of bipolarity in land use can be observed in contrast to the densely populated urbanized area on the one hand and the abandoned rural landscape on the other, which in many cases becomes (again) a natural landscape (Vos & Klijn, 2000). Such landscapes, respectively parts of them that retain their ancient appearance attract scientific and public attention. The Landscape Convention supports efforts to inventory different types of landscape, in particular for better management of the landscape (Council of Europe, 2000). This is also one of the objectives of the project "The inventory of the pre-industrial landscape of Moravia and ensuring public awareness of its existence as a cultural heritage" (Kolejka et al., 2018), which is in some sense the successor of earlier landscape classifications and surveys in a more complex way (compare Antrop & van Eetvelde, 2008; Antrop, 2002; Correia et al., 2002; Somper, 2002), while other studies have emphasized biodiversity in a changing landscape (at random, Dramstad et al., 2001; Aalen et al., 1997; Ihse, 1996). Also, UNESCO considers segments of the ancient (old) landscape to be a valuable cultural heritage (e.g. Bandarin, ed., 2009). Few countries or their regions have so far systematically registered this type of cultural heritage, e.g. Belgium (van Eetwelde & Antrop, 2005), Great Britain (Bunce et al., 1996), Slovakia (Slámová & Jančura, 2012; Hreško & Petluš, eds., 2015) and the Netherlands (Mücher et al., 2003) in the European landscape typology framework. Currently, the evaluation processes of the identified ancient landscapes are beginning only, both for the limited amount of material collected and for the evident novelty of the subject (see van Eetwelde & Antrop, 2005). Recently completed inventory of segments of the pre-industrial landscape of Moravia is an exceptional case of carrying out a comprehensive inventory of ancient landscapes in countries that have undergone radical changes in land use changes in the period of industrial society. One of the remarkable regions of Moravia is

the area of the Jeseníky Mountains and their foothills, where has preserved numerous segments of the pre-industrial landscape not only due to extreme foothill to high mountain natural conditions, but also social, political and ethnic changes after World War II.

LANDSCAPES OF THE JESENÍKY MOUNTAINS AND THEIR FOOTHILLS

The landscape of the Jeseníky Mountains and its foothills in the northeastern part of the Czech Republic (Fig. 1) appears to be specific both in (1) the type of preserved segments of pre-industrial landscape and in their (2) relatively high number and relatively (3) considerable individual sizes. These segments are located in the highest Hercynian mountain ranges of Moravia belonging to the Czech Highlands and Sudeten (Krkonoše-Jeseniky) system – from west to east: Králický Sněžník Mts. (max. 1423 m), Rychlebské hory Mts. (max. Mt. Smrk – 1127 m), Hrubý Jeseník Mts. (Mt. Praděd – 1491 m) and in their foothills – from west to east: Branenská vrchovina Uplands (max. Mt. Jeřáb – 1003 m), Hraběšická hornatina highlands (max. Mt. Kamenný vrch – 964 m) as a part of the Hanušovická vrchovina Uplands, and Nízký Jeseník (max. Slunečná – 800 m). These mountains are mostly built by Proterozoic/Paleozoic metamorphites (paragneisses, orthogneisses, phyllites, amphibolites) and hard Paleozoic sediments (mudstones, sandstones, arkoses, conglomerates, shales). Due to the dissected relief (but with the large top plateaus) and the relatively cold and humid climate, mostly poor cambisols, often waterlogged, and podzols with peat islets developed here.

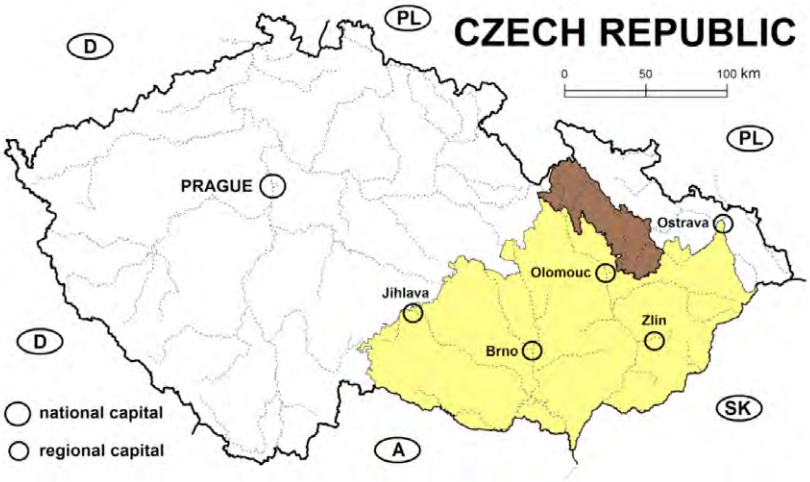

Fig. 1: The historical territory of Moravia (yellow) in the east of the Czech Republic with the Jeseníky region in the north (brown)

Source: own data processing

The vast majority of the detected segments (more than ¾ of the total 87) are in the elevation range (measured according to the geometric centers of the segments) 400-700 m a.s.l. (see Table 1). More than 15% of them are even at altitudes above 700 m a.s.l. (Fig. 2). This situation is facilitated by rounded ridges and relatively narrow watershed plateaus between deep forested valleys, which are found in all local types of relief (Table 2). The settlement and agricultural colonization of these areas probably took place already in the 14th century, although many of the first mention of the villages dates back to the turn of the 14th and 15th centuries. The colonization of forest mountain areas was dominated by members of the German-speaking population from the territory of present-day Germany, eventually the Netherlands and the Alps. The result of the colonization efforts were the so-called linear hide villages with characteristic parralel land parcels running from the linear built-up area to the edge of the cadastral area.

Tab. 1: The spatial distribution of segments of pre-industrial landscape (PreIL) in elevation zones in the Jeseníky region

No.	Sea elevation (in m)	PreIL (number)	PreIL (share in %)
1	201– 300	0	0,00
2	301– 400	5	5,75
3	401– 500	17	19,54
4	501– 600	32	36,78
5	601– 700	19	21,84
6	701– 800	13	14,94
7	801– 900	1	1,15
8	901–1000	0	0,00
9	1000+	0	0,00
Σ		87	100,00

Source: own data peocessing

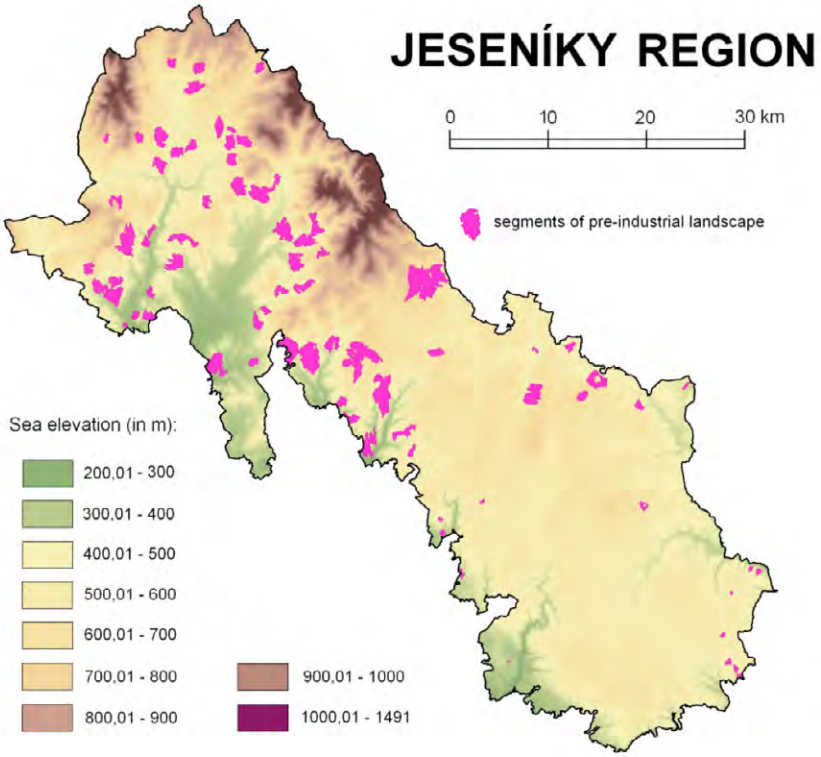

Fig. 2: Segments of pre-industrial landscape detected in the Jeseníky region (in the colour elevation zones)

Source: own data processing

However, it is interesting that even in the first half of the 19th century there were many (perhaps even most) mountain villages of the region (except for towns) having in addition to German names and Czech names as well.(Fig. 3). It can be estimated in general that the villages in higher elevation were more affected by the abandonment of land after World War II. The municipalities, which were established as mining localities, founded often later after the agricultural colonization, faced a particularly intense decline of their population, since their supplementary agriculture was localized to extreme slope and soil conditions and played a secondary role in the municipality's economy in times of prosperous ore mining. The segments of the pre-industrial landscape in these municipalities face intensive reforestation, both spontaneously by natural succession and purposeful afforestation. Originally extensive agricultural areas of arable land and pastures are currently covered by forest and are therefore not registered as segments of the pre-industrial landscape.

Fig. 3: Names of municipalities in the Jeseníky region on title pages of imperial prints of the Stable Cadastre from the 1830s.

Source: maps Moravský zemský archiv, own data processing

An interesting role in the current territorial distribution of segments of the pre-industrial landscape plays the type of relief in terms of vertical dissection (Table 2). As it is generally an elevated high mountain area, there is a very dissected relief. The differentiation of relief by river valleys reached the highest intensity in the uplands and mountains, while in the hilly lands remained extensive plateaus and areas of slightly undulated terrain separated by systems of deep valleys (Fig. 4). The territory in a more dissected relief of uplands and mountains, or large valleys in otherwise flat surrounding terrain thus especially resisted the post-war settlement and collectivization of the land. These dissected territories account for 74.58% of the Jeseníky region, but 94.81% of all identified segments of the pre-industrial landscape. This ratio is especially significant in the uplands, where almost 2/3 of the identified segments account for approximately 1/3 of the region's territory. On the other hand, plateaus and hilly lands make up 22.11% of the region, but only 3.06% of all identified segments. Obviously, the vertical dissection of the relief led favorably to the preservation of the ancient landscape structure. Due to more complex natural conditions, it was not subject to pressure on land consolidation after abandoning their agricultural use.

Tab. 2: Results of analysis of territorial distribution of pre-industrial landscape segments in relief types of Jeseníky region

No.	typ of relief	%	PreIK (n)	PreIK (%)
1	mountains	20,28	31	27,65
2	upland	37,54	69	59,86
3	hilly land	15,91	10	3,03
4	plateau	6,20	3	0,03
5	plain	2,28	5	0,82
6	valley	16,76	14	7,30
7	escarpment	1,01	2	1,31
8	inclined foothills	0,02	0	0
∑	total	100,00	134	100,00

Source: own data processing

Also regionally (see Table 3), it is clear that most segments of the pre-industrial landscape are concentrated in the foothills of higher mountain ranges, albeit rather in the contact area between foothills and mountains at higher altitudes (Figure 5). Most of the preserved remnants of the ancient landscape remained in the northwest end of the region, peripheral in terms of location (at the state border), as well as of economy and population (relatively far from large cities and key roads in areas with low population density). Many of 87 identified segments are also divided into more parts (totally134) into different types of relief by their natural borders (Table 2).

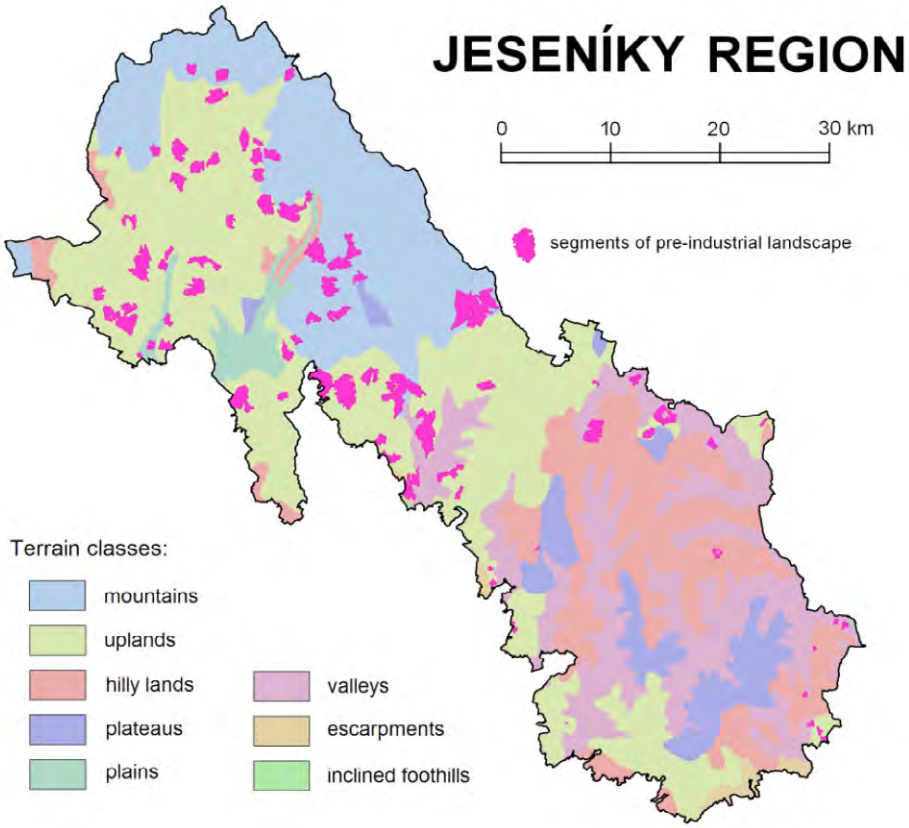

Fig. 4: Location of segments of pre-industrial landscape in relief types in Jeseníky region.

Source: own data processing

In the foothills of the Branenská vrchovina and Hraběšická hornatina regions, more than 50% of the identified segments of pre-industrial landscape (50.76%) are concentrated. Together with Nízký Jeseník it is a total of 72.89%. Among other mountain assifs, Hrubý Jeseník Mts.only show a significant number of segments (almost 25%). A number of segments are shared together by mountains with foothills (this way 104 fragments originted). Hrubý Jeseník Mts. have a central location in the region, while the Rychlebské hory Mts. and Králický Sněžník Mts. represent an extreme periphery. The valleys of Hrubý Jeseník are open to economic influences from the south, and therefore the abandonment of agricultural land and afforestation has not reached the dimensions known in cadastres further to the northwest, although the arable land conversion to grassland is at the same level.

Tab. 3: Results of analysis of territorial distribution of pre-industrial landscape segments in individual mountains and foothills of the Jeseníky region

No.	Sub-region	Share (in %)	PreIK (number)	PreIK (share in %)
1	Králický Sněžník	2,34	1	0,52
2	Rychlebské hory	2,55	5	1,62
3	Hrubý Jeseník	15,42	24	24,97
4	Branenská vrchovina	19,15	31	34,14
5	Hraběšická hornatina	6,83	10	16,62
6	Nízký Jeseník	53,71	33	22,13
∑	total	100,00	104	100,00

Source: own data processing

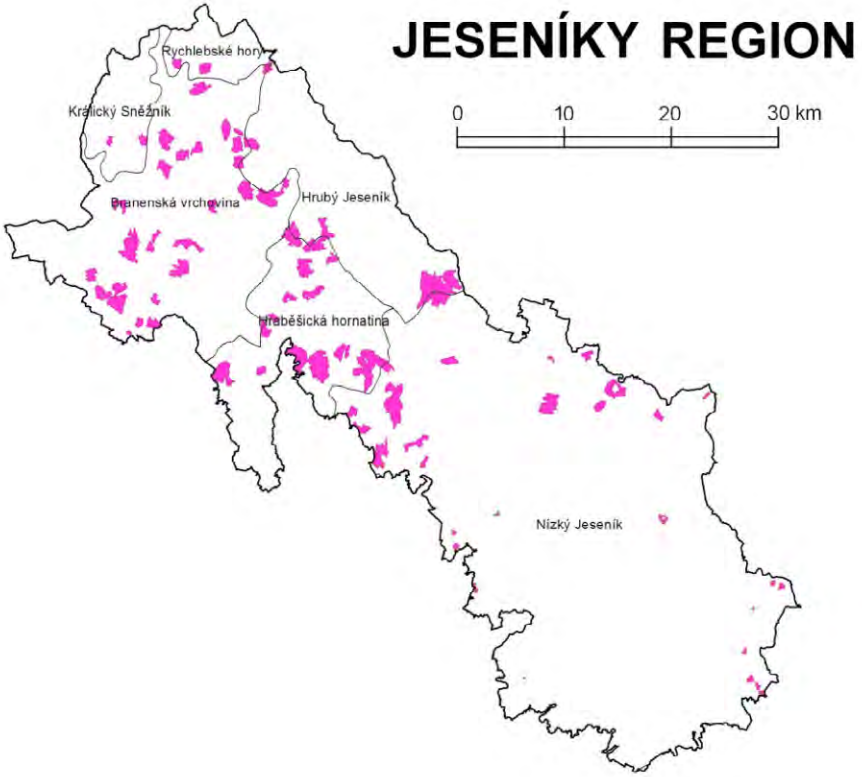

Fig. 5: Position of segments of pre-industrial landscape in sub-regions of the Jeseníky region.

Source: Landscape Atlas of Czech Republic, modified

The local configuration of the relief greatly influenced the layout of the land of linear hide villages, where each farmstead was followed by an elongated plot (Fig. 6). There are basically three types of land arrangement with regard to the slope of the relief.

Fig. 6: Types of land organisation in linear hide villages of the Jeseník regions in well-preserved segments of pre-industrial landscape (Legenf: 1 – forests, 2 – shrubs, 3 – meadows and pastures, 4 – forest nurseries, 5 – orchards, 6 – arable land, 7 – abandoned areas. 8 – urban areas with buildings and gardens, 9 – isolated buildings, 10 – roads, arrows indicate the down slope direction.

Source: Own data processing.

The land to the northwest of the village Břevenec is are still mostly horizontally arranged along the contour lines (between 320–400 m a.s.l.) on the marginal slope of Nízký Jeseník Uplaands above the fertile plains of the Hornomoravský úval lowland. The upper part of the village is in a narrow valley, while the lower part is already in the plain. The plots are arranged perpendicularly to the longitudinal axis of the village.

Sobotín municipality located in the deep valley of Hrubý Jeseník Mts. about 10 km northeast of the district centre Šumperk shows a large landscape segment with preserved pre-industrial structure of the land use on slopes (between 450–670 m a.s.l.) to the east from the village. The plots are arranged perpendicularly to the longitudinal axis of the development, but downhill along the slope. Such character of land organisation has a relatively large number of segments of the pre-industrial landscape in the Jeseníky region.

The Hartíkov settlement, now part of the village of Bušín, is situated on the western slope of a long round ridge extending from the Mt. Kamenec (912 m) to the southeast to the Morava River, about 10 km west of Šumperk. Due to its location in the shallow dish-shaped end of a small valley with plots reaching up to the watershed (between 500–630 m a.s.l.), the land arrangement is significantly influenced by the local relief in the preserved segment of pre-industrial landscape. The parcelling takes the form of a fan converging from the sides of the arches into the center. The plots comming downhill from the watershed lead straight to the edge of the village, where they suddenly turn to the center of the village. Such an arrangement of land is typical for municipalities located bear-by flat ridge tops.

CONCLUSION

Preserved segments of pre-industrial landscape of the Jeseníky region mostly correspond to the type of so-called linear hide colonization villages, whether they were inhabited by Czech or German ethnic groups or both together. They document representative examples of the natural and cultural heritage of the region. In contrast to the original agricultural use with the predominance of arable land, grasslands of meadows and pastures dominate at present. Once narrow edges are highlighted by tree or shrub lines. The main degrading factor of the original land use structure is spontaneous or organised afforestation. This leads to a gradual change in the landscape from mountain farming to mountain woodland. Afforestation is particularly striking in the less accessible peripheries of cadastral areas, distant from local economic centers. Narrow parallel parcel merging into larger units is (rather was) common if there were only dran edges between the original fields. At present, the tree or shrub lines on edges are often cut by punching transverse passages for agricultural machinery and for cattle herds, or for conducting the electricity lines.

Although a considerable part of the identified segments of the pre-industrial landscape of the Jeseníky region is already subject to some conservation attention within the Jeseníky PLA, most of them (and often well preserved) remain out of reach of the nature and landscape conservation authorities. The protection and care of the old structures of the local mountain cultural landscape would be particularly beneficial for the local public and the businessmen to be aware that it is an interesting historical heritage typical of the region, which could, if not already is, surely constitute an extraordinary attraction in the future for visitors. In the relatively less favorable conditions for the development in the foothills (mountain areas are already overloaded by intensive winter and summer recreation now), the preserved segments of the pre-industrial landscape can represent a significant tourist potential, the romantic and harsh environment for historical movies or contemporary scenarios. Then only specially selected most valuable representative segments of the ancient cultural landscape could enjoy a legislative protection.

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Shrnutí

V současné době kultivovaná lidská společnost zaměřuje svoji pozornost na přírodní a kulturní, resp. historické dědictví. Vedle chráněných území a památkových objektů se do centra zájmu dostává rovněž průmyslové dědictví. Poněkud stranou zůstává zachovalá běžná (nikoliv parkovní) kulturní krajina z doby před průmyslovou revolucí. V ČR neexistuje pokryvná inventarizace segmentů předindustriální krajiny a ani iniciální náznaky její ochrany, resp. regulovaného managementu. Kolektivizace zemědělství a zestátnění lesů v období reálného socialismu vedlo ke spojování pozemků drobných vlastníků do rozsáhlých homogenních ploch, které zcela překryly staletí formovanou pestrou mozaiku polí, luk a lesů. Privatizace půdy po ekonomických a politických změnách v bývalém Československu po roce 1990 trend spojování pozemků ještě zesílila. Drobné parcely zemědělských kultur jsou tak v současné krajině vzácností a stávají se předmětem zájmu statní ochrany přírody, krajiny a životního prostředí. Současně se o takové areály zajímá místní administrativa jako o atraktivní turistický objekt, který může do lokalit přilákat návštěvníky. Na historickém území Moravy (východní 1/3 území ČR) byla po jednotlivých katastrálních územích provedena regionální inventarizace ploch se zachovalou starobylou strukturou využití ploch (nejen drobná parcelace, ale i šlechtické velkostatky na zemědělské a lesní půdě) z doby před hlavní vlnou průmyslové revoluce na Moravě, tedy před rokem 1850. Každá lokalita byla posuzována z 10 hledisek. Všechny lokality byly vloženy do geodatabáze GIS a provedena jejich mnohoparametrická analýza za účelem odhadu možností zákonitostí jejich prostorového výskytu. Vlastní geodatabáze je také určitým svědectvím jejich současného stavu a míry ohrožení. Lokality jsou stále podrobovány ekonomickému tlaku na spojování pozemků a jejich velkoplošné využití. Jejich existence do budoucna je ohrožena a každoročně jich ubývá. V příspěvku jsou demonstrovány výsledky inventarizace, dokumentace a hodnocení zjištěných segmentů předindustriální krajiny Moravy na příkladu regionu Jeseníky.

GEOGRAPHICAL APPROACH TO THE ANALYSIS OF ELECTIONS ON THE EXAMPLE OF PARLIAMENTARY ELECTIONS IN SLOVAKIA IN 2016

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Abstract: With regard to surprising results of Parliamentary elections in Slovakia their geographic dimension is also important. The aim of this article is to analyze the milieu of elections and the subsequent spatial differentiation of the results of the 8 parties which were successful to enter the Parliament. Election data were processed via the diversification of election preferences, the identification of areas of election support and correlation analysis by means of which the mutual cohesion of individual parties election results was studied. We found out that within the diversification of election preferences the one party dominance – the winning SMER – SD (40 out of Slovakia's 79 districts) – prevails. Further we have

Key words: Parliamentary elections Slovakia area of election support disintegration of central right extremism

INTRODUCTION

This has been already the seventh occasion in the era of independent Slovakia, when in March 2016 the Slovak citizens voted for their representatives to the national parliament. Taking into account the possible extension of the Direction – Social Democracy's (SMER – sociálna demokracia, SMER-SD) „hegemony" we also witnessed electors' mobilization (voter turnout almost 60%) and the results of these elections can be labeled as surprising. Exactly for this reason the interpretation of the elections results from the viewpoint of geography is very important.

The aim of this article is to give a brief analysis of electoral political parties which passed the system, milieu of elections and consequently a detailed spatial differentiation of the results of 8 political parties which met the requirement of passing the 5% election threshold in order to advance into the Parliament. The individual districts' election data were processed via the diversification of election preferences, the identification of areas of election support and correlation analysis by means of which the mutual cohesion of individual parties election results was explored.

ELECTION SYSTEM

At the elections into the National Council of the Slovak Republic (Národná rada Slovenskej Republiky), the proportional representation system is applied as it is in majority of European countries whereby there is a 4-year election term in a single multi-member constituency. New election rules valid as of 1st of July 2015 have not caused significant changes in the election system of Slovakia. These changes modify election rules and the election campaign (e.g. they set limits of financing election campaign, moratorium on leading the election campaign, moratorium on disclosing of election surveys etc.) (Coll. of Laws, 2016a, 2016b).

Voters can choose one of the nominated political parties, movements and coalitions. Via preferential voting they can choose up to 4 politicians from the so called bonded candidate list. Identical system issued in election system of countries e.g. Greece, Norway, and Czechia etc. Each party must cross the 5% threshold to gain seats, and this barrier is slightly higher for coalitions (Spáč, 2014). The votes are redistributed via Hagenbach-Bischoff quota, meaning the number of mandates is redistributed according to the acquired number of votes received by the nominated political parties. There are 150 seats in the unicameral Parliament. As the constituency in the Parliamentary elections is the whole state, the mandates are divided only in one scrutiny (Horváth, 2004).

ELECTION MILIEU

The election atmosphere in Slovakia was influenced by early national elections in 2012, when the voters gave unequivocal support to SMER-SD.

After a series of unsuccessful albeit formal attempts to create a coalition the representatives of SMER-SD having reached a result of 44.41% decided to create a unicolor gov-

ernment, first unicolor government after the velvet revolution of 1989. Thus a concentration of power occurred on the state level (majority in the Parliament and uncolored government). SMER-SD also scored successfully on the regional and local levels.

Massive success of SMER-SD in the elections had had an influence on the gradation of fracturing of the Slovak right-wing (conservative and Christian) parties following 2012. These parties represented by Christian Democratic Movement, (Kresťanskodemokratické hnutie KDH), Ordinary People and Independent Personalities (Obyčajní ľudia a nezávislé osobnosti, OĽaNO), Bridge (MOST-HÍD), Freedom and Solidarity (Sloboda a solidarita, SaS) and Slovak Democratic and Christian Union – Democratic Party (Slovenská demokratická a kresťanská únia – Demokratická strana SDKÚ-DS) kept constantly fragmenting and loosing deputies in the Parliament. These deputies then founded new political parties or joined other right-wing parties. This resulted then among others into the presence of new political parties in the Parliament which actually did not take part in the early national elections of 2012. These parties include: Up! (Skok!), Chance (Šanca), #Net (#SIEŤ), NOVA, Slovak Democrats – Ludo Kaník (Demokrati Slovenska – Ľudo Kaník. In general the right-wing parties performed patchy and were unable to form a counterweight to SMER-SD.

From the point of view of foreign politics the uncolored government of SMER-SD adjoined to the European mainstream lines of which the party abandoned only after the reactions to the EU migration policy in 2015 by refusing the EU quotas on migrant resettlement (Haughton, Deegan-Krause, 2016).

Between 2012 and 2016 Slovakia has classified itself to the EU countries with the highest economic growth, whereby e.g. Slovakia's GDP has increased by 3.5% (European Commission, 2016). The government noted success by increasing incomes, decreasing tax leakage, decreasing the unemployment rate as well as decreasing the state budget deficit. Slovakia remained attractive to the foreign investors which can be illustrated by the announcement of the government in the December 2015 about an arrival of a great investor to Slovakia, Jaguar-Land Rover, being already the fourth automotive company to have settled in Slovakia. Satisfactory economic situation has an influence on introduction of so – called social packages (e.g. a lower tax rate on certain goods, free trains for certain groups of inhabitants, increase of maternal leave allowance, increase of minimal salary, subsidy to ski excursions, contribution to heat cladding etc.) which were seen as populistic and controversial by the political opposition. Despite its dominance the government did not resolve to perform reforms in education system and health care. The period of SMER-SD government was also marked by several corruption affairs (overpriced orders in public competitions) and clientelism (case Váhostav).

The election campaign started on the day of their announcement i.e. 12. 11.2015. 23 political parties and movements took part in election representing the second largest number of political subjects taking part in general election. These political parties represent a whole ideological spectrum ranging from far-left represented by Communist Party of Slovakia (Komunistická strana Slovenska, KSS) and RESISTANCE – labor party (VZDOR – strana práce) to the far–right from Kotleba's Party – People's Party – Our Slovakia (Ľudová strana – Naše Slovensko, ĽS – Naše Slovensko).

Within the themes of the election campaign the topic of migration dominated reflecting the situation in Europe. It was a crucial topic for SMER-SD in particular. It is coming out of the mainly refusing attitude of Slovak society towards the redistribution of refugees and to the migration crisis itself respectively. The government of Robert Fico held a clear and refusing stand-point to the question of redistribution of refugees and to the migration crisis itself.

SMER-SD proclaimed itself into the role of the only „protector" of Slovakia against the migrants, which according to its representatives no opposition party could guarantee. On the contrary, in political debates the representation of SMER-SD warned that a possible rightist government will be helpful in the question of accepting the migrants to Slovakia. Protesting teachers and multiple resignations of health staff both dissatisfied with the state of and in their resorts has muted the topic of refugees' redistribution. The party in power – SMER-SD was unable to react promptly to these events which later proved to be one of the key moments during election campaign.

Next theme of election campaign was an attempt of SMER-SD to discredit the leader of OĽaNO party which point-blank called attention to corruption and clientelism of SMER-SD. At this attempt the Slovak PM used confident data – records of tax inspection of OĽaNO party leader I. Matovič which he could not get access to legally (Krbatová, 2016).

Election campaign of opposition parties was waged in spirit of two basic premises. The first one was an effort of securing their entrance to Parliament. The conservative and Christian parties performed solely as competitors within the right scope of the political spectrum. All these activities confirmed the inability of Slovak right to create a united alternative against the government of SMER-SD. The other premise of Slovak right parties was their restriction to the possible coalition cooperation with SMER-SD. This delimitation, however, was of a different intensity whereby explicit refusal of cooperation with SMER-SD was declared only by SaS and OĽaNO a NOVA which created a coalition prior to the elections.

Thus the general parliamentary elections were supposed to present an answer to the question, whether the government of SMER-SD which was responsible for both positives and negatives is going to sustain, or whether there is going to be a political restart of Slovak right parties.

DATA AND METHODOLOGY

The data provided by the Slovak Statistical Office relating to the 2016 general elections to the National Council of Slovak republic were the entry data for the analysis of spatial differentiation of elections results of political parties and their election behavior (Slovak Statistical Office, 2016). The basic spatial application unit were districts due to the availability of their statistical data which we can, according to Madleňák (2010) consider for political regions on a sub-state level.

In this study we applied three methods standardly used in political geography. To evaluate election preferences we chose the method of their diversification in which the ra-

tio of election gains of the competing political parties in individual regions is explored. To be more precised we aimed to identify the status of the dominant political party or dominant political parties respectively in relation to the gain of other partaking political subjects. In accordance with Madleňák (2012), we have identified three typologically different regions based on establishing the degree of diversification of election preferences:

regions with dominant position of one political subject, the election gain of which markedly exceeds the gains of other parties,

regions with dominant position of two political parties the election gains of which are mutually relatively equal, however the gains of the rest of the partaking political subjects are significantly lower, these are so called regions with polarized election behavior,

regions in which the electorate base is relatively equally divided among several competing parties, where the differences of election gains are not significant – we refer to these regions as to the regions with fragmented election preferences.

For the purpose of identification or on the contrary for the purpose of excluding the dominance of one political subject in the given region we used the index of dominance as defined by Kowalski and Śleszyński (2000) as follows:

$$I_D = \frac{A_{max}(A_{max} - B_{max})}{(A_{max})^2}, \text{ where}$$

ID represents the index of dominance, Amax the relative number of votes given over to the party with the highest sum of votes in the given region and Bmax the relative number of votes given over to the party with the second highest sum of votes in the region in question

We can refer to a region as to a region with dominant position of one political subject only if the following condition is met 30% <Amax> 133% Bmax. It is precisely this condition which causes, that the index of dominance receives values in the range from 0.25 which is a minimal dominance of the winning political party to 1, which is a value representing a maximal dominance of a political subject in the region in question. A political party with such an index would obtain 100% of valid votes in the region. Within the given index we set up 3 categories, which are going to help us to establish the degree of dominance more precisely:

- low degree of dominance (0,25–0,449),
- medium degree of dominance (0,45–0,649),
- high degree of dominance (0,65 and more).

As presented by Plešivčák (2013), if in the selected region no dominance of one political party emerges, in this case it is rational to consider the existence of a polarized formula of election behavior. This election behavior can be identified in terms of above mentioned authors as follows:

$$I_P = \frac{A_{max} + B_{max}}{100} + \frac{B_{max}}{A_{max}} - \frac{C_{min} x D_{min}}{2(A_{max} x B_{max})}, \text{ where}$$

ID represents the index of dominance, A_{max} the relative number of votes given over to the party with the highest sum of votes in the given region, B_{max} the relative number of votes given over to the party with the second highest sum of votes in the region in question, Cmin the relative number of votes given over to the party with the third highest sum of votes in the region in question and Dmin the relative number of votes given over to the party with the fourth highest sum of votes in the region in question. We can speak about polarized formula of election preferences if the following condition is met $60\% - B_{max} < A_{max} < 2B_{max} - C_{min}$.

If in the studied region in case of evaluating of the mutual ratio of elections gains of political subjects neither dominance nor polarization of election support is confirmed then we speak about fragmented formula of election behavior of its inhabitants.

Electoral geography uses several methods to analyze inherent laws of regional lay-out of political parties' support. For our needs we have chosen generally accepted method of identification of the area of electoral support by Jehlička and Sýkora (1991), which was also used in works of Szöllösz (2006), Madleňák (2012), Mikuš (2014) and others. It is a combination of relative data of the level of electoral support with the figures of real number of votes in individual regions, by which the disadvantages connected to unilateral usage of either relative or absolute data is partially removed. Regions are listed in a descent manner according to the relative value of electoral support for a given political party.

According to this sequence, presenting the decrease of the intensity of electoral support, the absolute numbers of votes for a given political party are added up in a cumulative manner. Regions, which are according to cumulated relative ratio in the first quarter of the total number of votes of a political party represent a core of electoral support area. For regions which are located in the band of 25 to 50% we use a term periphery of electoral support area. This category also includes regions which are outside its boundary especially in case if the cumulative addition of votes of a given category was – after inclusion of this region was closer to the set limit than when this region was not included. Regions which are not part of the aforementioned intervals can be considered to be areas which are – from the point of importance of electoral support of a certain political subject – irrelevant.

For the study of mutual interconnection of election gains of individual political parties within parliamentary elections the correlation analysis was used, to be more precise Pearson's correlation coefficient. Positive correlation coefficient between two compared parties signifies a similar type of voters, being addressed by the two parties. A negative coefficient, on the other hand notes to a relation when the parties compared are usually on the opposite ends of some conflict lines and usually their voters are in confrontational mood with the other party, The figure of Pearson's correlation coefficient points

to a strength of mutual coherence or mutual difference of parties. Where the Pearson's correlation coefficient in the mutual relation is close to 0, there is no significant relation between the voters of political parties. On the contrary, where the figures are approaching 1 (or -1 respectively), we can observe either a positive or negative bonding between the voters of political parties.

ELECTION RESULTS

2 648 184 of qualified voters partook in the general elections in March 2016, which represents an election turnout of 59.82%. 8 parties crossed the 5% threshold and thus gained seat in the National Council.

SMER-SD – has won for the third time in the history of Slovakia's Parliamentary elections. 28.28% of the electorate has voted for it (737,481 votes), however the opinion polls were suggesting results close to 35%. In comparison with the 2012 election results however the winning SMER-SD booked a loss of almost 400 thousand votes, which meant that the next step of the party was going to be looking for coalition partners despite the fact that some parties had had refused coalition cooperation with SMER-SD. The reasons for the losses of SMER-SD in 2016 elections can be explained by the fact that all corruption cases were solely SMER-SD's cases since it was the only political party that had created government. The party was also unable to satisfy the expectations of its voters in social issues and towards the end of its governing period it reacted arrogantly against strikes of teachers and health personnel. SMER-SD won in 70 out of 79 districts of Slovakia with the exception of districts with Hungarian population as well as district of Senec Košice I. and the districts of the capital city Bratislava which witnessed a return to conservative and liberal formula in sense of Madleňák (2012).

The results of parliamentary elections confirmed the crisis of centre-right parties. The most successful centre-right party scoring 12.1% is became the liberal SaS party. Its success could be ascribed to its position of an outsider at the beginning of the campaign as confirmed by the election polls. Behind its election success is a strict rejection of cooperation with SMER-SD as well as anti-migrant rhetorics and criticism of EU. The voters were also attracted by its campaign on the social network. SaS party profited from the inability of MOST-HÍD, KDH and #SIEŤ to such an extent that the voters forgave SaS its position and role leading to resignation of their own government in 2011 or their failure to fulfill several promises including the promotion of gay rights and decriminalization of marihuana.

The coalition OĽaNO – NOVA convinced 11.02% voters by the anti-corruption image and policy based upon criticism of SMER-SD and unambiguous refusal of post-election cooperation with SMER-SD.

Slovak National Party (Slovenská národná strana, SNS) has returned to the Parliament after receiving votes of 8.64% of voters. The reform of the SNS and the reduction of nationalistic rhetorics has had a positive effect on its voters. SNS has not abandoned its critical view on EU and NATO.

The biggest surprise of these elections is the huge success of the radical right-wing party Kotleba – ĽS Naše Slovensko, which attracted more than 200 000 voters (8.04%) thus proceeding its successful performance at the Elections to the bodies of self-governing regions of Banská Bystrica region in 2013. In the Parliamentary elections it exploited the frustration of great many voters, who by voting for Kotleba, expressed radical protest against the standard political parties, which were dividing the power in state by means of democratic elections.

The disappointment with the work of standard political parties was also exploited by the youngest political subject of the political stage – the WE ARE FAMILY – Boris Kollár (SME RODINA – Boris Kollár, SME RODINA) movement which has surprisingly gained 6.62%. This movement attracted the voters above all by its anti-migration rhetorics. Furthermore, the movement presented itself as a subject of a protest against all of political parties which was documented by their election slogan: „I do not vote for politicians, I vote for Boris!".

Civil Party which aims to join the nationalities with the majoritarian population of Slovakia, MOST-HÍD entered the Parliament with almost identical election result as it had gained four years earlier. The reasons of election loss of the MOST-HÍD party could possibly be its milder reaction to migration crisis and shift of some of its previous voters to other parties oriented on Hungarian minority e.g. Party of Hungarian Community (Strana maďarskej komunity – Magyar Közösség Pártja, SMK-MKP).

#SIEŤ was supposed to become a leader of opposition parties at least that is what the election polls were signalizing. These suppositions were also confirmed by the result of the party's leader R. Procházka who got 24% support the year before at the presidential elections of 2015. It is also for this reason that that its gain of 5.6% is perceived as disappointment. This result was marked by the party leader's ambiguous comments regarding possible future cooperation with SMER-SD.

The voters did not nominate into the Parliament standard conservative parties KDH a SDKÚ-DS which just confirmed the destruction of Slovak center-right parties.

DIVERSIFICATION OF ELECTION PREFERENCES

The results of democratic elections into the Slovak Parliament gave us an opportunity to outline regions with dominance of one political party as well as regions with fragmented and/or polarized formulas of behavior using the method of diversification of election preferences.

The biggest representation has regions with dominance of one political party (Fig. 1). We identified this type in case of 41 districts. In 40 districts the winning SMER-SD has dominated and only in district of Komárno SMK-MKP – an outside the Parliament party founded on the nationality principle dominated. We further divided these regions with the dominance of one political party into regions with high, medium and low degree of dominance.

High degree of dominance of SMER-SD shows two regions of Slovakia – one in the NW of Slovakia, the other in the East. Three districts: Gelnica, Stará Ľubovňa a Čadca in total of 17 districts are isolated outside the mentioned regions. We identified medium degree of dominance of SMER-SD in districts located in the western, north-western, central and eastern parts of Slovakia. In total the medium degree of dominance was identified in 21 districts. A low degree of dominance was identified in three districts. Two in favour of SMER-SD Trenčín and Krupina. District Komárno is a district with a low dominance of SMK-MKP party.

We identified polarized election behavior only in the district of Dunajská Streda where the voters preferred SMK-MKP and MOST-HÍD parties, which are traditionally favoured by the Hungarian minority.

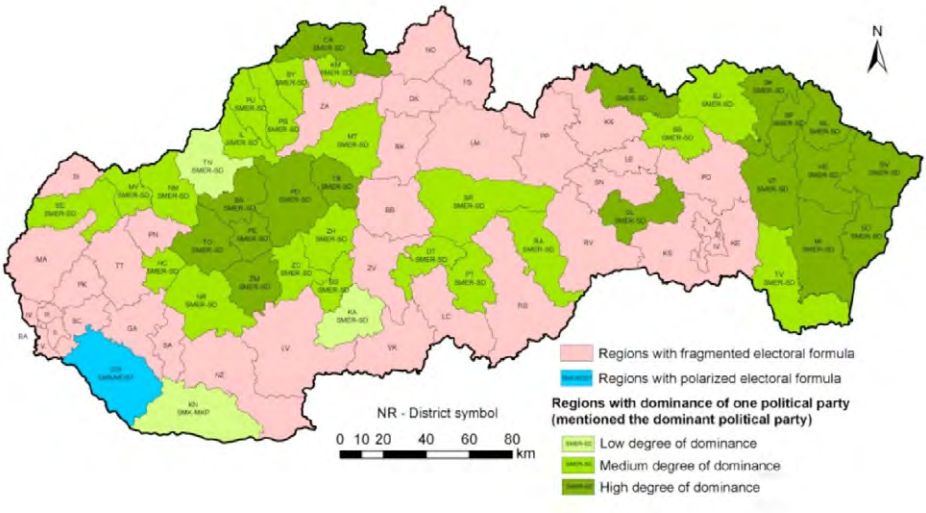

Fig. 1: Regions of Slovakia according to diversification of election preferences.

Source: according to Slovak Statistical Office, 2016, processed by authors.

Using the method of diversification of election preferences we have also identified a region with fragmented electoral formula. This region is made up of 37 districts of Slovakia. The reason of fragmented electoral formula is a fragmentation of Slovak central and conservative parties in districts of western Slovakia and in six districts with regional cities where voters traditionally favor central and conservative parties. In the other regions of Slovakia the fragmented electoral formula is a result of the conflict between right and left parties of the political spectrum.

IDENTIFICATION OF THE AREAS OF POLITICAL PARTIES ELECTORAL SUPPORT

The area of electoral support of the winning party **SMER-SD** is with its rate the biggest. It represents 39 districts out of which the superelectoral i.e. creating the core of the support are 21 districts (Fig. 2).

Three regions of coherent support of SMER-SD party can be identified on the map. The first one runs along the border with Czech Republic from the district of Senica, across the district of central Považie and Kysuce. The region extends in southern east direction to Ponitrie with tips to the region of Turiec and Pohronie respectively. Within this region, 10 districts represent superelectoral districts. These areas naturaly incline to parties of the left with a strong leader who offers social securities. In the past these values were represented by (Party of the Democratic Left (Strana demokratickej ľavice, SDĽ), Movement for democratic Slovakia (Hnutie za demokratické Slovensko, HZDS) and at present by SMER-SD. In case of Považie, since 1989 these are the districts which have undergone a transformation along with its negative impact mainly in the machinery industry (i.e. high unemployment rate). These districts have rural character with a high ratio of worker professions which naturally incline to left values. Guarantees of social securities presented by SMER-SD triggered a formation of superelectoral region in Ponitrie in which it is necessary to give notice to district Prievidza. In this district the party gained the second highest number of votes. This is a typical mining region with state donation for mining, continuity of which was promised precisely by SMER-SD.

The inclination to left parties and to social programme is a reason for forming of another region of electoral support of SMER-SD. It is located in the northeastern tip of eastern Slovakia. It is created by 8 superelectoral regions of Lower and Upper Zemplín, north of Šariš and a part of Zamagurie region. The historical preference of parties of the left can be documented, among others, by the victory of KSS (Komunistickej strany Slovenska/ Communist Party of Slovakia) in the district of Medzilaborce in the parliamentary elections of 2002. Four years later it was precisely in this district where SMER-SD, after profiling itself as a left party with a strong leader, gained its best election result.

The smallest region of electoral support of SMER-SD is the region in central Slovakia. It is formed by 3 districts, out of which Poltár and Detva we filed into the region of superelectoral support of the party. Along with district of Brezno these districts represent districts which copy rather hardly with the changed situation connected to the transition of Slovakia to market economy. This again is responsible for the preference of left parties' offering social securities. The same reasoning applies to the isolated superelectoral district of Gelnica.

Area of election support of liberal party **SaS** (Fig. 2) is formed by 19 districts out of which 6 districts are superelectoral. These are bound to the highly urbanized parts of western Slovakia. Voters in these districts prefer liberal and conservative values respectively. Similar values are also preferred by voters of the town district of Košice – the only election

region of SaS party in eastern Slovakia. The remaining areas of electoral support are connected to the electorate with traditionally right election formula. The party has profited in these regions mainly due to the crisis which plagued the standardly preferred parties SDKÚ-DS and KDH.

Mostly with its anti-corruption rhetoric the Slovak electorate delegated the **OĽaNO-NOVA** (Fig. 2) coalition of parties into the parliament. From the viewpoint of transformation of election results of this coalition we identified three regions of election support. First region is located in the western Slovakia and is formed by 13 districts, which with exception of districts Skalica and Trenčín create a homogenous area. Within them the superelectorate regions are the town districts of Bratislava I., III. and IV., which documents the traditionally central-right orientation of electorate of metropolitan city. The districts of Trnava, Pezinok, Piešťany and Skalica, also belong to category of superelectorate regions where voters prefer central-right parties.

The second region of electoral support was identified in the central and northern parts of Slovakia. It is formed by 6 districts out of which the district of Tvrdošín is superelectoral. This fact documents a correction of election formula of the electorate of this district, since the districts of Oravaregion, (where the district of Tvrdošín belongs) traditionally identifies itself with conservative, christian values.

The last election region of this party we identified in eastern Slovakia. It is created from 7 districts, out of which 4 town districts of Košice and Prešov with strong urban influence are superelectorate districts. It is possible to confirm the preference of liberal parties in metropolitan cities in this case as well Krivý (2000).

From the viewpoint of spatial analysis of parliamentary elections has **SNS** (Fig. 3) being historically the oldest political subject in Slovakia 2 compact regions of support. The largest region consists of 30 districts, of which 16 are superelectoral. It is connected to northwestern and central Slovakia with the exception of Banská Bystrica. This is an ethnically homogenous region, whose voters on historical basis manifest in elections as well their attitude to Slovak nationality. In this region the SNS acquired 45.6% of all of its votes. The second region of electoral support from the point of view of rate as well as area is located in the northeast Slovakia. It is formed of 6 districts out of which the 2 easternmost districts of Slovakia Snina and Sobrance we identified as superelectoral. This region had profiled itself in the previous elections despite the fact that majority of its voters incline traditionally to left parties.

Rather surprisingly the far-right extremist party **ĽS Naše Slovensko** (Fig. 3) has made it to the Parliament as well. The party presented its dismissive stand-point to Roma question and it also promotes the exit of Slovakia from the EU and NATO. Regions of election support of this party are 39 districts in total. These are mainly concentrated in the central and eastern Slovakia. In the north of central Slovakia a distinct superelectorate region emerged formed by 7 districts. In these districts the voters are traditionally very perceptive to emphasising of national and christian values, which were presented in the program of this party. Another pillar that helped the party was a populistic solution of social problems, which could have addressed a lot of unemployed in these districts. The

national, christian and social motive had been already once used successfully in this region by Hlinka's Party in 1935.

The second superelectoral region is located in the south of central Slovakia. It is an area where the party has booked its first election success. In the elections of 2013 for the post of the chairman of Banská Bystrica Self-governing region the leader of the party Kotleba won. The mentioned superelectoral region is made up of 9districts which share in common a substantial unemployment rate caused by the reluctance of finding a solution to the slow decrease of the machinery including weapon) industry as well as the abolition of the agricultural cooperatives following 1989. Inhabitants of the region in question belong to the poorest in Slovakia is seeking a new leader since they have until then strongly supported R. Fico of SMER-SD has neglected these districts.

As strong, horseshoe-like region of electoral support formed in the east of Slovakia and is formed of 11 districts out of which the districts of Stará Ľubovňa, Kežmarok, Poprad, Gelnica a Vranov nad Topľou are regions of superelectoral support. Again, these are low-income regions with a slightly more significant number of Roma minority.

From the viewpoint of spatial analysis of parliamentary elections one of the youngest o political subjects (established only 6 months prior the election) **SME RODINA** (Fig. 3 has got 2 more significant regions of election support. The first one is localized in western Slovakia (formed of 12 superelectorate districts) and the second one in eastern Slovakia in town districts of Košice and Košice – okolie with 3 superelectorate districts. Both of the regions have a compact character. Three districts – Zvolen, Liptovský Mikuláš a Spišská Nová Ves - located in isolation have an attribute of periphery of election support where the support of the party can be ascribed to the voters in towns.

MOST-HÍD (Fig. 4) is a party the aim of which is to defend the interests of the state-forming nation and of the Hungarian ethnic minority living in Slovakia. Based on the election results of the party we identified a region of electoral support formed of 12 districts in the south of Slovakia (arithmetically the smallest representation out of all parties). The superelectoral region is formed of 4 districts in the southwest Slovakia. The election periphery of this party is represented by 8 districts all of which, apart for some minor exceptions, stretches through the districts on the Slovak – Hungarian border. The results of MOST-HÍD the leader of which is Béla Bugár, originally a representative of Hungarian minority in Slovakia, confirm the traditional election formula of the voters from the districts with significant presence of Hungarian minority, since regions of support copy districts with distinctive presence of Hungarian minority. For MOST-HÍD to get into Parliament it is important to note the fact that by their moderate politics they manage to address a portion of conservative right voters of other districts, even though these districts did not make it into regions of election support.

The last political party which crossed the 5% threshold is **#SIEŤ**, which was running in the elections for the first time. From fig. 4 we can identify 4 more compact regions of election support of the party and one individual district – Skalica. As for the number of addressed voters, there are two almost identical regions: Bratislava's region and a region in east Slovakia. In each of these regions the party gained 15% or its votes. In Bratislava's

region and in the southern part of region in east Slovakia it was the electorate of bigger cities, who are tending to favour central and conservative right parties. (i.e. Bratislava, Košice, Prešov. The election formula of inhabitants of superelectorate districts of Levoča and Sabinov reflect in the long-term an orientation to christian values. In the region of northern Slovakia we identified 3 superelectorate districts from Orava – Námestovo, Dolný Kubín, Tvrdošín and 1 superelectoral district from Upper Nitra – Prievidza. The electorate of Orava region inclines to christian values, for this reason the voters preferred the conservative KDH. Electorate of KDH was gained by #SIEŤ whose election leader had begun his political career precisely in this party. In case of the superelectorate district Prievidza the phenomenon of "countryman" has possibly played role as the mayor of the town she was 2nd on the voting list of #SIEŤ and she left the party shortly after the elections) comes from this district. The smallest region of selection support from the point of view of number of votes is formed by districts of Banská Bystrica, Zvolen and Brezno, where the majority of votes the party gained in town settlements. None of them is a superelectorate district of election support though.

MUTUAL CONNECTION OF ELECTION GAINS OF INDIVIDUAL PARTIES WITHIN PARLIAMENTARY ELECTION

For the study of mutual interconnection of election gains of individual political parties within parliamentary elections the correlation analysis was used, to be more precise Pearson's correlation coefficient. Its application can point out the program proximity of individual political parties which is important when creating coalition government as only the parties professing similar principles have a chance of forming a functional government.

From table 1 it is obvious that the winning party SMER-SD had a rather limited coalition potential. If we omit the ĽS Naše Slovensko with which all the parties throughout the political range refused any post-election cooperation, then the only potential partner was SNS which had already been a coalition partner of SMER-SD in the government of 2006–2010. In their case the Pearson's correlation coefficient was 0.69, which represents a significant level of bonding. Thus there were quite a tough talks ahead of SMER-SD regarding creation of the government meanwhile their success was very questionable.

From the group of central and conservative parties the broadest coalition potential was that of SaS the election results of which has reached a high level of bonding OĽaNO – NOVA (Pearson 0.71), furthermore we have identified a moderate level of bonding with political subjects SME RODINA (0.44) and #SIEŤ (0.33), but due to the overall results of the elections a creation of center-right government was improbable. For this reason, shortly after announcing the definite election results to the public, voices of politicians have emerged forecasting the creation of a government of experts (so called white collars government) and repetition of elections.

Tab. 1: Correlation of gains between political parties in 2016 elections

PARTY/PARTY	SMER-SD	SaS	OĽaNO-NOVA	SNS	ĽS Naše Sloven-sko	SME RODINA	MOST-HÍD	#SIEŤ
SMER-SD	1.00	-0.50	-0.38	0.69	0.51	0.02	-072	-0.15
SaS	-	1.00	0.71	-0.31	-0.42	0.44	0.01	0.33
OĽaNO - NOVA	-	-	1.00	-0.21	-0.12	0.49	-0.28	0.52
SNS	-	-	-	1.00	0.61	0.04	-0.71	-0.06
ĽS Naše Slovensko	-	-	-	-	1.00	-0.08	-0.60	-0.04
SME RODINA	-	-	-	-	-	1.00	-0.33	0.12
MOST-HÍD	-	-	-	-	-	-	1.00	-0.32
#SIEŤ	-	-	-	-	-	-	-	1.00

Legend:

Correlation/ level of bond	Zero	Moderate	Significant	High	Very tight bond
Positive					
Negative					

Following the talks about forming a government lead by SMER-SD there was an agreement reached in the end, which ended in forming a coalition government in which besides SMER-SD also the following political parties, SNS, MOST-HÍD and #SIEŤ, found their place.

Thus the coalition government was formed out of the parties which have created a line of conflict since 1989. This is most obvious in the relation between the parties of (and self-evidently the voters of these parties, too) SNS and MOST-HÍD. As we have already mentioned previously SNS has undergone through some changes in the period of 4 years when it was left outside the Parliament. These changes caused a certain brushing off of nationalistic rhetoric (it is possible though that this image has been still preserved in the eyes of its voters). In a similar way such was the situation in case of MOST-HÍD which has had, for example, more candidates of the Slovak origin on their voting list then those of the Hungarian background. Similarly, the relations between SNER-SD and MOST-HÍD were quite turbulent for a longer period of time, the conflict being on the level of nationalism.

Creation of the government in its current form is not to be seen as something non-standard with regards to Pearson's correlation coefficient. The parties reached an agreement of forming a coalition because of natural effort to gain their share of power and thus put through a part of their agenda, but also because of fears connected to growing political power of the extremist party ĽS Naše Slovensko.

CONCLUSION

The winner of the Slovakia's parliamentary elections in March was SMER-SD despite causes which were accompanying its four year government without any coalition partner. However, compared to the elections of 2012 SMER-SD has lost 400,000 votes which made it impossible to SMER-SD to repeat its power superiority of the period of 2012–2016 when it was able to form a government on its own.

An important consequence of these elections is the roll call of the parties of protest (unlike the standard political parties) into Slovakia's parliament. Apart from OĽaNO, which has confirmed its presence in the Parliament, two other parties have made it to Parliament SME RODINA and extremist party ĽS Naše Slovensko. It is possible to suppose that ĽS Naše Slovensko has not gained even more votes only thanks to the reformed SNS.

The results of the elections confirmed that the political stage of Slovakia is still in development. This is documented by the fact that in all of the elections so far at least one political party has either got into or dropped off the Parliament. We have listed the political newcomers above, the voters have sent the conservative and Christian political subjects – which both had been a governing parties at one time in the past – outside the parliament (KDH, SDKÚ-DS). The central and right side of the political spectrum remained unconsolidated, the anticipated leader #SIEŤ has booked a huge loss compared to the election polls prior the elections.

The available data of election results projected into space confirmed the electoral formulas of Slovak electorate valid on a long-term basis. Thus east of Slovakia and Ponitrie and Považie remain traditionally left oriented with a significant representation of the working layer. The left side of the political spectrum which was dominated and consolidated by SMER-SD has created from the point of view of diversification of election formula the most numerous region with the dominance of one party in which we identified 40 districts.

The orientation to the centre and right were sustained in the districts of the capital city and eventually districts with larger towns and the conservative, significantly rural environment of Orava. In their cases there was a shift of voting preferences from SDKÚ-DS to SaS, respectively from KDH to #SIEŤ. None of the central-right parties with exception of SMK-MKP has managed to form a region with a dominance of one party.

On the March 23, 2016 the president of the Slovak republic appointed a new government, which was formed by the winner of the elections SMER-SD in coalition with 3 central-conservative parties (SNS, MOST-HÍD and #SIEŤ). This act can be deemed as a break-through moment on the Slovak political scene the reason being the participant of the two "nationalistic rivals" (SNS and MOST-HÍD) in one government. Similarly antagonistic relation is between the electorate of SMER-SD and MOST-HÍD, whereby a significant portion of the electorate of the latter one is made up of electorate of Hungarian minority which negatively perceives the comments of top representatives of SMER-SD towards minorities.

The coalition agreement of these antagonistic parties has been reached in order to eliminate the danger of spreading of far-righ extremism in Slovakia.

Shortly after the government was established the government coalition changed from four to three parties after the destruction of Party # SIEŤ. During its governance, the coalition failed to solve problems in education, prosecution and corruption. On the contrary, suspicions have accumulated that point to links between government officials and financial group parties, and even links to the mafia. Also a murder of an investigative news reporter Jan Kuciak and his girlfriend is linked with this fact. This event initiated the resignation of the government of Robert Fico. The President entrusted Peter Pellegrini with forming a new government based on a declared support of 79 deputies. Neither the new government was able to solve the existing problems. As for the coming elections in Slovakia it is possible to encounter the election collapse of the MOST-HID, the weakening of the SMER party, the return of the KDH and a rising a party that would be supported by electorate of the Hungarian minority as well as the advent of new political parties.

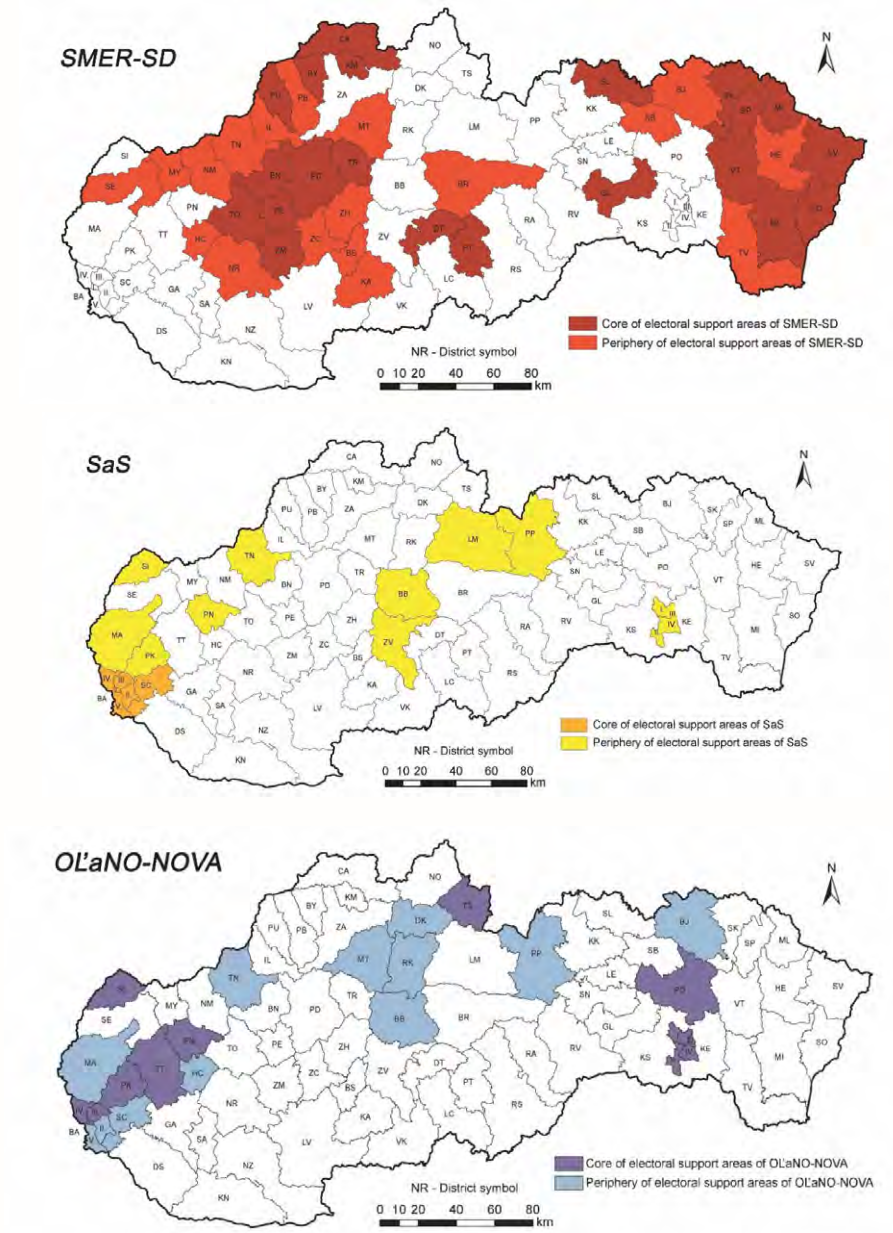

Fig. 2: Identification of electoral support areas of parties SMER-SD, SaS and OĽaNO-NOVA.

Source: according to Slovak Statistical Office, 2016, processed by authors

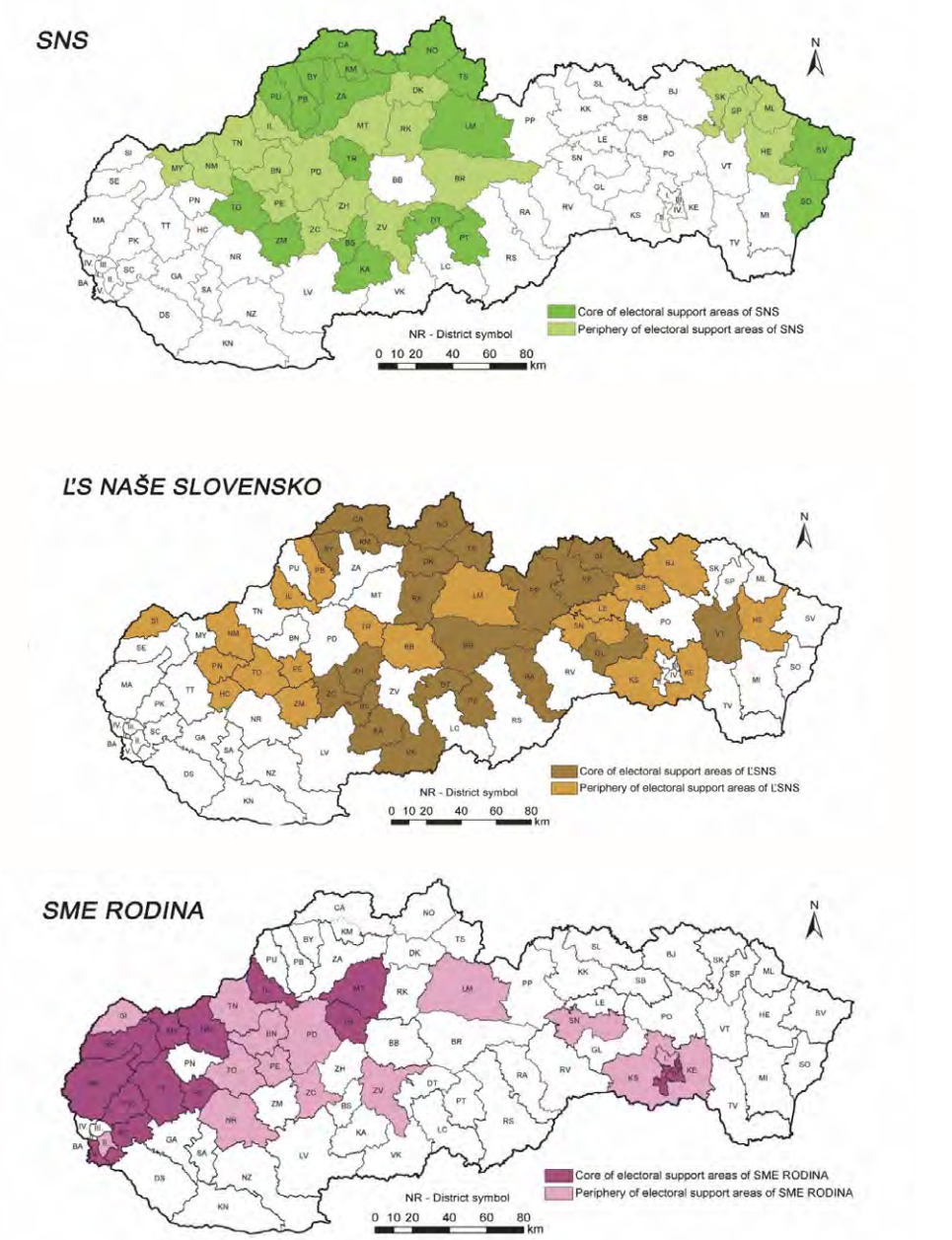

Fig. 3: Identification of electoral support areas of parties SNS, ĽS Naše Slovensko, SME RODINA.

Source: according to Slovak Statistical Office, 2016, processed by authors.

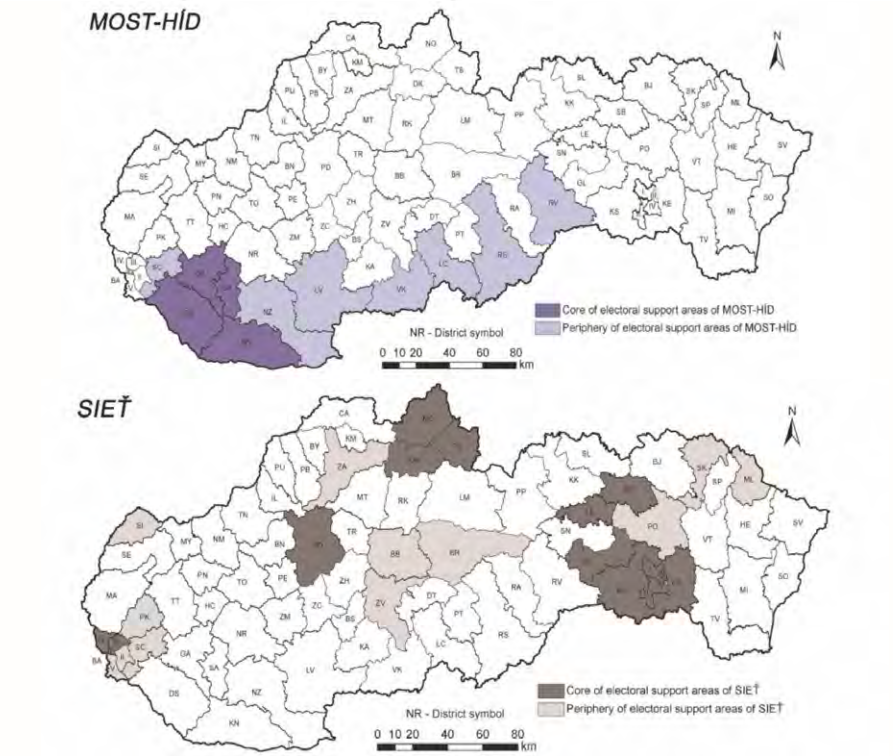

Fig. 4: Identification of electoral support areas of parties MOST-HÍD and #SIEŤ.

Source: according to Slovak Statistical Office, 2016, processed by authors.

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Zhrnutie

Víťazom v marcových parlamentných voľbách na Slovensku v roku 2016 sa stala strana SMER-SD, ktorý vytvoril koaličnú vládu. Slovenský elektorát vo voľbách vyjadril nespokojnosť so spôsobom vládnutia tradičných strán odovzdaním mandátu do rúk stranám protestu. Reprezentujú ich strany – SME RODINA – Boris Kollár a extrémistická ĽS Naše Slovensko. Naopak do parlamentu voliči nezvolili bývalé vládne politické subjekty (KDH, SDKÚ-DS).

V štúdii sme aplikovali štandardne politickou geografiou využívanú metódu diverzifikácie, metódu identifikácie území volebnej podpory a korelačnú analýzu.

Volebné výsledky premietnuté do priestoru potvrdili platné vzorce volebného správania sa slovenského elektorátu. Tradične ľavicovú politickú orientáciu si udržal východ Slovenska, resp. Ponitrie a Považie. Ľavicové politické spektrum, ktoré ovládol SMER-SD vytvorilo z hľadiska diverzifikácie volebného správania najpočetnejší región typu dominancie jednej strany, v ktorom sme identifikovali až 40 okresov.

Pravicová orientácia bola zachovaná v okresoch hlavného mesta, resp. okresy s veľkými mestami a konzervatívne, výrazne rurálne prostredie Oravy. V ich prípadoch došlo k presunu volebných preferencií od SDKÚ-DS k SaS, resp. od KDH ku strane #SIEŤ. Žiadna z pravicových strán s výnimkou neparlamentnej SMK-MKP si však nevyformovala región s dominanciou jednej strany. Analogicky sú rozmiestnené regióny volebnej podpory jednotlivých politických strán.

Novú vládu, ktorú zostavil víťaz volieb SMER-SD pôvodne s tromi pravicovými stranami (SNS, MOST-HÍD a #SIEŤ) vymenoval prezident Slovenskej republiky 23. 3. 2016. Takto zostavenú vládu je možné považovať na politickej scéne Slovenska za prelomovú, nakoľko sa v nej stretli tradične „nacionalistickí rivali" (SNS a MOST-HÍD). Podobne antagonistický vzťah je aj v prípade elektorátu strany SMER-SD a MOST-HÍD. Ku koaličnej zhode práve týchto antagonistických strán došlo z dôvodu snáh o elimináciu nebezpečenstva šírenia pravicového extrémizmu na Slovensku.

Vládna trojkoalícia (strana #SIEŤ krátko po vstupe do vlády zanikla) nedokázala riešiť problémy v rezortoch školstva, zdravotníctva, navyše rástli podozrenia z korupcie, klientelizmu a napojenia na mafiu. Po vražde novinára Jána Kuciaka a jeho priateľky a po protestných zhromaždeniach došlo k odstúpeniu premiéra a ministra vnútra.

Je možné predpokladať, že v budúcoročných parlamentných voľbách voliči do parlamentu nedelegujú predstaviteľov strany MOST-HÍD, ktorej elektorát tvorený hlavne z radov maďarskej menšiny, sklamanej z participácie tejto strany vo vláde, bude preferovať inú stranu, resp. koalíciu strán, založených na národnostnom princípe. Nie je vylúčený ani návrat KDH do parlamentu a príchod ďalších politických newcomerov (napr. strany Za ľudí, ktorú založil bývalý prezident Kiska, či pravicovej koalície Progresívne Slovensko a Spolu).

GEOLOGICAL PATHS – THEIR USE FOR THE REGIONAL GEOGRAPHY TEACHING

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Abstract: Geological paths (geopaths, geotrails) represent a type of educational paths that connect sites which are interesting from the Earth-sciences point of view. These sites (e.g. outcrops, old quarries, historical buildings built of local stone or viewpoints) often represent the links between geodiversity and other phenomena within a region (which is in accordance with a holistic approach to geotourism). Thus, they can give complex information not only about the abiotic nature but also about biodiversity, history or culture of the region, usually through narrative. Suitable interpretation of geodiversity and its relationships to the biodiversity and cultural heritage allows to identify regional specifics, it helps to find the mutual connections between particular phenomena within the region and it supports the holistic perception of a given region. The contribution presents an example from the Brno city where the urban geopath can be used for teaching regional geography of Brno and its surroundings.

Key words: geodiversity, geotourism, geoheritage, cultural heritage, Brno

INTRODUCTION: GEOTOURISM AND EDUCATION

In the last decades, the geotourism has shown a considerable growth all over the world and it is appreciated and accepted as a useful tool for promoting natural and cultural heritage and for fostering local and regional economic development (Hose, 2012; Dowling & Newsome, 2018). Originally, the geotourism was defined as "tourism relating to geology and geomorphology and the natural resources of landscape with an emphasis on provision of interpretive and service facilities to enable tourists to acquire knowledge" (Hose, 1995), later, the National Geographic (2005) presented a more complex definition: geotourism as geographical tourism: tourism that sustains or enhances the distinctive geographical character of a place, i.e., its environment, heritage, aesthetics, culture, and the well-being of its residents. This approach is reflected e.g. in Arouca Declaration (2011) and in holistic concepts of geotourism as well, e.g. Dowling (2013) who stresses the ABC concept or Dowling and Newsome (2018) who discuss the mutual relationships between the various concepts (Fig. 1).

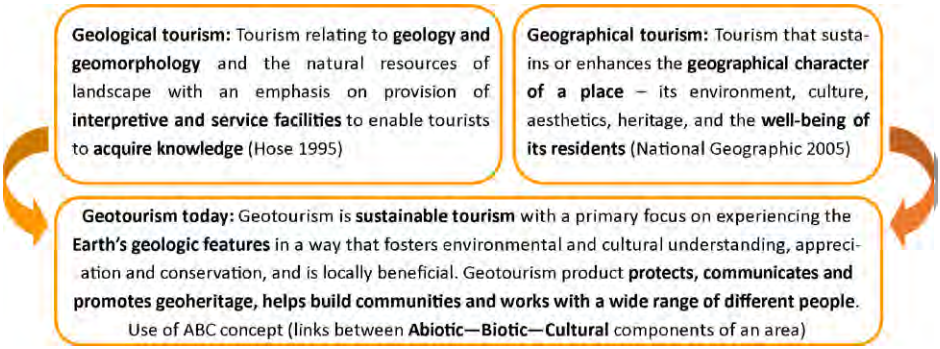

Fig. 1: Definitions and approaches to geotourism

Geotourism and education have been always closely related. Environmental education is one of the pillars of the geotourism and it also plays an important role within nature conservation (Dowling & Newsome, 2010). Since the early 1990s when the concept of geotourism originated, the education and interpretation were emphasized and accepted as an important tool that can raise the awareness of the geodiversity and geoheritage conservation and contribute to the sustainable development of geotourism. The educational aspect is integrated or reflected in numerous definitions and approaches to geotourism, beginning from the early ones up to the present holistic approaches (Dowling & Newsome, 2018).

National Geographic has adopted the term geo-education to describe education about our world; a well-rounded geo-education provides young people with a fundamental understanding of how the human and natural worlds work at local, regional, and global scales (National Geographic Society, 2018). This approach includes both natural features and anthropogenic impact on them (and vice-versa). Dowling and Newsome (2010) con-

sider the geoeducation a part of the environmental education that is focused especially on Earth sciences and which seeks to create interlinks among geology, pedology and geomorphology within the landscape. The importance of geoeducation and interpretation is also emphasized by Hose (2012) who presents three key interrelated aspects of modern geotourism: geoconservation, geohistory and geo-interpretation. The geoeducation is, of course, an important tool for increasing public geoliteracy (Clary, 2018, Vegas Salamanca & Díez Herrero, 2018).

Based on the abovementioned, it can be stated that geoeducation has numerous functions, for example: (1) it helps to increase recognition of geodiversity and geoheritage in international, national, regional and local levels which contribute to the geoconservation activities; (2) it makes geodiversity relevant to where the people live and the places they visit; (3) it helps to interpret, utilise and widen understanding of geodiversity and geoheritage for numerous purposes (including geotourism and other forms of sustainable tourism); (4) it helps to create and foster the sense of place and regional identity; (5) it contributes to discover the links between abiotic, biotic and cultural components of the landscape by the public. These selected aspects make the geoeducation really essential not only for geoconservation and geotourism, but also for regional geography teaching.

GEOPATHS: AN EFFECTIVE TOOL FOR EDUCATION

There are numerous geotourist products that have an educative outreach. Geological pedestrian trails (geotrails, geopaths) are one of the ways how to introduce geoheritage to the public. They are usually seen as part of educational activities, as Gray (2013) notes, "the greatest threat to geodiversity is ignorance". Geotrails combine the desire for knowledge (as the main reason for knowledge-based tourism), the experience of an attractive location and the positive feeling of movement. Their appearance can vary greatly depending on the phenomenon they represent, from short walks to and around certain locations (e.g. geotrails in the Mixteca Alta UNESCO Global Geopark; see Palacio Prieto et al., 2019) to long-distance hiking trails (e.g. GeoRoute Ruhr; see Wrede & Mügge-Bartolović, 2012). According to Brilha (2018), the following factors have to be taken into account for the geotrail to be implemented in geosites: (1) the geoheritage has a remarkable aesthetic relevance; (2) the geological/geomorphological significance can be easily understood by visitors with no geoscientific background; (3) there is a low risk of degradation as a result of human activities; (4) there are good facilities and infrastructures to receives visitors, including those with disabilities. Geotrails can be combined with other kinds of educational activities such as visitor centres, museums, theme parks, disused mines, audio-visual presentations, expert-led programs etc.

Geotrails today are not only a hiking trail lined with interpretation panels; on the contrary, they often use various 3D models, the ability to touch the stone, interact with exhibits or admire the aesthetic side of various works of art. In recent years, modern technology has been widely applied, where, with the help of a smartphone, a visitor can view a virtual

3D model, play a video, or explore the surroundings of his / her habitat using augmented reality, which shows the location in another time period. In addition, if geotrail tells an interesting story, which Drápela and Büchner (2019) consider being a key factor in the acceptance of the educational component of the trail by ordinary tourists, it can be used for thematic teaching at various levels of education. Brilha (2018) describes the suitability of geosites for educational use when: (1) its geoheritage is resistant to the eventual destruction caused by students; (2) it can be easily understood by students of different school levels; (3) it can be easily reached by bus or short and easy trails; (4) it provides safe conditions for students, in particular considering the younger ones. The possibilities of using geotrails for educational purposes are enormous, as geology affects both nature in the locality and many related human activities. They can be used not only in the teaching of biology and geography but also in history, civics, physics, chemistry, art, etc. However, it has the closest connection to teaching the regional geography of the local region.

STUDY AREA

Brno is the second largest city in the Czech Republic (population approximately 380 000 inhabitants) and it is situated in the south-eastern part of the Czech Republic. It lies on the contact of the two different geological units: Bohemian Massif and Carpathian Foredeep. The geology and landscape of the area is very diverse; in the relatively small area of the city, numerous rock types are present: Cadomian Brno massif (metabasalts, diorites and granodiorites), Paleozoic cover (clastic sediments, limestones), Jurassic limestones, Neogene sediments of the Carpathian Foredeep (gravels, calcareous clays) and Quaternary sediments (loess, fluvial sediments, anthropogenic deposits) (Müller & Novák, 2000). The study area belongs to the two different geomorphological provinces: Bohemian Highlands and Western Carpathians (Demek & Mackovčin, 2014) which implicates a variety of landforms. In the northern and central parts, the relief is tectonically influenced (horsts, grabens and tectonically conditioned valleys) and more pronounced, the southern part is rather flat. The uniqueness of the relief of the Brno City lies in the "chessboard" layout of the ridges and valleys which influenced the situation of the important communications, buildings and urban development in general (Buček & Kirchner, 2011).

The centre of Brno reflects the lithological and morphological diversity of the wider area (Fig. 2). Two geocultural sites – Špilberk and Petrov Hills are probably the most important landmarks within the Brno City and they represent the inherent part of the city's image. These elevations are noteworthy both from Earth-sciences and cultural/historical point of view. Geologically, both Špilberk and Petrov Hills are a part of metabazite zone of Brno Massif, they are built of Cadomian basalts which were intensively deformed and metamorphosed into the green slates and they represent one of the oldest rocks in the study area (Müller & Novák, 2000). The pillow lavas on the top of Špilberk Hill represent one of the best examples within the Czech Republic. On the eastern slopes of both elevations are covered by loess. Geomorphologically, both sites are considered tectonic horsts elevated above the flat relief of Dyje-Svratka Valley (Demek & Mackovčin, 2014).

The original landforms (macroforms) are still visible and distinctive, however, parts of the elevations (including natural outcrops) have been modified by human activities that document the land use and landforms changes in the past.

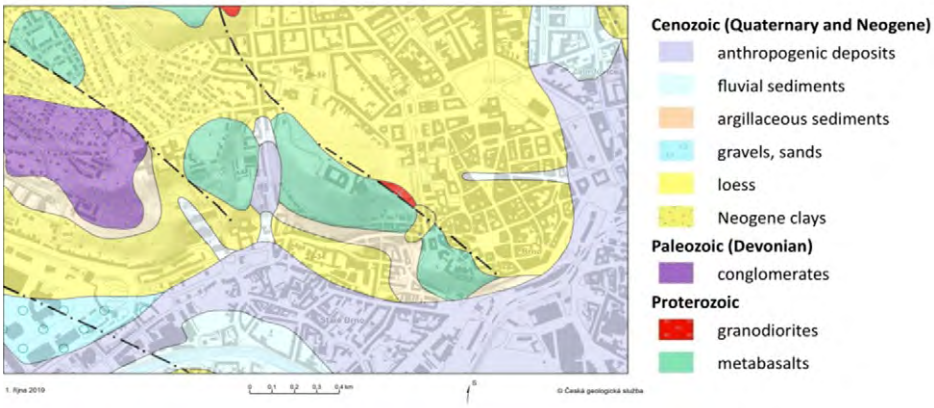

Fig. 2: A geological scheme of the city centre with Špilberk and Petrov Hills which correspond with occurrences of metabasalt outcrops.

GEOPATH THROUGH BRNO CITY CENTRE AND ITS POSSIBLE USE FOR REGIONAL GEOGRAPHY TEACHING

Based on the detailed literature review (Buček & Kirchner, 2011; Czech Geological Survey 2019; Müller & Novák, 2000; Mrázek, 1993), an inventory and assessment of geotourist resources in Brno city was done (Kubalíková et al., 2017; Kubalíková et al., 2019 in prep) and a geopath connecting Petrov and Špilberk Hills was proposed. It includes eight stops which intent to cover all the types of geotourist resources (outcrops, hydrological features, viewpoints, building stone, geomorphology, paleontology, anthropogenic landforms). The supporting information material (Fig. 3) was issued by Tourist Information Centre of Brno, so the geopath can be considered a full value tourist attraction in the city centre. The printed and electronic material (https://ticbrno.cz/informacni-centra/magazin/to-je-geostezka-centrem-brna) includes a brief description of every site comprehensible for a wide public. However, in the future, more education-oriented activities are intended: for every stop, the team of geographers, geologists, historians and teachers wants to propose activities to recognize particular geodiversity features and their relationships to the other phenomena of Brno's region. Primary, the team would like to stress the importance of geodiversity in the city, however, this is going to be done by interpretation of relationships between geodiversity, biodiversity, history and cultural heritage.

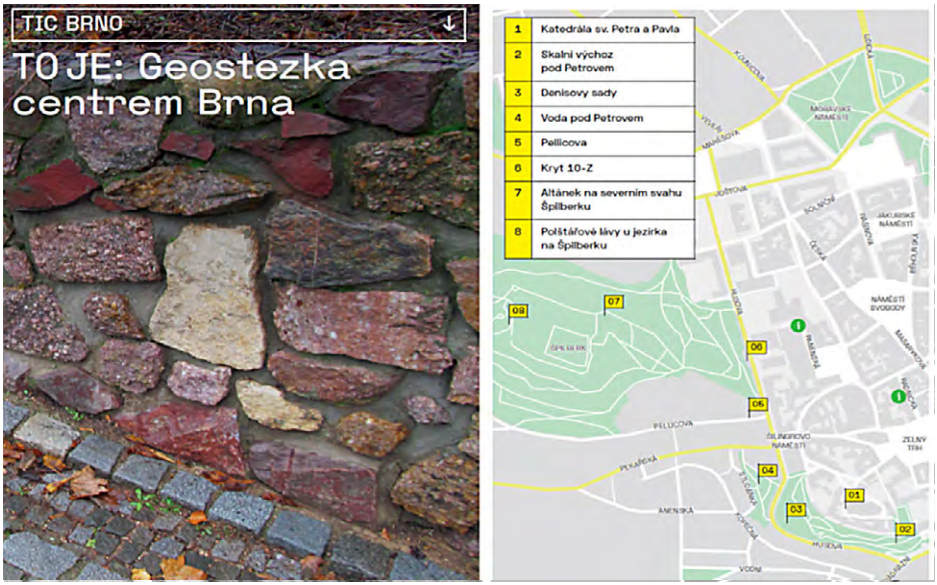

Fig. 3: Printed material of the Geopath through Brno city centre.

Below, there are several examples of how originally geologically and geomorphologically important sites can be used for regional geography teaching.

Stop 1: St. Peter and Paul's Cathedral

The cathedral is built on a distinctive metabasalt elevation (such elevations were usually used for placing important buildings), the building stones for the cathedral came from quarries in Brno or nearby, e.g. white limestone from Stránská skála, purple conglomerate from Červený kopec, and dark metabasalt probably from small quarries in the Brno centre.

Topics for regional geography:

- Influence of the landforms on the position of important buildings and city development
- Mining history, diversity of materials, extraction of the building stone
- Religious history

Stop 2: Metabasalt outcrop on Petrov

In Precambrian (some authors say over 700 Ma ago), Brno lay on a mid-ocean ridge from which lava spewed. Later, under great pressure and heat, it underwent metamorphic processes so that rocks we call metabasalt appeared. The outcrops are now protected as Important Landscape Element.

Topics for regional geography

- Geology, volcanism, tectonics
- Geomorphology (resistance of the rocks)
- Nature conservation and management of protected sites

Stop 3: Denis Gardens

From the lookout in Denis Gardens, it is possible to observe the difference between two European-scale geologic provinces: Bohemian Massif and Western Carpathians (Fig. 4). The obelisk is built of coral marble from Šumbera and it is possible to find some fossils here.

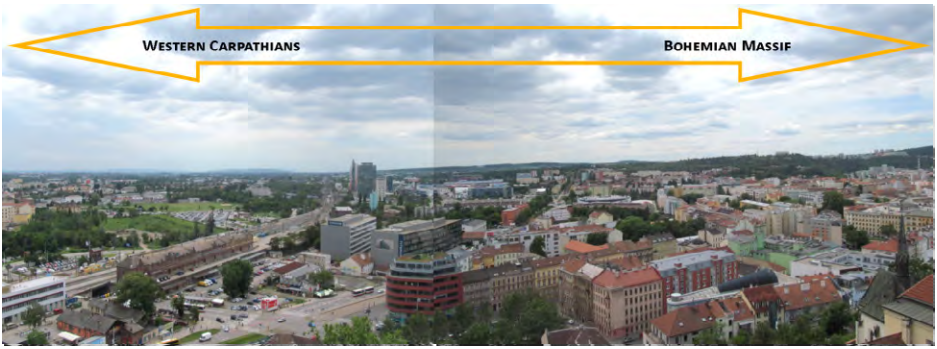

Fig. 4: A view from Denis Gardens: the difference between two main geological units of the Czech Republic can be observed here: pronounced relief of Bohemian Massif (old and resistant rocks, e.g. metabasalts, granodiorites or limestone) and flat relief of Western Carpathians (soft and younger sediments as sands or clays).

Topics for regional geography

- geological and geomorphological settings of Brno and its surroundings, its influence on agriculture and landuse in the past
- influence of landforms on the position of important buildings or communications
- geography of the industry (importance of natural resources and landforms for industrial development)
- paleontology

Stop 4: Water under the Petrov Hill

The spring in Studánka Park is one of several fracture springs under Petrov. In the Middle Ages, it was an important water resource, but at the end of the 19th century, the water was contaminated by typhoid-causing bacteria. There are some legends about underground lakes under Petrov that are based on the existence of underground wells which sometimes overflow due to the high pressure.

Topics for regional geography

- hydrography, hydrology, hydrogeology
- use of water resources, water management, contamination
- underground anthropogenic landforms

Stop 5: Pellicova Street (use of local building stone)

The walls are composed mostly of red conglomerate mined on Červený kopec, which is one of the materials typically used in Brno. There also appear grey limestone, red-grey granodiorite, and dark metabasalt, so on a simple wall, it is possible to study the diversity of building material from Brno and its close surroundings.

Topics for regional geography

- geological history of the Brno surroundings
- typical rocks for buildings, mining history
- engineering geology, use of natural resources

Stop 6: Bunker 10-Z

Thanks to its good engineering geologic conditions, the Špilberk massif was suitable for the constructing of the war shelter and other underground constructions. The Bunker 10-Z (a typical military anthropogenic landform) was built during World War II, today it is a museum.

Topics for regional geography

- anthropogenic landforms
- history, historical geography, military history
- engineering geology

Stop 7: A view on the northern pavilion

From this lookout, it is possible to observe the landforms of the northern part of Brno. The terrain is varied due to the diversity of the bedrock: in addition to the mentioned pre-Paleozoic metabasalt, the area also has Paleozoic granodiorite, limestone, and sandstone; Mesozoic limestone; Cenozoic sand and clay; and Quaternary loess. Hardier rocks forming ridges and hills were broken, and rivers (Svratka and Ponávka Rivers) found their way along these breaks and over many thousands to millions of years created deep valleys.

Topics for regional geography

- geomorphology, influence of geology on landforms
- influence of geodiversity on the position of important buildings and communication
- mining history (quarries)

Stop 8: Pillow lavas on Špilberk Hill

The small outcrops of dark metabasalt that can been found on Špilberk are often incorporated into the castle walls. The most interesting is the outcrop in front of the main castle entrance, especially because it include pillow lava – rock that formed from lava extruding under water and that prove that Brno lay at the bottom of a Precambrian ocean on a mid-ocean ridge.

Topics for regional geography

- geological history, volcanism
- geoheritage issues and geoconservation
- recultivation, revitalisation
- incorporation of the outcrops into the historical buildings

CONCLUSIONS

Geology and geomorphology (or geodiversity) have strong relations to other components of the landscape and influence human activities (position of the cities themselves, the suitability of landforms for industrial development, managing natural resources, influence on cultural identity, landforms as typical features of a city's panorama).

Geopaths can be seen as a tool for promoting geoheritage that can be used for teaching regional geography, biology or history. Interpretation of the relationships between geodiversity and cultural heritage allows specifying regional peculiarities or typical characteristics of a given region (e.g. use of typical building material that contributes to the typical appearance of the buildings in a given area). Particular stops on the geopath can be used as excursion localities with a considerable number of possibilities of how to teach regional geography.

Further activities will be focused on the proposals of geoeducational activities on every stop of the geopath (educational materials focused on geodiversity importance in the city) with an outreach to the regional geography teaching. Another activity can be represented by guided walks for the students of local schools and general public. This can support the holistic perception of the region (or city) and views from a different perspective.

Acknowledgement

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Shrnutí

Geostezky jsou typ naučných stezek spojující místa zajímavá z hlediska věd o Zemi. V současné době jsou velice populární v geoparcích nebo ve zvláště chráněných územích, kde slouží jako efektivní způsob propagace geodiverzity a dědictví neživé přírody. Postupně se objevují i ve městech, kde mohou být považovány za alternativu k tradičním turistickým destinacím přístupným velkému množství návštěvníků. Dílčí zastávky na geostezce (např. skalní výchozy, staré lomy, budovy, kde je využitý místní materiál, výhledová místa) často představují vzájemné vztahy mezi geodiverzitou a dalšími fenomény v rámci určitého regionu (což je v souladu s aktuálním holistickým pojetím geoturismu). Geostezky tak podávají informaci nejen o neživé přírodě regionu, ale i o jeho biodiverzitě, kultuře nebo historii, většinou prostřednictvím příběhu. Vhodná interpretace geodiverzity a jejích vztahů k živé přírodě a kulturnímu dědictví může přispět k identifikaci regionálních specifik, napomáhá při hledání vztahů mezi dílčími fenomény v rámci regionu a přispívá ke komplexnímu vnímání konkrétního regionu. Příspěvek představuje geostezku centrem Brna a ukazuje, jak můžou být jednotlivá místa na geologické stezce využita při výuce regionální geografie Brna a jeho blízkého okolí.

MONUMENTS OF CULTURAL HERITAGE FROM THE PERSPECTIVE RESIDENTS – A CASE STUDY OF MIKULČICE (CZECHIA) AND VLKOLÍNEC (SLOVAKIA)

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Abstract: Considering and deciding of future same territory is a complicated task requiring the cooperation of a wide range of stakeholders and institutions. When it comes to deciding in the areas or sites under UNESCO patronage, it is a process sensitive to other inputs, comments, evaluations and attention from all sides. The following paper provides a description of the main results of questionnaire survey aimed at obtaining data on traditional natural and cultural values in carrying out the protection and care of UNESCO monuments. The model territory were on the Slovak side of Vlkolínec (for 25 years on the list of UNESCO World Cultural and Natural Heritage) and on the Czech side of the Slavonic fortified settlement in Mikulčice, which is a potential candidate for registration on the UNESCO list.

Key words: UNESCO heritage, Mikulčice, Vlkolínec, survey, natural heritage, cultural heritage

INTRODUCTION AND METHODS

For balanced development of the territory, while maintaining the principles of sustainable development, it is necessary to involve in development processes many entities (so-called collective actors), but also individuals (residents, citizens of the territory or general public). In the planning process, the active participation of the users in the territory always means a contribution to the future development (positive or negative). This process is called **participation**. The main purpose of this instrument is to enable actors in the territory to influence the resulting form of development, while maintaining the delegated responsibility of the self-government for the development of its own territory. It can help to optimize development (resources, plans, projects, etc.) with regard to the needs of actors and residents, find new resources for the public sector, improve communication between the self-government and other actors, while raising awareness of the future direction of development. Participation represents a possible answer to the social changes that are most often represented in the central self-government by specific plans or projects. Early and effective public involvement helps to create a true picture of the state of the community, brings new perspectives and new solutions, clarifies opinions, develops common views, removes unnecessary concerns, fosters people's involvement, helps to create a summary of mutual knowledge of local circumstances. The public (professional and lay) is one of the important actors in the development of the area. Public involvement (in planning and decision-making processes), public participation, residents participation, participation, participatory process – synonyms describing one or more actions or steps in a process (e.g. problem solving, discussion of a proposal or plan, preparation of decisions, collection of information and opinions etc.) to which the public is invited (e.g. locals, representatives of various interest or social groups, people interested in the topic of the meeting) and has an impact on the content and course of the meeting and the resulting decision. Choosing the appropriate way to engage the public is an important decision of the planning process. Various techniques, their parts, combinations or modifications can be used for public involvement. These include, for example, workshops, working groups, round tables, community vision, action planning, etc.

One of the important aspects to be taken into account in the management of cultural landscapes is the views, attitudes and needs of people who are present in the locality (residents, visitors), thus co-shaping them with their activities or their lives are landscape affected.

As expected and confirmed by questionnaire surveys, the presence of an important cultural monument (and its consequences) brings with it certain specificities for the daily life of the inhabitants of municipalities who live or work nearby this monuments. As cultural heritage and natural attractions are becoming a destination for tourists and also of interest to experts, it is necessary to focus on the needs of each of the above-mentioned interest groups and to try to set the conditions in the locality so as not to exclude, while sufficiently protecting the cultural and natural heritage.

In order to obtain information, needs and attitudes of the residents of Mikulčice and Vlkolínec, was carried out from 2017 to 2019 an extensive questionnaire survey. The

results of survey are presented further in this paper. The survey focused on the target groups of the inhabitants of Mikulčice and Vlkolínec, visitors to the Slavonic fortified settlement in Mikulčice and Vlkolínec and the professional public. Due to the limited possibilities of the contribution, we present the results only of the survey conducted between the inhabitants of Mikulčice and Vlkolínec.

On the Czech side, the aim of the research in the case of residents municipality Mikulčice was to find out answer how local residents evaluate the village Mikulčice and the region from view of cultural monuments, in terms of the natural environment and finally in terms of civic amenities. The survey was going on the background of registration an important monument Slavic fortified settlement on the list of UNESCO monuments. The survey was going in December 2017 with the participation of the interviewer, about 4% of the population were interviewed (the population of Mikulčice was 1 975 as of 1 January 2017), in total 76 respondents answered the questions. Individual variables were monitored according to gender (52% women, 48% men) and age (average age 50 years) of respondents.

In parallel, a survey was going on the Slovak side in Vlkolínec, where the target group consisted of local residents, huts, foresters and farmers. In total, 55 questionnaires were collected. The respondents were 30 women (54%) and 25 men (46%), with an average age of 42.5 years. In the questionnaire there were 9 questions focused on the current state and future of Vlkolínec, while respondents had the opportunity to give more answers. At the end of each questionnaire, information on respondent's gender, age and education was provided.

SHORT THEORETICAL BACKGROUND

The cooperation of subjects on protection and development of areas Vlkolínec and Mikulčice was given by activities of individual actors within the framework of international project "*UNESCO Monuments in the Life of Municipalities, Towns and Regions*", during time of project: September 2017–June 2019. Actors of project were: Masaryk University, Faculty of Education (leading partner), Catholic University in Ružomberok (main cross-border partner), Lower Morava Biosphere Reserve, Town of Ružomberok and Constantine the Philosopher University in Nitra. The project was aimed at deepening the cooperation of institutions, entities and persons directly managing UNESCO monuments or located in the site of such an important monument of world heritage. It was therefore primarily an application project that seeks to combine scientific knowledge in the field of landscape, spatial and strategic planning of the territory, protection of the natural and cultural heritage UNESCO with practice at the level of municipalities (municipalities Mikulčice and Ružomberok).

Methods and forms of cooperation of actors in the territory are described in many papers, studies and publications. Among the important ones for setting the objectives of the questionnaire survey are: Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (Aarhus Convention

from Year 1998) or specialist monographs Arnstein (1969), Ackoff (1974), Collins and Ison (2006). In the Czech area were published studies of authors, Pitaš (2010) and Veselý (2009) deal with the topic.

Before the realization of the questionnaire survey, the model area on the Czech side was mainly dealt with by historians and archaeologists (thanks to the presence of the archaeological locality of the Slavonic fortified settlement), eg Poulík (1960, 1963, 1975), Opravil (1983), Hladík (2014) or Poláček (2010, 2012, 2018). The geographers in Mikulčice and its surroundings wrote eg Kolejka, Boltižiar, Svatoňová, Vojtek, & Oláhová (2016), Kolejka, Boltižiar, & Vojtek (2018).

Location Vlkolínec is described in the works of Slovak authors: Liptayová et al. (1990), Berkova et al. (1996), Hudeková et al. (2009), Hochel (2018), Nezval (2018), Pauditšová et al. (2018), Pauditšová et al. (2019) etc.

DESCRIPTION OF STUDY AREA (MIKULČICE AND VLKOLÍNEC)

Demarcation of territorial areas (model areas), was mainly due to the need to obtain up-to-date background data for the creation of a new form of protection of natural and cultural heritage in archeopark Mikulčice – Kopčany and for the creation of a new urban plan of the zone Vlkolínec on the Slovak side. Both areas are registered on the UNESCO World Heritage List – Vlkolínec 25 years (since 1993), and the Mikulčice site, including the Slavonic Fortified Monument, has been part of the Lower Morava Biosphere Reserve since 2003.

Mikulčice (Czechia)

The model area of the village of Mikulčice, including the area of the Slavonic fortified settlement, is located in the Hodonín district close to the Czech-Slovak border. The area of the administrative district of the municipality is 1 530 ha and 1 953 inhabitants (1. 1. 2019) lived permanently in the village (https://www.czso.cz/eng/cso/czso/pocet-obyvatel-v-obcich-za0wri436p). In the administrative area of the village there is a national cultural monument – Slavonic fortified settlement in Mikulčice (National Heritage Institute, r. No. 11792/7-2312). The Slavonic fortified settlement in Mikulčice represents, from the historical point of view, an extremely valuable territory in which the beginnings of Czech and Slovak statehood took place. The site is protected as a national cultural monument (since 1962) and "still" aspires to be included in the UNESCO World Heritage List. Together with the area of Kopčany on the Slovak side of the border, it is currently the largest Slavic archaeological site in Central Europe. The whole area of the former fortified settlement is defined by a strip of territory in the west from the eastern edge of the village of Mikulčice (along with Těšice) above the Morava valley near Mikulčice through the regulated Morava river on the Czech-Slovak border. The northern boundary is formed by the boundaries of the cadastre Mikulčice (in these places associated municipalities Těšice) against the land registers Lužice and Hodonín on the Czech side and the

railway Holíč-Hodonín on the Slovak side. In the south, the border of the area of interest forms the road from Moravská Nová Ves to the former ford across the river to the Slovak Kopčany and from there to town Holíč.

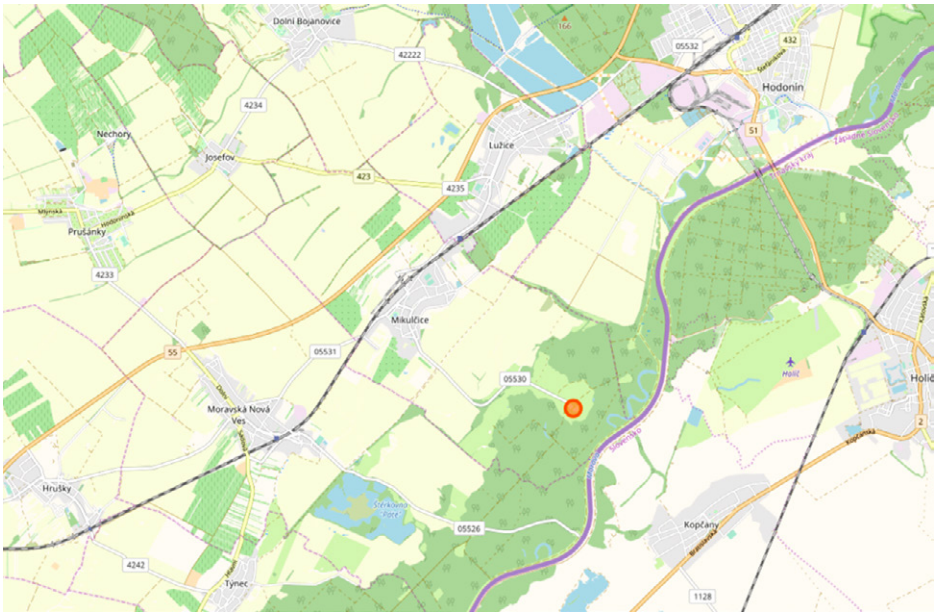

Fig. 1: Localization of Slavic fortified settlement in Mikulčice.

Source: OpenStreetMap, 2019.

Vlkolínec (Slovakia)

City district Ružomberok-Vlkolínec is an extremely valuable natural-no-settlement complex that creates a positive landscape mosaic created by the interaction of anthropogenic and natural processes. The Vlkolínec site has the highest form of heritage protection, which is allowed by Slovak legislation pursuant to Act No. 49/2002 Coll. on the Protection of the Monuments Fund. In 1977, Vlkolínec was declared a Monument Reserve of Folk Architecture (Government Resolution of the Slovak Republic, 1977) and most of the buildings located in the built-up area of the settlement are protected as national cultural monuments. A total of 73 buildings are registered in the List of Monuments, a substantial part of which are wooden houses or farm buildings (The Monuments Board of the Slovak Republic, 2008). In December 1993, in Cartagena, Colombia, it was inscribed on the UNESCO World Heritage List as a unique landscape-no-residential-architectural complex. The uniqueness of the Vlkolínec site is also contributed by the specific surrounding landscape mosaic of the protection zone, which is conditioned by the type of relief and, above all, by the methods of traditional management in the country in the past centuries. Currently, there are remnants of elements of historical landscape structure.

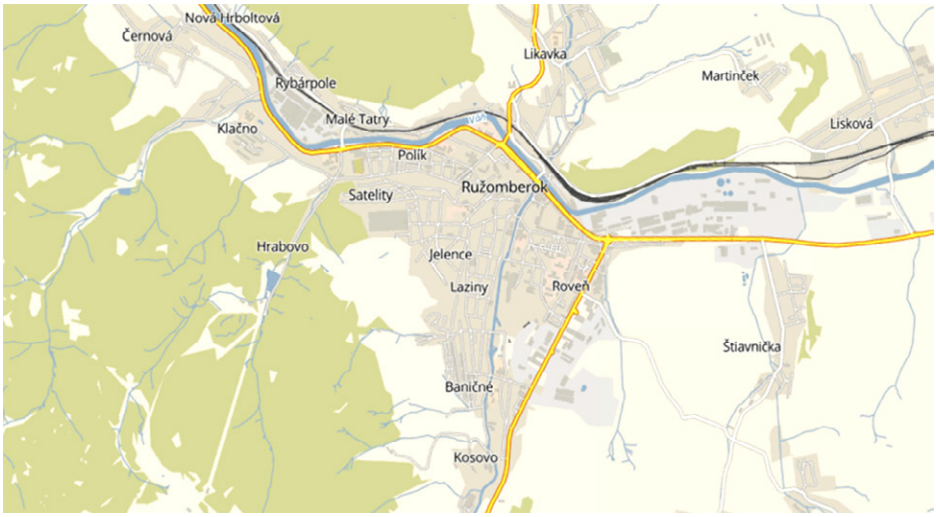

Fig. 2: Localization of district Vlkolínec inside the town Ružomberok.

Source: Územní plán města Ružomberok. GISPLAN, ***T-MAPY Slovensko s. r. o., 2019.***

They are not noticeable dominants profiling the entire landscape. On the contrary, they are inconspicuous objects that naturally fit into the current landscape structure. Vlkolínec is characterized by two types of historical landscape structures, agricultural and architectural (Pauditšová et al., 2019). Agricultural historical structures in Vlkolínec are mainly represented by gardens located in the immediate vicinity of the dwellings. Another representative is a complex of terraced terrain arrangement with meadows divided by vegetation in parallel lines. This phenomenon reflects primary land use and is therefore considered one of the most valuable elements. Last but not least, it is a homogeneous collection of meadows and pastures where the limits were removed in the 1970s to unify agricultural land. Previously used terraced fields and gardens around Vlkolínec are currently growing, land management has a long-term downward trend (Pauditšová et al., 2019).

The next part of the paper brings the main results of the questionnaire survey. The results are described separately for the locality Mikulčice and Vlkolínec. This is due to the large diversity of the results and the different input data (population – residents and respondents).

MAIN RESULTS FROM SURVEY

In the analysis of the main results of the questionnaire survey in the village of Mikulčice and its surroundings, the researchers focused on the following areas among the local respondents: (1) cultural monuments, (2) natural environment or (3) civic amenities. The

results of the survey at a more professional level serve as one of the documents for setting up the care of cultural monuments in the municipality in accordance with the needs of local inhabitants and increasing / maintaining their quality of life.

And what about the main results?

The first question in survey was: *What is the most valuable thing in Mikulčice?* 40 residents (56.3% of valid answers) mentioned **Slavonic fortified settlement** and 18.3% of residents (13) mentioned the **Monument of Great Moravia**. Significant distances were then recorded as a **culture house** or **museum** (4 respondents, ie 5.6% of the total). Furthermore, partial responses such as e.g. whole village, church, village square etc. It is therefore a significant material monuments in the municipality, or dominants known to citizens, which was the reason given by 21 residents. Only 3 residents cited intangible artifacts such as viticulture and village life.

Another question was aimed at finding out, *What is missing in the village?* most residents (21) mentioned **pub** or restaurants, refreshments, as well as **specialized shops** (11 residents) – butcher shop, pharmacy, post office or confectionery and **activities, facilities and services for seniors** (7 residents) – retirement home, retirement home, nursing home. Other recorded responses were directed to activities, facilities for children and youth, road maintenance, parking places or relative quiet.

The future development of the village was investigated two questions Mikulčice in 20 years: *What do you think should look like?* and *Do you think that services and infrastructure for tourists should be further developed?* More answers to the first question were recorded as neutral – **I don't know** (16), but there were answers such as **quiet** (5x), existence of **pub** (5x) or **restaurant for tourists** (2x). In total, 29 different options were answered on this question (eg building plots, accommodation, tourist services, transport accessibility, post office, bus stops, train station or cycle paths). However, there were also negative responses related to the possible future inclusion of the memorial site on the UNESCO heritage list, expensive charges for water and sewerage, the state of the road in the direction via Lužice or regarding further construction development. The second question with a view to the future development of services and infrastructure for tourists brought 55 answers with localization in the village. The main reason was the possibility of improvement (25x), it is also desirable for local residents (7x or residents don´t mind (5x). There was a threat to the peace and comfort of local residents, a threat to nature (4x).

Next question was focused on spending of free time of local inhabitants was investigated (*Where do you prefer to spend free time?*). The most frequent answer was **in the environment of your home**, **in your backyard**, respectively **in the garden by the house** (61 residents), in the vicinity and nature around Mikulčice (37) or in the **cultural house** or the **Monument of Great Moravia** (if there is an event), (21).

In connection with the transformation of agriculture, the opinion of inhabitants on the use or preservation of original farm buildings was surveyed. Three possible scenarios were offered from which residents chose 3 options (yes, no and don´t know). The results are clearly summarized in a graph in which a positive opinion of a change in the way of use prevails. One possibility was also to maintain the current state of buildings. 27 resi-

dents would like to maintain the status quo, while 23 citizens want change. 17 residents took a neutral stance. And the last option in this part of the question was the freedom of expression (*what other purpose*?). The answers included, for example, roads or retirement homes.

The last part was devoted to expressing their own opinion on the change in the village or its surroundings. It was an open question, so the answers were also very varied. Most residents **would not change anything** in the village (14 replies). What they said about the change most want **to improve transport accessibility and maintenance of roads** (12x), **establishment of pub** (7x), as well as increasing the number of parking spaces (6x), reconstruction of buildings in the center (6x), reconstruction of the mill (5x) reconstruction of agricultural cooperative (5x), building facilities for seniors (5x), repair of playground (5x), replacement of municipal council (4x) or construction of sports facilities for children (3x). For the main reasons why residents want change, answers were heard such as: *missing, needed, inoperable, out of order, better us*e, etc.

In Vlkolínec, outside the residents (23 inhabitants – 1. 1. 2019), the questionnaire survey was also attended by cottagers, cottagers, foresters and farmers. For the following paper we select only some interesting questions. The respondents stakeholders unequivocally expressed the main contribution of Vlkolínec – preservation of traditional architecture in the natural environment, preservation of the original cultural mountain agricultural landscape. In all answers, possibilities prevail this view. Rural architecture with nature and its surroundings makes up 63.5% in the first option, 69.3% in the second option and 48.1% in the third option. Interesting is the ranking among the most valuable options and the answer – Vlkolínec as a whole, peace and quiet, but also the genius loci (Boltižiar, & Petrovič, 2019).

From the point of view of missing things, it can be seen that the answers come from 'home' residents and vacationers. In all options, the top two places were: lack of trade and improved communication quality. In the first option 39.1%, in the second option 28% and in the third option 32.2%. At the same time, there is also an effort to improve the situation for visitors – tourists, because other options in the answers were just improvement, creation of services (mainly catering facilities) and subsequently construction of public toilets. (Boltižiar, & Petrovič, 2019).

Another interesting question: *Imagine Vlkolinec in 20 years. What do you think it should look like, write down what should change here and what should not be missing?* This question made it possible to choose, on the one hand, what and how to change, and on the other, what not to change. This bilateralism was also reflected in the responses. Highest answer 13 (21%): better and original land use in the context of not allowing the construction of new buildings in non-original architecture. Furthermore, there is an effort to maintain a resident population of 10 responses (16.1%), which was directly followed by an improvement in the state of communications - 9 responses (14.5%). It could be said that all the answers, with the exception of the construction of the guest house, aim to keep Vlkolínec alive with permanent residents. (Boltižiar, & Petrovič, 2019).

From the answers to the closed question *Do you think that services and infrastructure for tourists should be developed?* there is a certain divergence in the responses of the respondents. **While cottagers would prefer to develop tourist infrastructure not directly in Vlkolinec** – 20 responses (38.5%), on the other side, **residents would support development directly in Vlkolinec** – 19 responses (36.5%). This result confirms the absence of basic infrastructure in Vlkolínec and the need of inhabitants to have such infrastructure as close as possible. It is also interesting to note that almost 10% of the responses (5) oppose the development of any infrastructure.

In answer to the question *Write what do you think has changed in Vlkolínec for the last 10 years, or for the worse?* it is in comparison with the previous answers to see the compliance of the cottagers and the locals. They consider the higher number of cultural events, improvement of the infrastructure for tourists (total – 7 responses, 41.1%) and at the same time direct improvement of the situation in the municipality within the functioning of the civic association and fire protection (total – 6 responses, 35, 2%). On the contrary, a clear deterioration of the situation is in the decrease in the quality of transport infrastructure (14 responses - 28%), in the decrease, resp. non-use of the landscape (7 responses – 14%) and the consequent negative impact of inadaptable tourists on the privacy of residents and cottagers (12 responses – 24% in total). It was interesting to point out in several responses to the negative experience with wildlife damaging property in gardens (damage to fences, trees, hives, etc.) and the need for measures to protect them (mainly bears).

SUMMARY AND CONSLUSION

The method of questionnaire survey can be considered as a sufficient way to obtain the opinions of citizens. More detailed results, including all recorded responses, are available from the investigators or published in the book: Traditions and Cultural Values of the Territory in the Care of UNESCO. Possibilities of purpose restoration of traditional farming (Lněnička et al., 2019). The whole questionnaire survey serves as a basis for the creation of conceptual and strategic documents in connection with the preparation of the area of the Slavonic Playground for inclusion on the UNESCO list and on the Slovak side for the preparation of the new zoning plan Ružomberok-Vlkolínec.

The most important conclusions concerning Mikulčice can be summarized as follows:

- Most in the village is missing hospitality, where it would cook hot food and could meet residents of the village.
- The inhabitants are most worried about the disturbance of peace in the village after the inclusion of Mikulčice on the UNESCO list and the increase in tourism, but the increase in tourism is generally considered desirable.
- However, increasing tourism is generally considered desirable.
- Citizens consider the Slavic hillfort as a whole to be the most valuable in the village and its surroundings.
- Respondents‘ answers did not differ significantly according to gender or age.

The questionnaire survey in Vlkolínec was focused on direct users of Vlkolínec, built-up area and its surroundings. As part of the questionnaires, the respondents received their personal views on the current situation as well as on the perspective of the development of the territory in the future. Given the current socio-economic situation (low to extinction of residents with permanent residence in Vlkolínec) and unfavorable conditions for agriculture, leaving the country, intensively overgrowing pastures and meadows with trees. Without the willingness of local agricultural subjects and the Municipality of Ružomberok, the original agricultural and current recreational function of the country could significantly decline. The only stable function of the country would be forestry, which has the potential to strengthen but at the expense of abandoning agricultural land. Thanks to the interest of the present inhabitants in preserving the historical diversity of the country and its characteristic appearance, there is still the potential to preserve the genius loci of this unique location.

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Shrnutí

Úvahy a rozhodování o budoucnosti území je komplikovaným úkolem vyžadujícím součinnost širokého spektra zainteresovaných osob a institucí. Jde-li o rozhodování o územích či lokalitách pod patronací UNESCO, jde o proces citlivý na další vstupy, komentáře, hodnocení a pozornost ze všech stran. Následující příspěvek přináší popis hlavních výsledků získaných při dotazníkovém šetření zaměřeném na získání dat o tradičních přírodních a kulturních hodnotách při vykonávání ochrany a péče o památky UNESCO. Modelovým územím je na slovenské straně Vlkolínec (již 25 let na seznamu Světového kulturního a přírodního dědictví UNESCO) a na české straně Slovanské hradiště v Mikulčicích, které je potenciálním kandidátem na zápis na seznam UNESCO.

Na české straně bylo cílem výzkumu v případě cílové skupiny obyvatel obce zjistit, jak místní obyvatelé hodnotí obec Mikulčice a její okolí, a to jednak z hlediska kulturních památek, dále z hlediska přírodního prostředí a konečně z hlediska občanské vybavenosti, to v souvislosti s možným budoucím zápisem významné památky Slovanského hradiště na seznam památek UNESCO. Dotazování probíhalo v prosinci 2017 za účasti tazatele, dotazována byla cca 4 % obyvatel (počet obyvatel Mikulčic byl 1975 k 1. 1. 2018), celkem na otázky odpovědělo 76 respondentů. Jednotlivé proměnné byly sledovány v závislosti na pohlaví (52 % žen, 48 % mužů) a věku (průměrný věk 50 let) respondentů.

Paralelně probíhalo šetření i na slovenské straně ve Vlkolínci, kde cílovou skupinu tvořili místní obyvatelé, chataři, lesníci a zemědělci. Celkově bylo sebráno 55 dotazníků.

Jak a které návrhy úprav v obou sledovaných zájmových územích budou v budoucnosti realizovány, záleží jak na zájmu všech zainteresovaných aktérů, tak i na aktuální ekonomické situaci státu a participujících právnických a fyzických osob. K dalšímu rozvoji obou lokalit přispívá i rozvíjející se cestovní ruch a turismus. Značka UNESCO na jednu stranu znamená záruku mimořádného území, na straně druhé také s sebou nese riziko a potencionální ohrožení ze strany turistů, či návštěvníků. Zkušenosti z jiných, nejen světových památek UNESCO (viz Lednicko-Valtický areál, či Biosférická rezervace Třeboňsko a problematika cykloturistiky) ukazují na zvýšené riziko rozvoje tzv. masového turismu, na který nejsou lokality dostatečně připraveny z pohledu např. infrastruktury nebo sociálního vybavení. Nápor turistů lačnících po návštěvě lokality může přinést komplikace

při zajištění dostatečné ochrany památek, či v případě Vlkolínce přímé narušení soukromí rezidentů. Vždy je třeba hledat kompromisy a vyvažovat potencionální ekonomickou stránku, jež cestovní ruch přináší, se sociálními potřebami a dopady na místní obyvatele.

REGIONAL BIOGEOGRAPHICAL MODEL OF VEGETATION ZONES IN DOCTORAL PROGRAMME REGIONAL BIOGRAPHY IN OLOMOUC (CASE STUDY FOR NORWAY SPRUCE)

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Abstract: Regional climate changes impacts induce vegetation zones shift to higher altitudes in temperate landscape. This paper deals with applying of regional biogeography model of climate conditions for vegetation zones in Czechia to doctoral programme Regional Geography in Palacky University Olomouc. The model is based on general knowledge of landscape vegetation zonation. Climate data for model come from predicted validated climate database under RCP8.5 scenario since 2100. Ecological data are included in the Biogeography Register database (geobiocoenological data related to landscape for cadastral areas of the Czech Republic). Mathematical principles of modelling are based on set of software solutions with GIS. Students use the model in the frame of the course "Special Approaches to Landscape Research" not only for regional scenarios climate change impacts in landscape scale, but also for assessment of climate conditions for growing capability of agricultural crops or forest trees under climate change on regional level.

Key words: climate change scenarios, landscape, regional model, vegetation zone

INTRODUCTION

Climate change has induced serious changes in vegetation zoning of landscapes around the world. Global vegetation models cannot consider the migration capability of individual plant species as well as the vegetation succession processes at the level of specific ecosystems. There is therefore most suitable to study the impacts of climate change on species distribution and succession processes at regional-scale level. Climate change often influences specific ecosystems in a specific geographic region in synergy with other specific regional impacts. Regional models of vegetation changes are seem to be as one of the fundamental knowledge bases allowing us to understand the significance of climate change within specific ecosystems.

Ecological concept of vegetation zoning seems to be very useful framework for better understanding to climate change impacts on landscape in regional scale (Machar et al., 2017a). Published studies focused on shifts in vegetation zonation due to climate change in the temperate climate zone of Europe are concentrated to the Alpine region (Rosbakh et al., 2014). Outside the Alpine countries, Svajda et al. (2011) studied the altitudinal shift in dwarf pine vegetation at the upper forest limit in the High Tatra Mts. (Slovakia), while Kutnar and Kobler (2011) published a prediction of climate-change induced changes in forest vegetation zones in Slovenia. In Czechia, Treml, & Chuman (2015) studied the impacts of terrain and vegetation structure on the dynamics of forest ecotone limit in the context of climate changes in the Central European Sudeten mountain ranges.

This paper deals with applying of regional biogeography model of climate conditions for vegetation zones in Czechia (Oprsal et al., 2018) to studying of doctoral programme Regional Geography in Palacky University Olomouc, Faculty of Science. Students use the model in the frame of the course "Special approaches to Landscape Research" not only for regional scenarios climate change impacts in landscape scale, but also for assessment of climate conditions for growing capability of agricultural crops (Kopecka et al., 2013) or forest trees (Machar, 2010) under climate change on regional level. The model is based on general ecological relationships between climate and vegetation zonation of landscape (Machar, 2009). Results of the model are presented under RCP8.5 scenario. The paper presents some examples of applying the biogeographic model in the landscape of the Czech Republic for the prediction period 2030–2100.

Methods and data

The regional biogeographic model of climatic conditions of vegetation zones (referred to as "model") in the Czech Republic (hereinafter "CR") draws on the assumption that the expected climate change will be manifested by changes in the climatic conditions in the existing vegetation zones at the regional level which can be good predicted. This does not imply that the existing vegetation zones will simply extend (shift) to higher elevations of the European cultural landscape. The model reveals scenarios of future predicted changes in climatic conditions of vegetation zoning. The main principle of the model is based on using of vegetation zones as a reference framework for climate predictions of growth conditions for algorithmized species.

The current vegetation zones in the Czech Republic (see Tab. 1) were defined using the bio-indication method. Detailed characteristics of the vegetation zones are included in the characteristics of the geobiocoenological landscape typology units of the Czech Republic which can be translated well into European forestry, agricultural and nature conservation typology systems of habitats, e.g. the habitat typology used in the Natura 2000 network (Pechanec et al., 2018).

Climatological data used by the model are providing by the predictive climate database which assigns climate data to a set of 131 points regularly distributed throughout the territory of the Czech Republic in the form of a regular trapezoidal network. Database involves validated climate data calculated for the RCP8.5 regional scenario in period 2030–2100. The Register of Biogeography includes a detailed geobiocoenological characteristics of the CR landscape (vegetation zoning, trophic and hydric series) matched with individual cadastral areas, provides input biogeographic data for the model. These databases also use the cadastral areas as their basic spatial units. The possibility to create application programs utilizing up-to-date data on factors affecting the landscape was the key motivation for using cadastral areas as the basic elements of the Register of Biogeography. Naturally, the cadastral areas as historically conditioned units of territorial division for the purposes of property and land use records are not entirely homogenous from the perspective of local natural conditions (Machar, 2012). However, on the regional scale (for the entire territory of CR) the cadastre polygons are quite representative of the heterogeneity of the entire country's natural conditions, since the original 19th century cadastre system (which has not changed much since) used natural boundaries such as streams, forest edges or major geomorphological formations in the landscape.

The biogeographic model of changes in climatic conditions of vegetation zones represents a suite of special programs (Fortran programming language) and GIS applications of Esri products. Climate characteristics (i.e. individual climatological variables used) were assigned to the definition points of the Register of Biogeography using analytic geometry by recalculation of a regular trapezoidal network using the gradient method. The predicted climate characteristics of the definition points, their respective potential vegetation zones and corresponding characteristics of natural climatic conditions are algorithmized by the model. Algorithmization of climate growth and ecological conditions for individual target species (e.g. agricultural crop or forest tree) in relation to vegetation zones is conducted using the method of spatio-temporal analogies, with Lang's Rain Factor used as the coefficient of relationship combining total annual precipitation and average annual temperature in a single value. The algorithmization divides the climatic conditions for algorithmized species usually into a relative four-step scale. The model results for defined conditions (climate scenario for a defined period, defined geographic area, and algorithmized ecological conditions of species) provide a regional scenario of predicted future climatic conditions for individual species.

RESULTS

Regional scenario of changes in climatic conditions of vegetation zones of the Czech Republic

The regional scenario of changes in climatic conditions of the vegetation zones of the Czech Republic for the prediction period 2030–2100 (hereinafter "the regional scenario") indicates three major predicted trends: (i) a gradual increase in areas with climatic conditions of lower vegetation zones (i.e. zones 1–3), (ii) an area with climatic conditions of vegetation zone 4 will be still dominant in the CR landscape in the future as well, and (iii) a significant and fast decline in areas with climatic conditions of higher vegetation zones (5–8).

Application of the model in doctoral programme Regional Geography in Palacky University

Students of doctoral programme Regional Geography in Palacky University use the model in the frame of the course "Special approaches to Landscape Research". Students apply the model as a support tool for assessment of regional scenarios climate change impacts in landscape scale (Kilianova et al. 2012). Another example of applying of the model by students is assessment of climate conditions for growing capability of agricultural crops or forest tree under climate change on regional level.

Current case study has been done by students under modelling of the regional scenario for the climatic conditions for Norway spruce cultivation in CR (Simon et al., 2014). Nowadays, Norway spruce has suitable climatic conditions in upland to mountain regions of CR. Very good climatic conditions for spruce correlate with the currently defined vegetation zones 5–8 in the mountain regions of the country (where Norway spruce has its growth optimum). As results of modelling indicated, the regional scenario for 2030 reveals a significant decrease (by 16.41 %) in the area of very good climatic conditions for spruce cultivation. In the prediction period of 2050, the trend of climatic conditions for Norway spruce will not be very pronounced, and the situation according to the regional scenario will similar that in 2030.

The ratio of sites with climatic conditions completely unsuitable for spruce cultivation will increase significantly in 2070 to 68.23 % of the area of the Czech Republic. The ratio of sites with good climatic conditions for spruce will drop to 5.60 % in 2070 and the area of sites with very good climatic conditions will be reduced to a mere 1.08 % (compared with the present state, this represents a loss of 22 %). This trend of changes in climatic conditions is confirmed by current ecological collapse of spruce monocultures in the CR because of drought in last years. According to the scenario, in approximately 55 years very good and good climatic conditions for spruce cultivation on most of the territory of today's Czech Republic will be limited to small sites in the highest mountain regions. Based on the results provided by the regional scenario, we can recommend fundamentally reassessment of the Czech national strategy of sustainable forest management (National Forestry Program) in order to restrict the currently common practice of spruce

cultivation only to areas defined precisely by the biogeographic model in the mountain regions of vegetation zones 5 to 8.

Discussion and Conclusion

The mathematical models do not exactly represent predictions of future trends of climate changes. Models only support the predictions but their results must be carefully interpreted on the basis of knowledge of biology and ecology of individual species that are modelled. The vast majority of the models are correlation models – they are based on the interdependence (a function or algorithm) between certain bioclimatic variables of the environment (usually average temperature and average rainfall) and the current range of a species or the characteristics of the ecological niche of a species (Kovarik et al., 2014). When you predict future changes in climatic conditions on the basis of climate scenarios, you can assign relevant biological species or communities to the changed variables. This procedure is known as bioclimatic envelope modelling. For example, the model predicting the effects of climate change on the growing conditions of sugar beet in the Slovak Republic was based on the evaluation of the current production potential of agricultural soils expressed by estimated soil ecological units which were assigned environmental growth requirements and production parameters of sugar beet.

The biogeographic regional model used in this article uses the dependence of vegetation on the long-term effects of altitude and exposure climate, which is determined by the average and extreme air temperatures and the amount and distribution of precipitation (including horizontal precipitation). The current vegetation zones in the Czech Republic stabilized in older subatlantic about 800–500 BC and the shifts of vegetation zones in the landscape faithfully reflect the progress of climate change (Simon et al., 2015). The delimitation of the current vegetation zones in the Czech Republic was elaborated in great detail in the context of the creation of bio-geographical basis for the national ecological network of the landscape (Machar et al., 2017b) and, therefore, the current vegetation zonation is a suitable basic initial framework for the modelling of the effects of climate on production and growing conditions of the vegetation in the Czech Republic.

The results revealed by our biogeographical model as presented in this paper are consistent with the expected trends in vegetation changes induced by climate change in Europe under the ecological model for European vegetation. The main trends of the presented results are also in line with the currently observed trends of changing distribution of wild organisms which are attributed to climate change. There were observed that certain butterfly species expand their range to higher elevations of the Czech Republic, a fact which they explain by the impact of climate change. This in fact correlates with the presented regional scenario of changes in climatic conditions for spruce cultivation. The present upper forest limit in the highest mountain ranges of the Czech Republic is demonstrably shifting to higher elevations at the expense of forest-free habitats of alpine grasslands.

Modelling of the spatial aspects of the occurrence, development and impacts of vegetation zones generates material for further research activities. Elevation is the key variable affecting the overall floristic diversity of the community – a conclusion which supports

hypotheses on the relation between altitudinal climate and vegetation belts. However, the occurrence of individual species was more influenced by the slope aspect, topographic index, soil water content and sun radiation than by elevation alone. The existing models of future distribution of flora and fauna tend to focus on individual target species or species groups. Living organisms engage in the ecosystem processes within their ecological niches and thus the response of biota to climate change is more likely to be identified at the level of ecosystem diversity. The biogeographic regional models are particularly useful in this respect.

An important asset of biogeographic models is their possible application within strategies of adaptation and mitigation measures in the landscape in the context of ecosystem services (Salekl et al., 2017). Vegetation zones serve as important frameworks of ecological conditions for the cultivation of agricultural crops and forest tree species. E.g. grapevine has best conditions in regions with climatic conditions of first vegetation zones (Kilianova et al., 2017). Above mentioned study by Kopecka et al. (2013) demonstrated the practical applicability of such biogeographic model in the creation of a scenario of the climate change impact on the future growth conditions of sugar beet (*Beta vulgaris altissima*) in beet and corn-producing regions of Bohemia. The first studies analysing both the continual fluctuation of agroclimatic conditions in the past 200 years and the expected shifts in the upcoming decades in the Central European region have been demonstrated an expansion of warmer and drier agroclimatic conditions in the most fertile agricultural regions. This study indicated that the development of European climate may result in the most massive shift in agroclimatic conditions since the onset of farming, which is beyond our historical experience.

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Shrnutí

Důsledky klimatických změn se v krajinách mírné klimatické zóny mohou projevovat mimo jiné v posunech vegetační zonace do vyšších nadmořských výšek. Příspěvek představuje regionální biogeografický matematický model klimatických podmínek vegetační stupňovitosti krajiny v Česku a jeho aplikace v rámci vzdělávání studentů doktorského studijního programu Regionální geografie na Přírodovědecké fakultě Univerzity Palackého v Olomouci. Model se opírá o obecně ekologické závislosti vegetačních stupňů krajiny na dlouhodobém působení výškového a expozičního klimatu. Zdrojem klimatologických dat pro model je predikční validovaná databáze klimatických prvků pro období do roku 2100 podle scénáře RCP8.5. Zdrojem ekologických dat je databáze Registr biogeografie, která zahrnuje geobiocenologické údaje o krajině vázané na jednotlivá katastrální území celého Česka. Matematické modelování změn klimatických podmínek jednotlivých vegetačních stupňů v důsledku definovaných klimatických změn je řešeno jako soubor speciálních programů s aplikací v prostředí GIS. Výstupy matematického modelování pro definované okrajové podmínky lze přehledně graficky vizualizovat. Studenti model aplikují v rámci seminářů ze studijního předmětu „Vybrané přístupy k výzkumu krajiny“ nejen pro tvorbu regionálních scénářů potenciálních impaktů predikovaných klimatických změn na krajinu, ale i jako podpůrný nástroj pro posouzení predikovaných změn klimatických růstových podmínek vybraných zemědělských plodin nebo lesních dřevin v regionálním měřítku.

AGRICULTURE DEVELOPMENT OF THE NITRA REGION IN THE CONTEXT OF SLOVAKIA AFTER YEAR 2004

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Abstract: The agriculture in Slovakia has undergone structural changes since its accession to the European Union (EU) in 2004, that have been linked to the adoption of the Common Agricultural Policy of the EU Member States. The article focuses on the Nitra region as a typical agricultural region of Slovakia and its development from the agricultural point of view from 2004. Compared to other Slovak regions the Nitra region has good soil climatic ratios, for the development of agriculture. The Nitra region has the largest share of agricultural land which is characterized by a high-level share of arable land from total agricultural land. The region has the highest values in gross agricultural production from the 2004-2016 reporting period. It has good results in plant and livestock production. The region has the highest employment in agriculture. Despite the decline in agricultural land, as well as a decline in total employment in agriculture, the region has the highest employment in agriculture in Slovakia. It is characterized by a well-developed business structure for intensive agricultural production.

Key words: Nitra region, plants production, livestock production, employment in agriculture, business structure

INTRODUCTION

The Central and Eastern-Europe regions have been currently passing through multilateral transformation (Vaishar & Šťastná, 2016). In 2004 the share of the primary sector of Slovakia showed 3.6% of gross domestic product and by 2016 it showed a decrease to 3.0%. The tendency in share decreases on edit value production corresponds in years 2004–2016 with the reduction of using the factor of production work too. In recent years, we have witnessed, among other things, a significant reduction in the agricultural sector's position in total employment in Slovakia (Strojny & Piecuch, 2017). The share of the primary sector on total employment decreased in 2004 from 4.7% to 1.6% in 2014. The change from centrally planned to the market economy has opened the way to other directions of permanent transformations such as: from productive to post-productive and from (inter)national to global transformations (Vaishar & Šťastná, 2016). Blacksell (2010) described the transformation in agriculture as a process of changes in production aid of the widest conceived maintainable development of strategy in the countryside. Job reductions in agriculture are the accompaniment of continual restructuring of the agricultural sector. According to Buchta (2013), the future perspective of agrarian employment will depend mainly on the production increase of the department, the intensity of department modernization, enhancing human capital and in various usage of the internal development potential of the rural economy.

Agriculture is an important sector of the economy, and rural development amplified by the Common Agriculture Policy plays an important role in every European country, especially in its Central and Eastern parts (Strojny & Piecuch, 2017). The important indicator of agricultural development in Slovakia is gross agricultural production. Comparing the years 2004–2016 in the Slovak Republic there was a slight increase in gross agricultural production (GAP) by 4.8% based on the decrease of gross plant production by 22.6%. Gross animal production decreased by 13.44%. It is similar in monitored the Nitra region, where was an increase of GAP of more than 20%, gross plant production increased more than 40% and gross animal production decreased around 10%. The structural imbalance in agriculture deepended on 2004. Gross plant production starts to prevail not only in Slovakia but as well as in the Nitra region. The decrease of animal production share in Slovakia in 2004–2016 is related to prevailing of livestock keeping, especially pigs and cattles before Slovakia joins the EU (Némethová et. al., 2014). In 2004 the share of the Nitra region on total gross agricultural production (GAP) of Slovakia was 27.40% which is positive for the region. The agricultural importance of the region within the country increases which is proved by the share increase in 2016 which was 30.00%. The share of the region on gross plant production of Slovakia has been changing gradually and as well as gross animal production. The region has the highest values in gross agricultural production as well as in gross crop production and gross livestock production. The Nitra region based on the results of the monitored results is very important for the whole agrarian sector in Slovakia.

METHODS AND DATA

According to Lacko-Bartošová and Buday (2013), Slovakia´s agriculture has undergone a recession in recent years, and stagnation of decisive economic and production indicators is currently taking place. From selected indicators of sustainable agriculture are showing that Slovakia's agriculture is not able to generate a reasonable level of profit on the long horizon, thus ensuring competitiveness in the EU global market. There is an effort to keep the agricultural development even in less developed regions of Slovakia with a donation from EC and a national budget. Regional differences in agriculture of Slovakia are the result of the historical development which had been determined by different soil and climate conditions in lowlands, mountains or areas under the mountains (Marcinčáková, 2013). Different productive–economical conditions of the agrarian sector affect agricultural production in productive regions of Slovakia including the Nitra region. The regions with different productive- economical conditions determined remarkable regional disparity in Slovak conditions (Marcinčáková, 2013). In productive lowlands, there are most suitable conditions for plant production and that is why is animal production in such regions less important. In animal production keeping of poultry and pigs prevail. Plant production in these regions keeps enough forage base for keeping animal production (Némethová et al., 2018).

The use of agricultural land, the size of agricultural production, employment in agriculture, business structures in agriculture and the greening of agriculture are widely used in the work of several experts. In the Czech Republic and the Slovakia Republic are several geographers concerning with the problem, for example, Věžník et al. (2008); Věžník et al. (2013); Spišiak et al. (2005); Spišiak and Némethová (2008) and others. Nowadays development tendencies of agrorural structures lead to increasing in social-economical differences between the regions. The subject of interest of several Slovak and Czech experts: Svobodová and Věžník (2011); Věžník and Konečný (2011); Věžník et al. (2017), Némethová et al. (2018) and others. According to Némethová et al. (2014), under the influence of EC, there have been several structural changes in new EC members as well as Slovakia, touching the decrease of acreage of agricultural soil and its usage. The Czech Republic, long-term changes in the use of agricultural land have been addressed by Kabrda and Jančák (2006). A similar issue is elaborated on in Szturc et al.´s (2017) case study. The take-over of agricultural land is connected with the development of urban areas, with the growth of built-up areas. If this trend continues, a large-scale decline in agricultural land can be expected in the future, coupled with possible problems regarding sustainable agriculture, which can also cause difficulties with food shortages. The relationships between urbanization and agriculture are addressed in Zasada et al.'s (2013) paper. According to Šveda and Vigašová (2010), the increase of built-up areas in last years relates to the change of agricultural usage of the land.

The article focuses on the agriculture development of the Nitra region in the period 2004–2016.

1. Using the development index we analyze the development of areas of agricultural land, arable land and permanent grassland at the district level of regions in Slovakia in 2004 and 2016, with an emphasis on the Nitra region.
2. We will show the development of areas of arable land in the Nitra region at the level of municipalities in 2004 and 2016 according to the growth/decline index.
3. The development of employees in the agriculture of the Nitra region and Slovakia is monitored by the development index. We analyze the proportion of employees in the agricultural sector of the Nitra region in Slovakia from 2004-2016. We compare the share of agricultural employment in agriculture per 100 hectares of agricultural land (relative employment in agriculture) in the monitored region with the rest of Slovakia.
4. With the help of the development index, we can show the development of the production of selected crops (cereals, oilseeds, potatoes, sugar beet, multiannual fodder) in the Nitra region and Slovakia as a whole. We analyze the production of monitored crops in the Nitra region – we show the region's share in the production of these crops of Slovakia in the period from 2004–2016. We compare the hectare yield of the monitored crops achieved in the region with the amount for the SR from 2004–2016.
5. The development of the quantity of livestock in the Nitra region and the SR, form 2004–2016, will be expressed using the development index. We analyze the position of the Nitra region in animal production in Slovakia - we show the region's share concerning individual types of livestock (cattle, pigs, sheep and rams, poultry) in Slovakia. We compare the achieved density of animal production in the Nitra region with the amount for the SR – the density of cattle, sheep, and rams per 100 hectares of agricultural land, the density of pigs and poultry per 100 hectares of arable land.

To monitor arable land development villages of Nitra county in 2004 and 2016 growth/decline index was used. It indicates a percentual increase or decrease of arable land (Blažík et al., 2011). The mathematical expression of growth/decline index:

$$ZR_{k(a-b)} = \left(\left(\frac{\frac{r_{ib}}{c_{ib}}}{\frac{r_{ia}}{c_{ia}}} \right) \times 100 \right) - 100\ [\%]$$

where $ZR_{k\,(a-b)}$ is the change of the area of soil usage (growth/decline index), r_{ia} is the area of the land at the beginning of the perid and r_{ib} at the end of the period, c_{ia} is overall area of monitored land at the beginning and c_{ib} at the end of the period.

Statistical data used in article was from the Regional DataCube Database of the Statistical Office of the Slovak Republic (2016).

THE AGRICULTURAL LAND SOURCES USE

According to Zelenský (2002), the Nitra region in terms of use of agricultural land is classified to the type of country with a prevalence of arable land and the subtype of the country with a high intensity of agricultural production. In connection with the soil context, it is important to observe changes in soil management. The agricultural land in the Nitra region in 2016 covered the area of 465.7 thousand hectares it is 19.4% from the total area of agricultural land in Slovakia (the share value is the highest compared with other regions). From agricultural land is 87% arable soil. This high level of share of arable land in agricultural land predetermines the Nitra region for intensive agricultural production. The share of the arable soil of the region in the total arable soil of Slovakia represents about 30%. This share is the highest in comparison with other regions of Slovakia. The Nitra region also concerns the highest share of arable soil per capita (roughly 0.57 ha). The most important aspect of Slovakia's entering the EU was the increase in direct payments in agriculture, which greatly supported farmers´ incomes and thus the overall development of Slovakia's agriculture, which also contributed to a reduction in the process of decoupling agricultural land in the country. The process of grinding, resp. the non-use of agricultural soil was mainly related to the transformation process in the 90 years of the 20th century when the decline occurred, resp. there was a decrease in agricultural production in selected parts of Slovakia, due to inadequate financial support of the state for farmers. With the help of the EU, funds are supported not only in the agricultural sector but also in rural development. Despite this fundamental support, we can observe a decrease in the area of agricultural land in the districts of Slovakia. According to development index, there is a smaller decrease of agricultural soil areas according to the development index in the regions on Podunajská nížina (lowland), Juhoslovenská kotlina (basin) as well as Východoslovenská nížina (lowland). These are the most agriculturally used regions of the region of Slovakia (Fig. 1).

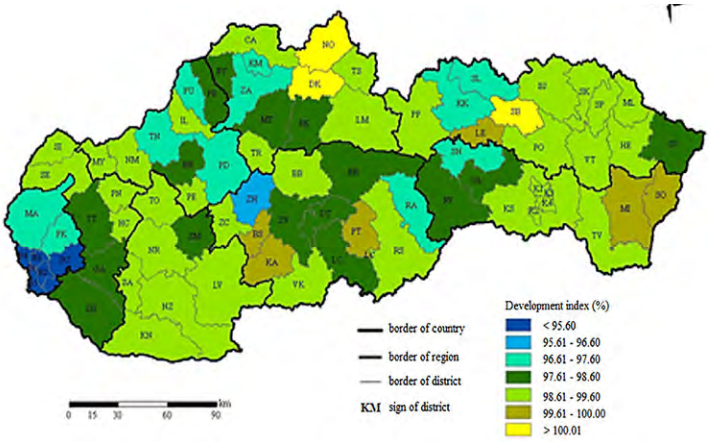

Fig. 1: The development of agricultural land area in Slovak districts in years 2004 and 2016.

Source: Statistics Office of the Slovak Republic, 2016

We were monitoring the decrease of arable land to villages of the Nitra region according to the growth/decline index in 2004 and 2016 (Fig. 2). Our findings indicate that the decrease of arable land in the individual municipalities villages of the Nitra region is related to its extensive usage as well as building purposes. Changes occurred with the reduced arable land and the built-up area increased are also typical of the municipalities of the monitored region as a result of the current suburbanization, the building of family houses and flats, building of production and commercial-storage complexes, shopping and entertainment centres, logistics operations, industrial parks, and others. A decrease in arable land occurred in 182 municipalities (52.0%). The overall growth of arable land occurred in 108 villages (30.9%) and there was no change in arable land area in 60 villages of the region (17.1%).

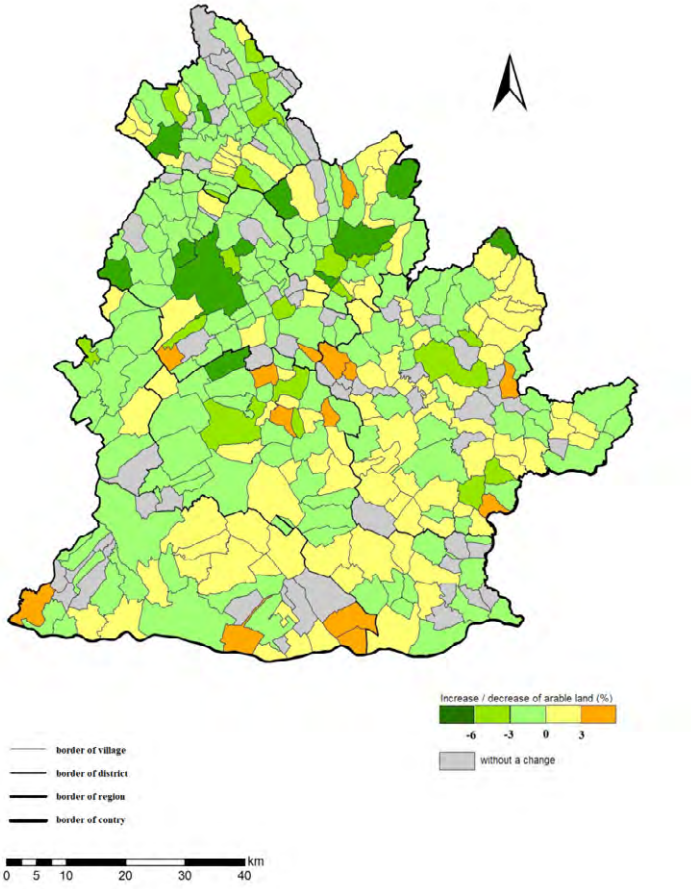

Fig. 2: Increase and decrease of arable land in villages of the Nitra region in 2004 and 2016.

Source: Statistics Office of the Slovak Republic, 2016; authors' calculations

THE EMPLOYMENT IN AGRICULTURE

The employment rate in agriculture in Slovakia before entering the EU was characterized by a decrease of more than 50%. From 2004 to 2016 the decrease was slighter. The indicator in the Nitra region according to the development index showed a decrease of about 40%. Even according to relative employment (the number of employees on 100 ha of agriculture land) there is a drop of employees in agriculture recorded in Slovakia as well as in the Nitra region. The Nitra region comparing to other regions in Slovakia shows the highest share of total employment (Tab. 1).

Tab. 1: Development of employed in agriculture in the Nitra region and in the Slovak Republic in 2004–2016

Employment/ years	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2016
Nitra region	12 582	12 240	11 494	10 714	10 007	9 879	8 289	8 178	7 738	7 365	7 461
Slovak Republic	59 362	56 109	51 330	48 510	45 372	43 733	38 006	37 973	38 347	37 469	37 810
Share of the region in the SR (%)	21,2	21,8	22,4	22,1	22,1	22,6	21,9	21,6	20,2	19,7	19,7
Number of employees per 100 a.l. in the region	2,7	2,6	2,4	2,3	2,1	2,1	1,8	1,8	1,7	1,6	1,6
Number of employees per 100 a.l. in the SR	2,4	2,3	2,1	2,0	1,9	1,8	1,6	1,6	1,6	1,6	1,6

Source: Statistics Office of the Slovak Republic, 2016; authors' calculations

Note: a.l. – agicultural land

PLANT PRODUCTION

When evaluating the development of the production of selected crops, we chose the indicator of the percentage of production of individual crops of the Nitra region in the total production of Slovakia. Based on the selected index, we dare to say that the Nitra region holds an important place in the cultivation area of grain and oil-bearing crops and their importance is going to rise (Tab. 2). The importance of these crops in Slovakia's overall production will be to increase. In the observed period (2004–2016) at the level of both region and SR, according to the development index, there was a slight increase of cereals up to 0.3%. From these values (Tab. 2) it is confirmed that the Nitra region is the important region in the cultivation and production of cereals in Slovakia. In the observed years (2004–2016), this region even reached higher numbers of hectare grain crop production in comparison to the overall Slovak average (Tab. 2). Recently, there has been recorded an interesting surge in the cultivation of oil-bearing plants what can be explained by higher

demand, especially for reasons of their possible deployment for energy purposes. According to the development index, the production of oil-bearing plants during 2004–2016 increased by more than 18% in the Nitra region and more than 25% in Slovakia.

Tab. 2: Development of production and hectare grain crops production in the Nitra region and in the Slovak Republic in 2004–2016

Grain bearing crops		**2004**	**2005**	**2006**	**2007**	**2008**	**2010**	**2012**	**2014**	**2016**
Production (in tonnes)	Nitra region	1 424 114	1 418 287	1 167 110	1 054 000	1 577 696	1 017 260	1 105 691	1 883 885	1 425 512
	Slovak Republic	3 793 238	3 585 391	2 928 804	2 793 185	4 137 019	2 554 239	3 035 810	4 708 338	3 805 712
	Share of the region in the SR (%)	37,5	39,6	39,9	37,7	38,1	39,8	36,4	40,0	37,5
Hectare crop (tonne/ hectares)	Nitra region	5,3	5,3	4,6	3,9	5,8	4,2	3,9	6,9	5,4
	Slovak Republic	4,7	4,5	4,0	3,5	5,2	3,7	3,8	6,0	5,1
Oil bearing crops										
Production (in tonnes)	Nitra region	169 272	159 546	205 179	179 531	238 244	187 015	144 284	279 001	210 494
	Slovak Republic	478 363	453 036	514 669	467 512	633 141	500 688	454 288	738 667	562 951
	Share of the region in the SR (%)	35,4	35,2	39,9	38,4	37,6	37,4	31,8	37,8	37,4
Hectare crop (tonne/ hectares)	Nitra region	5,3	5,4	4,6	3,9	5,8	4,1	3,9	3,3	2,5
	Slovak Republic	4,6	4,5	4,0	3,5	5,1	3,7	3,8	3,1	2,3
Potatoes										
Production (in tonnes)	Nitra region	45 372	33 003	31 998	33 225	33 476	22 292	25 030	18 607	14 447
	Slovak Republic	450 103	344 741	297 448	336 509	281 921	151 350	165 666	178 817	144 625
	Share of the region in the SR (%)	10,1	9,6	10,8	9,9	11,9	14,7	15,1	10,4	10,0
Hectare crop (tonne/ hectares)	Nitra region	20,2	19,7	18,6	14,9	19,9	14,7	19,6	20,8	20,6
	Slovak Republic	15,8	15,8	14,3	16,2	17,2	11,5	18,5	19,6	17,9

Sugar beet										
Production (in tonnes)	Nitra region	634 001	715 114	558 097	330 974	190 520	353 613	355 695	575 848	508 941
	Slovak Republic	1 598 773	1 734 612	1 370 908	846 500	678 915	977 694	886 951	1 550 218	1 205 450
	Share of the region in the SR (%)	39,7	41,2	40,7	39,1	28,1	36,2	40,1	37,2	42,2
Hectare crop (tonne/ hectares)	Nitra region	45,4	54,4	52,3	45,1	61,3	51,7	44,1	69,3	55,5
	Slovak Republic	45,0	52,2	49,5	44,9	61,1	54,5	45,3	69,8	56,0
Multiannual forage crops										
Production (in tonnes)	Nitra region	151 963	125 166	109 023	105 232	111 511	98 327	80 479	98 265	81 763
	Slovak Republic	708 155	645 509	629 268	623 511	699 004	688 488	627 635	746 293	573 247
	Share of the region in the SR (%)	21,5	19,4	17,3	16,9	16,0	14,3	12,8	13,2	14,3
Hectare crop (tonne/ hectares)	Nitra region	8,2	7,3	7,4	7,3	7,8	6,5	5,7	6,8	5,5
	Slovak Republic	5,9	5,1	4,8	4,5	5,0	4,3	3,8	4,5	4,1

Source: Statistics Office of the Slovak Republic, 2016, authors' calculations

The areas of oilseed crops are increased that in reflects EU support in the form of direct support for energy crops. Notwithstanding the fact that Slovakia produces more oil-bearing crops than its home consumption, this row stock is mainly being exported and the domestic market is served by imported completed products (Blaas, 2013). Thanks to advantageous climate conditions, the highest share in the production of oil-bearing crops is recorded in those regions that are on Danube lowland, especially in the Nitra region is produced more than 35%. Similarly, also hectare harvests of oil-bearing crops in the region are higher than the Slovak average is (Tab. 2). The most significant descent between 2004 and 2016 was recorded in potato production at the level in Slovakia and the Nitra region more than 60%. Most potatoes are produced in the northern regions of Slovakia. In recent years there has not been a reduction of potato production, but rather the stop growing of potatoes in Slovakia. The share of the Nitra region in potatoes production is constantly falling (Tab. 2). What makes evidence of positive soil-climate conditions especially for cultivating early potatoes in the region is the fact of higher hectare yields than is the value of Slovak average yields (Tab. 2). The most productive soils are selected for sugar beet cultivation in the climatically most favorable regions of Slovakia. According to the

development index, the sugar beet production in 2004 and 2016 also recorded a decline of more than 20% both in the Nitra region and throughout Slovakia. The share of the region in the production of sugar beet is above 30% (Tab. 2). The Nitra region and Slovakia reach approximately the same values of hectare yields of sugar beet (Tab. 2). Cultivation of multiannual forage crops is closely connected to numbers of housekeeping animals for that they are cultivated for. As it is in the case of potatoes, a decrease in the production of multiannual crops was recorded both in Slovakia about 20% and in the Nitra region about 50%. The share of our region in the production of multiannual forage crops in SR goes gradually down (Tab. 2) This reduction in the production of multiannual forage crops can be explained by the overall decrease of beef cattle and pigs in observed years (2004-2016). Advantageous soil conditions for cultivating multiannual forage crops in the Nitra region are one of the reasons for their higher than average hectare yields in SR (Tab. 2).

ANIMAL PRODUCTION

When Slovakia entered the European Union in 2004, it had to adapt to new conditions for animal production and market demands, which led to further reduction of beef cattle and numbers of pigs. In the case of beef cattle, the overall decrease is less dramatic in the framework of Slovakia about 15% when compared to the situation in the Nitra region about 25%. The less importance of the Nitra region in keeping beef cattle can be shown in the share of the region of the intensity of animal production in SR (Tab. 3). Reduction of numbers is expressed also by the overall number of beef cattle per 100 hectares of agricultural soil Values of this index are under Slovak average. Out of all farm animals, the biggest fall was recorded in the keeping of pigs about 50% in the Nitra region and 60% in Slovakia. The most influential reason for this was the impossibility to obtain funds for breeding and keeping these farm animals in consequence with pig overproduction in the frame of whole of the Europe. The Nitra region has got the highest share in pig keeping thanks to its most suitable conditions for this type of keeping it and it also has got the highest numbers of pigs (Tab. 3).

Tab. 3: Development state of livestock number and intensity of livestock production in the Nitra region and in the Slovak Republic in 2004–2016

Beef cattle		2004	2005	2006	2007	2008	2010	2012	2014	2016
Cattle numbers (in pieces)	Nitra region	85 530	83 539	80 902	78 499	72 498	66 190	66 502	64 527	63 003
	Slovak Republic	540 146	527 889	507 820	501 817	488 381	467 125	471 091	465 543	457 586
	Share of the region in the SR (%)	15,8	15,8	15,9	15,6	14,8	14,2	14,1	13,9	13,8
Intensity cattle (in pieces)	Nitra region	20,1	19,5	18,7	18,2	16,9	15,4	15,6	15,0	14,7
	Slovak Republic	27,9	27,2	26,2	26,0	25,2	24,3	24,4	24,2	23,8

Pigs										
Pig numbers (in pieces)	Nitra region	326 752	317 470	326 188	278 337	193 771	170 070	147 705	152 170	164 927
	Slovak Republic	1 149 282	1 108 265	1 104 829	951 934	748 515	687 260	631 464	641 827	457 586
	Share of the region in the SR (%)	28,4	28,7	29,5	29,2	25,9	24,8	23,4	23,7	36,0
Intensity pigs (in pieces)	Nitra region	82,6	80	81,3	69,3	48,3	42,3	36,9	37,4	40,7
	Slovak Republic	84,5	81,7	82,2	70,9	55,5	50,7	46,4	47,2	46,9
Sheep and rams										
Sheep numbers (in pieces)	Nitra region	10 453	10 064	10 751	10 229	9 821	10 041	10 832	11 690	11 784
	Slovak Republic	321 227	320 487	332 571	347 179	361 634	394 175	409 569	391 151	633 116
	Share of the region in the SR (%)	3,3	3,1	3,2	3,0	2,7	2,6	2,6	3,0	1,9
Intensity sheep (in pieces)	Nitra region	2,5	2,4	2,5	2,4	2,3	2,4	2,5	2,7	2,7
	Slovak Republic	16,6	16,5	17,1	18,0	18,7	20,5	21,2	20,4	19,9
Poultry										
Poultry numbers (in pieces)	Nitra region	3 717 636	3 738 784	4 233 457	3 708 497	3 759 104	3 771 709	3 010 906	3 764 156	3 723 122
	Slovak Republic	13 713 239	14 084 079	13 038 303	12 880 124	11 228 140	12 991 916	11 849 818	12 494 074	12 836 224
	Share of the region in the SR (%)	27,1	26,6	32,5	28,8	33,5	29,0	25,4	30,1	29,0
Intensity of poultry (in pieces)	Nitra region	940,1	941,6	1 054,7	923,6	937,6	938,9	752,4	925,0	917,8
	Slovak Republic	1 007,7	1 037,7	970,3	959,2	832,1	959,2	871,3	919,3	950,7

Source: Statistics Office of the Slovak Republic, 2016; authors' calculations

Reduction in numbers of pigs both at regional and country level in the observed period 2004–2016 can be seen when looking at the intensity of pigs keeping that is expressed by the overall number of pigs per 100 hectares of arable soil whose values are constantly decreasing from 2004. Here, the Nitra region reaches lower values than is the Slovak average (Tab. 3).

In the case of sheep and rams, according to the development index, there is an increase in livestock production in Slovakia by more than 95% and in the region by more than 10%. The biggest help comes from the EU funds that provide support for keeping farm animals on the permanently grassy land. Here, the regional share reaches 2–3%. The increase in the number of sheep in the region and Slovakia is also indicated by the intensity

of livestock production, which is increasing (Tab. 3). In the case of poultry, we did not record as high a decrease as it was in the case of beef cattle and pigs. And what is more, in the Nitra region, there was a slight increment recorded (0.15%). This overall decrease (about 6%) was influenced especially by our openness towards the European market and the import of cheaper poultry. The Nitra region is also typical by its highest share in the keeping poultry (25–33%) area. There is another index showing the decrease of poultry, the intensity of animal production expressed by the number of poultries on 100 ha of arable land (Tab. 3). The values of this regional index are a bit below the average numbers of Slovakia, but when compared to other regions they are the biggest ones.

CONCLUSION

The Nitra region belongs to the traditional agricultural regions that are located on the Podunajská nížina (lowland). In evaluating of many indicators e.g. gross agricultural production, agricultural and arable land area, the number of people employed in agriculture, the number of subjects, the results of production indicators of plant and animal production the Nitra region has more of these indicators than any other region in Slovakia. It is characterized by the highest, resp. a higher proportion of the monitored indicator on the number of people employed in agriculture, in the production and number of livestock in Slovakia. Based on the results of the analyses, we can highlight the importance of the Nitra region in Slovak agriculture. Favorable soil-climatic conditions for the development of agriculture are a prerequisite for the cultivation of several types of crops, which can also be seen by the fact that the region has the highest share of gross plant production in the SR. Despite the decline in the production of multiannual crops, the region has a significant place in the gross livestock production of the SR.

It also has the highest about 20% share of agricultural land (of Slovakia´s total agricultural land and arable land about 30% of Slovakia´s arable land. It is characterized by a high level of share of arable land in agricultural land (87%). In the monitored period of 2004 and 2016, the Nitra region experienced the lowest rate of decline in agricultural and arable land only 2% of all Slovakia´s regions. The region has the right conditions for doing business in agriculture, as evidenced by the number of agrosubjects and agricultural employment, which are the highest in Slovakia. The region has about 20% of Slovakia's total employment in agriculture. In the region, cereals and oilseeds are the most cultivated, their production is significant throughout Slovakia. The quantity of crops grown per hectare is higher than Slovakia´s national average. Production of cereals, but especially oilseeds, increased in the monitored period 2004–2016 in contrast to the production of potatoes, sugar beet and multiannual crops. Favorable soil-climate allows the region to reach higher hectares in all crops compared to SR values. In the monitored period 2004–2016, not only at the level of Slovakia but also in the region there is a decline in the state of all livestock, except for the sheep and rams. The drop-in livestock also shows reduced values of livestock production. The region is characterized by a significant position in pig and poultry farming. It achieves higher values of the share of pigs and poultry on the total livestock of the Slovak livestock.

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Shrnutí

Nitranský kraj patří k tradičním zemědělským regionům Slovenka, které se nacházejí v Podunajské nížině. Při hodnocení několika ukazatelů, např. velikosti hrubé zemědělské produkce, výměry zemědělské a orné půdy, počtu zaměstnaných v zemědělství, produkčních ukazatelů rostlinné a živočišné výroby dosahuje Nitranský kraj významné postavení v zemědělství Slovenska. Vyznačuje se nejvyšším, resp. vyšším podílem sledovaného ukazatele na celkové zaměstnanosti v zemědělství, v produkci a v počtu hospodářských zvířat Slovenska. Na základě výsledků analýz můžeme vyzvednout důležitost kraje pro zemědělství Slovenska. Příznivé půdně-klimatické podmínky pro rozvoj zemědělství jsou předpokladem pěstování více druhů zemědělských plodin, což se projevuje i vysokým podílem kraje na hrubé rostlinné produkci SR. I přes pokles počtu některých druhů hospodářských zvířat, kraj má významné postavení i v hrubé živočišné produkci SR. Vyznačuje se nejvyšším zhruba 20% podílem na celkové zemědělské půdě Slovenska a dosahuje i nejvyšší zhruba 30% podíl na orné půdě Slovenska. Vyznačuje se vysokým stupněm zornění (87 %). Ve sledovaném období let 2004–2016 je v porovnání s ostatními kraji Slovenska, podle vývojového indexu, zaznamenaný v Nitranském kraji nejnižší, zhruba 2% úbytek zemědělské a orné půdy. Kraj má vhodné podmínky pro podnikání v zemědělství, svědčí o tom i zaměstnanost v zemědělství, která je v rámci Slovenska nejvyšší. Kraj dosahuje zhruba 20% podíl na celkové zaměstnanosti v zemědělství Slovenska. V kraji se nejvíce pěstují obilniny a olejniny, jejich produkce je významná v celoslovenském měřítku. Hektarové úrody uvedených plodin jsou vyšší než je celoslovenský průměr. Produkce obilovin, ale zejména olejnin ve sledovaném období let 2004–2016 vzrostla na rozdíl od produkce brambor, cukrové řepy a víceletých pícnin. Příznivé půdně-klimatické podmínky umožňují kraji ve všech sledovaných plodinách v hektarových úrodách dosahovat nadprůměrné hodnoty SR. Ve sledovaném období let 2004–2016 dochází nejen na úrovni Slovenska, ale i kraje k poklesu počtu kusů všech hospodářských zvířat, kromě počtu ovcí a beranů. Na pokles počtu hospodářských zvířat poukazují i snížené hodnoty intenzity živočišné výroby. Kraj se vyznačuje významným postavením v chovu prasat a drůbeže Slovenska. Dosahuje vyšší hodnoty podílu prasat a drůbeže na celkových stavech uvedených hospodářských zvířat Slovenska.

REGIONAL GEOGRAPHY OF AID: SUBNATIONAL APPROACH TO FOREIGN AID ALLOCATIONS IN RESEARCH AND EDUCATION

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Abstract: Foreign aid allocations have been of interest to researchers in developing economy, development studies, and development geography. Most of the available studies address development issues at countries level rather than at subnational levels within these countries. Researchers model and test the distribution of aid across recipient countries, considering recipient countries as homogenous units. This methodological approach masks an important regional heterogeneity within developing countries; therefore sub-national analyses may significantly contribute to more nuanced understanding of foreign aid. The gap in research arises from the related fact, that there has been a chronic lack of usable project-level data from developing countries. The situation has been changing only slowly over the last few years. This contribution attempts to emphasize the importance of the regional perspective in research of foreign aid allocations and to demonstrate the challenges associated with the geocoding of the Czech Republic's foreign aid projects on the example of students' seminar assignment on Czech foreign aid in Ethiopia.

Key words: foreign aid, subnational aid, geocoding, Czech Republic, Ethiopia, AidData

RESEARCH OF FOREIGN AID ALLOCATIONS ON SUBNATIONAL LEVEL: AN OVERVIEW

The allocation of foreign aid has been a subject of interest to researchers for more than three decades. The majority of empirical studies models and tests the distribution of aid across recipient countries, considering recipient countries as homogenous units. The research typically focuses on whether donors give more aid to relatively poor and well-governed recipient countries, or if their aid is motivated by economic and political ties between donor and recipient countries (Ohler & Nunnenkamp, 2014). The first contributions can be traced to the 1970s from McKinlay and Little (1977), while more recent prominent studies include paper by Alesina and Dollar (2000), Barthel et al. (2014), Berthelemy (2006), Dreher et al. (2011), Harrigan and Wang (2011), Lundsgaarde et al. (2010). Most of the focus was on established "western" donors (i.e. Western European countries, USA, and Japan) or China (Dreher & Fuchs, 2015), while donors from post-communist countries from Central and Eastern Europe (CEE) received only limited attention in the aid allocation literature. The only exceptions were studies by Szent-Iványi (2012), Harmáček et al. (2017) and Opršal et al. (2017). Cross-country analyzes are also dominant in research of specific sub-categories of foreign aid, such as foreign aid for democratization and good governance (Adedokun, 2017; Knack, 2004), or environmental aid (Miller, 2014; Opršal & Harmáček, 2019a; Opršal & Harmáček, 2019b).

In contrast, only limited empirical evidence exists on the allocation of aid within recipient countries. Considering recipient countries as homogenous units of observation masks the important regional heterogeneity within these countries, therefore sub-national analyses may significantly contribute to an understanding of the pattern and effects of foreign aid. The gap in the literature arises from two related facts; there has been a chronic lack of usable sub-national data and, therefore, most studies use aggregate donor aid flows rather than project-level data (Powell & Findley 2012). The situation has been changing over the last few years, mainly due to the initiatives aimed at the geocoding of foreign aid projects on the regional and/or local levels. The most advanced initiatives are the AidData Geocoding Initiative (by the College of William & Merry in the US) and Mapping for Results – M4R initiative (by the World Bank). Geocoding is a process by which an address is assigned to single data point (i.e. project activity) with a corresponding latitude and longitude and information about the precision of the location identified (Strandow et al., 2011). Each of the above-mentioned initiative has limits. The AidData Geocoding Initiative geocoded data are only available for a limited number of 37 African countries (BenYishay et al., 2017) and do not contain geocoded data of Czech foreign aid projects. The World Bank database includes solely World Bank projects and project activities. And the Development Gateway's Aid Management Platform runs for a few countries.

The small but growing literature on sub-national aid can be divided into two groups. The first investigates the sub-national level from the perspective of regional and local needs and/or other factors, which can alter the localization of aid activities at the regional and local levels. These studies focus either on a single country or on a cross-section of sub-national localities from different countries (Dreher et al., 2016). The examples of a sin-

gle-country studies include cyclone-related relief aid allocations in Madagascar (Francken et al., 2012), the influence of electoral biases on aid spending in Kenya (Briggs, 2014; Jablonski, 2014), the regional pattern of World Bank projects in India (Nunnenkamp et al., 2017), and micro-level evidence of foreign aid on infant mortality in Nigeria (Kotsadam et al., 2018). Cross-section studies comprise of research on the regional allocation of multilateral aid within recipient countries in Africa (Öhler & Nunnenkamp, 2014), the sub-national allocation arrangements of Chinas foreign assistance in Africa (Dreher et al., 2016), Chinese aid and local corruption (Isaksson & Kotsadam, 2018a), and the impact of Chinese development projects on trade union involvement in Africa (Isaksson & Kotsadam, 2018b).

The second group of studies focuses on the coordination of donors at a sub-national level, again dealing either with regions within a single recipient country or in multiple countries. The coordination of donor aid activities is considered an important prerequisite for higher aid efficiency. The topic was expanded on by several authors including (Powell & Findley, 2012) who conducted a sub-national spatial analysis of donor coordination in Sub-Saharan Africa. (Öhler, 2013) focused on donor coordination within Cambodia, (Nunnenkamp et al., 2015) examined aid fragmentation and donor coordination within Uganda and finally Nunnenkamp et al. (2016) investigated aid donors' specialization and coordination within Malawi. In summary, mapping subnational aid is an important step towards more detailed regional analyses on issues, which have so far been the domain of cross-country analyzes, and which can cover a wide range of topics ranging from institutional quality, public health, nature conservation or inequality and pro-poor growth (see, for example Burnside, Dollar, 2000; Opršal et al., 2018; or Harmáček et al., 2016).

CHALLENGES IN GEOCOCODING FOREIGN AID PROJECTS: AN EXAMPLE OF CZECH PROJECTS IN ETHIOPIA

When studying the regional distribution of Czech development cooperation projects, it is not possible to rely on the existing AidData database for two reasons. Firstly, most of the Czech Republic's foreign development cooperation priority countries (currently Bosnia and Herzegovina, Georgia, Cambodia and Moldova) are located outside the African continent and therefore AidData datasets are not available to them. Secondly, AidData datasets for sub-Saharan Africa countries do not contain geocoded information about Czech aid projects. The priority countries of Czech ODA in the sub-Saharan region are Ethiopia and Zambia for the period after 2018 (Ministry of Foreign Affairs 2017).

The situation in geocoding Czech foreign aid projects is further complicated by special cases of the separatist region of Transnistria in Moldava and Abkhazia and South Ossetia in Georgia. The different administrative and political regimes and general unavailability of data on aid (Hoch et al., 2017) of these separatists regions raise the question of whether these separatist regions should be included in analyzes within their formal (from the perspective of international law) home countries. The geographical distribution of the

priority countries of the Czech Republic's foreign development cooperation is largely due to historical ties from the Communist era (Harmáček et al., 2017; Szent-Iványi, 2012), partly as a manifestation of solidarity with the less developed Eastern European countries (Szent-Iványi & Végh, 2018).

Identification of projects and project activities for countries can be divided into several phases. The first phase should involve addressing individual donors and donor agencies (e.g. the Czech Development Agency) with a request to provide data (a list of projects and information on these projects) implemented in partner developing countries. The second phase includes implementation of new records into the datasets and geocoding exercise. Aid projects and project activities should be geocoded in accordance with the IATI/AidData methodology and included in the datasets. Using this validated methodology will ensure the consistency of data with other databases created in accordance with this methodology. AidData Geocoding Methodology works with the IATI standards (IATI – The International Aid Transparency Initiative) for describing the location class and geographic exactness of a given geocoded location (Strandow et al., 2011).

To ensure accuracy, more sources of information should be used in the geocoding process: the primarily analysis of project documentation, final reports, and available project evaluations; further (if necessary) information from project implementers (usually non-governmental organizations, academic institutions and private companies); and Czech embassies in the relevant recipient countries. To identify the appropriate location and corresponding coordinates, sources may also include Google Earth and OpenStreetMap among others. When aid projects were implemented in multiple locations, then additional rows of data in the location table should be included for each unique location for a given project record.

This method was verified by students in the form of seminar assignment within the course International Development Cooperation. This course is part of the International Development Studies undergraduate program curriculum at the Faculty of Science, Palacký University in Olomouc. The program retains relatively strong geographical focus (Opršal & Nováček, 2017). The exercise was conducted on a sample of five developing countries during the summer term 2019 and revealed the following challenges:

- only part of the Czech aid projects contain information about their exact location; this is typical especially for older projects
- even if the site is listed, it is difficult for some countries (especially sub-Saharan Africa) to locate it on the map and assign it the appropriate coordinates; the reason may be the incorrect transcription of the toponyms in the project documents which are available predominantly in Czech language and also the absence of some specific sites in the maps
- some projects contain information only about the administrative region in which they were implemented; in this case they were mapped at regional level
- some aid projects have a national reach (for instance projects to prevent illegal migration) and therefore cannot be assigned a specific location; this fact reduces the number of observations

– whole exercise is a "top-down" geocoding process, a unilateral system based on the "donor-recipient" relationship, where all resources and documentation are provided by the donor institution

The result of the geocoding process was an Excel sheet with project coordinates and other metadata. The datasets was subsequently transferred to geographic information systems (using QGIS or ArcGIS) and visualized. An example of visualization is a map of Ethiopia with the location of foreign aid projects of the Czech Republic. Ethiopia has a specific system of administrative division, where the whole territory is divided into 9 ethnically based federal states (kililoch), which are further divided into zones and those into districts (wereda) and municipalities (kebele). There are also two self-governing urban areas (Addis Ababa and Dire Dawa).

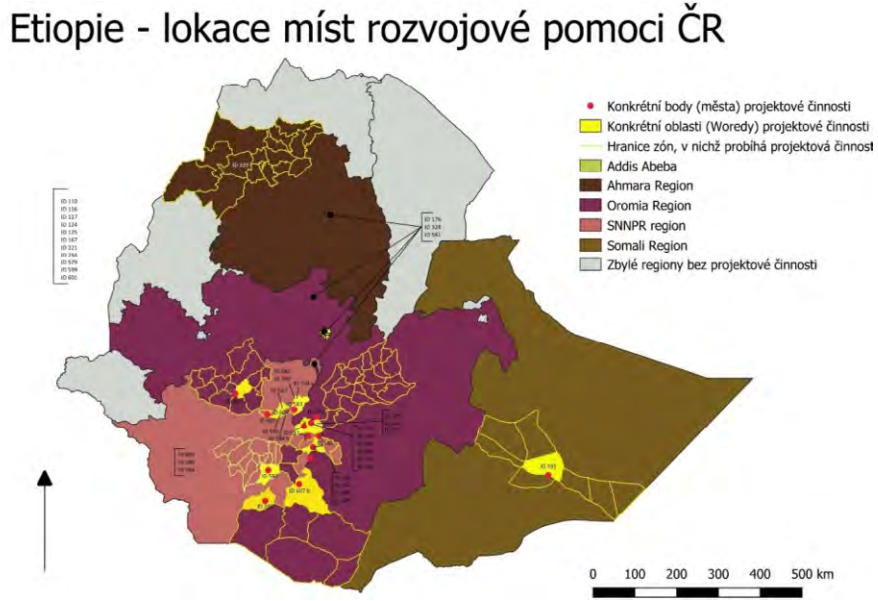

Fig. 1: Localisation of Czech foreign aid projects in Ethiopia.

Source: Burdík et al. (2019), supervised by the author

The Figure 1 shows the result of the geocoding exercise of the Czech Official Development Assistance (ODA) projects. In total, 18 projects were located to locate concrete sites, which is 35% of the total of 51 projects implemented in the period 2000–2015. Most geocoded projects are in the Southern Nations, Nationalities, and Peoples' Region (SNNPR). This corresponds to strategic documents of the Czech ODA, which is specified by SNNPR as a priority region within Ethiopia (Ministry of Foreign Affairs, 2017). In several cases, different projects were carried out at the same site (usually in human settlements), but there were also projects implemented in several different locations. In 12 cases, projects were only mapped to zone level because there was no data available

on the exact location of the project. Six aid projects could only be identified at regional level, usually because project documents referred to regional scope and did not mention specific sites. In accordance with the AidData methodology, eleven projects were assessed as national-wide. No data and descriptions were available for four projects and therefore these projects were not included in the geocoding process. Figure 2 summarizes the geocoding results according to the level of spatial accuracy achieved.

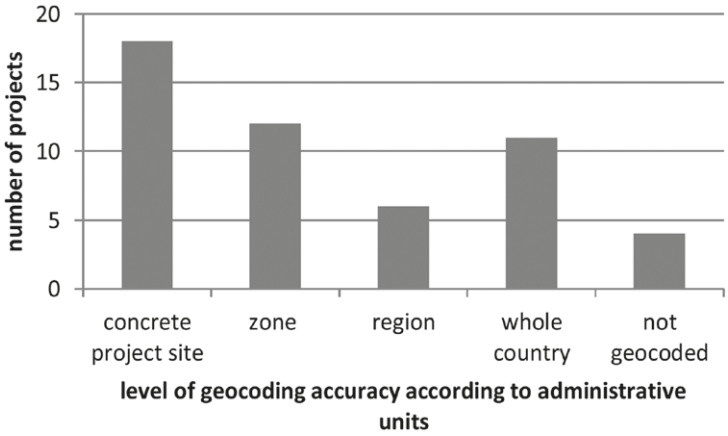

Fig. 2: Number of Czech foreign aid projects in Ethiopia geocoded at different spatial levels.

Source: own calculation based on (Burdík et al., 2019)

CONCLUSIONS AND RECOMMENDATIONS

This contribution attempted to feature the relevance of regional perspective in research of foreign aid allocations. Subnational approach is an important prerequisite to answer following key questions; (i) how regional factors alter the localization of aid activities within developing countries and; (ii) what are the effects of foreign aid at subnational level; (iii) whether donors spatially coordinate their aid projects within recipient countries. The main research limits are the lack of data locating donor country projects within recipient countries. This is particularly true for non-African countries and donors who are referred to as "new" or "emerging" donors (including the Czech Republic). The second part of the article presents a geocoding exercise that was implemented by students as a seminar assignment. The assignment enabled students to extend their knowledge and skills by (i) understanding AidData methodology; (ii) familiarization with selected projects of Czech Development Cooperation; (iii) practicing work with Geographic Information Systems. Only a minority of projects were georeferenced to a specific location. This fact (in the form of a low number of observations) limits further research possibilities in the form of statistical analyses. A possible remedy is a more thorough work in the geocoding process (for example, contacting the specific project implementers with a request

to clarify the location where the project was implemented). Last but not least, the Czech Development Agency (the Agency is a state organization responsible for the management of Czech foreign aid) could also contribute to better and more accurate localisation of Czech development projects, for example by requiring implementers of Czech foreign aid projects to provide accurate spatial information on project activities (ideally in the form of coordinates and in accordance with the AidData methodology).

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Shrnutí

Studium alokací rozvojové pomoci je předmětem zájmu výzkumníků z oblasti rozvojové ekonomie, rozvojových studií a rozvojové geografie. Většina dostupných studií řeší alokace rozvojové pomoci na úrovni států spíše než na úrovni regionů v zemích přijímajících pomoc. Výzkumní pracovníci analyzují rozdělování pomoci mezi rozvojové země, přičemž přijímající země považují za homogenní socioekonomické jednotky. Tento me-

todický přístup zakrývá významnou regionální různorodost v rámci rozvojových zemí; subnacionální analýzy proto mohou významně přispět k lepšímu pochopení motivací a dopadů zahraniční pomoci. Mezery ve výzkumu vyplývají z chronického nedostatku údajů k lokalizaci rozvojových projektů na místní a regionální úrodni a obtížné dostupnosti regionálních dat z řady chudých zemí světa. Proto většina studií pracuje se souhrnnými toky rozvojové pomoci na národní úrovni. Situace se v posledních letech mění jen pomalu, pozitivním trendem je iniciativa AidData, díky které vznikají datové soubory geokódovaných projektů především v regionu subsaharské Afriky.

Tento příspěvek se snaží zdůraznit význam regionálního přístupu k výzkumu alokací zahraniční pomoci a demonstrovat výzvy spojené s geokódováním projektů zahraniční rozvojové spolupráce České republiky na příkladu studentské semestrální skupinové práce zaměřené na Etiopii. Při studiu regionální distribuce projektů české rozvojové spolupráce není možné spoléhat se na existující databázi AidData ze dvou důvodů. Zaprvé, většina prioritních zemí zahraniční rozvojové spolupráce České republiky se nachází mimo africký kontinent (v současnosti jsou to Bosna a Hercegovina, Gruzie, Kambodža a Moldavsko) a proto pro ně datové sady AidData nejsou k dispozici. Za druhé, datové sady AidData pro země subsaharské Afriky neobsahují geokódované informace o projektech české pomoci, které byly v minulosti v těchto zemích realizovány. Celkově se v rámci cvičení podařilo lokalizovat 18 z celkového počtu 51 českých rozvojových projektů implementovaných v Etiopii v období let 2000 až 2015.

Výsledek předběžného výzkumu identifikoval několik výzev, kterým je třeba při geokódování českých rozvojových projektů čelit. Mezi nejvýznamnější patří fakt, že pouze u části projektů české rozvojové pomoci je možné dohledat informace o jejich přesné poloze v rámci rozvojové země; to je typické zejména pro starší projekty. I když je umístění uvedeno, je pro některé země (zejména v subsaharské Africe) obtížné identifikovat tato místa na mapě a přiřadit jim příslušné souřadnice; důvodem může být nesprávná transkripce toponym v projektových dokumentech, které jsou dostupné převážně v českém jazyce, a také absence některých konkrétních míst (které jsou zároveň projektovými lokalitami) v mapách. Konečně, některé rozvojové projekty mají celostátní záběr (například projekty zabraňující nelegální migraci), a proto jim nelze přiřadit konkrétní lokalitu; tato skutečnost snižuje počet pozorování. Ke zlepšení situace může přispět Česká rozvojová agentura (státní instituce odpovědná za management české zahraniční pomoci) například tím, že bude od realizátorů českých rozvojových projektů požadovat, aby poskytovali přesné prostorové informace o svých projektových aktivitách (ideálně ve formě souřadnic a v souladu s metodikou AidData).

REGIONAL GEOGRAPHY EDUCATION IN POLAND

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Abstract: Education in regional geography in Poland takes place at public schools from the earliest educational stages and is compulsory until young people reach the age of adulthood. Reforms of the Polish education system, resulting in changes in the core curriculum of general education, likewise resulted in changes in the concept of education in the field of regional geography. The subject of the authors' article is education in regional geography in the Polish education system at various educational stages. The authors' analysis has two research goals. The first concerns changes in the education of regional geography at Polish schools; here the analysis and evaluation of the current content of education in the field of regional geography are offered. The second one is the study of the model of regional geography education in geographical studies in Poland on the example of the geographyat the Pedagogical University of Cracow. Although elements of education about one's own region already appear in a kindergarten, they are most strongly implemented at a primary school in the form of educational paths, e.g. "Regional education – cultural heritage in the region", and at a lower-secondary school (gymnasium) during geography classes.

Owing to the current education reform, liquidating gymnasium (a lower secondary school level) and re-introducing the division of public schools into an 8-year primary school and a longer secondary school, the con-

cept of education in regional education has inevitably changed. Currently, it is implemented in accordance with a multidisciplinary model of education consisting in weaving the content of regional education into the core curricula of various school subjects, and thus building the image of the whole region by means of viewing from different perspectives and inevitable cooperation of teachers of diverse subjects. Invariably, however, content in the field of regional geography is carried out at a primary and secondary school during geography classes.

At university level, selected students – in geographical studies – receive a regional geography training. As an appropriate example one can offer A. Świętek's original classes in "Regional Education" for geography students of a teaching specialty consisting of students designing and completing an educational trail in the area of Nowa Huta in Cracow.

Key words: regional education, regional geography, geography core curriculum, reform of Polish educational system

INTRODUCTION

Education is perceived as „all activities and processes enabling people to get to know nature, society and culture, and at the same time to participate in their transformation, as well as to achieve as comprehensive development as it is possible (...)" (Okoń, 1984). This definition, commonly accepted in Polish pedagogical literature, offers regional geography anexceptional place and significance. Regional geography is a department of geography that deals with the study and description of features of the geographical environment of individual areas of the Earth, taking into account their natural conditions and the effects of human activities. It employs pieces of information acquired from various geographical sub-disciplines. Its basic task is the synthesis of a geographical content in order to learn about the relationship between the components of the natural environment and human activity in a given area. In the light of the definition of education according to Okoń (1984), regional geography should therefore play a significant role in educating the young generation. Is its potential in education at various levels of the education system properly utilized? The authors of this article decided to determine this by undertaking an analysis of education in regional geography in Poland.

The subject matter of the authors' paper is education in regional geography in the Polish education system at various educational stages. The research goals set by the authors are as follows:

- definition of school subjects and educational models under which education in regional geography is carried out at Polish schools,
- indication of the currently applicable content of education in the field of regional geography at Polish schools at the educational stage of at both primary and secondary school,

– defining the scope of teaching regional geography at geographical studies in Poland on the example of geography at the Pedagogical University of Cracow.

To achieve the assumed goals, the authors:

– analyzed the content of education contained in the new core curriculum for general education,
– analyzed the plans and the core curriculum of geographical studies in the field of regional geography, indicating the courses at which it is carried out,
– used the example study method by presenting the Regional Education course implemented by students of the teaching specialization in geography at Pedagogical University of Cracow.

REGIONAL GEOGRAPHY AT A POLISH ELEMENTARY SCHOOL

The reform of the education system in Poland, which has been gradually introduced into subsequent educational stages from 2017, resulted in closing down of a lower secondary school, extension of a primary school to eight years, and a secondary school by one year (a secondary school to 4 years and a technical school to 5 years) and establishment of a „trade school" in place of the former vocational school. Education in regional geography in the reformed education system takes place during geography lessons at both primary and secondary school (Osuch, 2018).

At a primary school, geography education during geography lessons is very extensive. An analysis of the content of education has shown that geography core curriculum included as many as four content ranges related to this department:

– II. Polish landscapes,
– IX. The natural environment of Poland and Europe,
– XI. Relations between elements of the geographical environment on the example of selected areas of Poland,
– XII. Own region,
– XIII. „Little homeland"

As far as teaching regional geography of Poland is concerned, the didactic principle „from a general level to a detailed level" is applied. As part of an implementation of the „Polish landscapes" section, students learn about the diversity of country and learn about: high mountain landscape (the Tatras Mountains), highlands (the Kraków-Częstochowa Upland), lowland (the Mazovian Lowland), the lake district (the Masurian Lake District), seaside (the Slovincian Coast), metropolitan (Warsaw), urban-industrial (the Silesian Upland) and agricultural (the Lublin Upland).As part of the „Own Region" section, students will acquire pieces of information about their own region, the dominant features of its natural environment, demographic structure and economy, tourist values and the scope of international cooperation that is carried out in it. Students also get to know their own

surroundings thoroughly, implementing the „Little Homeland" section: determining its area, geographical environment, attractiveness and identity. Geographical phenomena are also considered by students on a relational and larger scale. Students analyze the relationships between elements of the geographical environment on the example of selected areas of Poland, and compare the natural environment of Poland with the natural environment of Europe.

At secondary school (a technical school, a high school), students learn about the regional diversity of Poland based on the basics of knowledge acquired from individual sub-disciplines of geography. The regional diversity of the natural environment of Poland begins with learning about the division of the country into physico-geographical regions. They characterize them due to the geological structure and raw material resources, surface formation, water network, climatic conditions, forms of nature protection and the condition of the natural environment.

Broadly understood regional education has been implemented in the Polish compulsory education system not only in the traditional form – and thus during geography lessons.

As a result of the reform of the education system, the education model has changed. Prior to the 2017 education reform, regional education was implemented according to an interdisciplinary education model. It consisted in the implementation by students of educational paths combining knowledge and skills from various areas of knowledge about the region. At a primary school, students could choose the path „Regional education – cultural heritage in the region" and at a lower secondary school: „Regional education and civil defense". However, only some students participated in these activities, as these paths were one of many to choose from.

Currently, regional education is implemented in accordance with a multidisciplinary model of education consisting in weaving content from the field of regional education into the core curricula of various school subjects, and thus building a coherent image of the whole region. The core of regional education is evidentlygeography. Apart from geography classes, the content related to your own region appears likewise during Civic Studies classes and at both primary and secondary school, to a lesser extent during history classes, Polish language classes and even art classes. The figure below presents the content of education in the field of „Little Homeland" appearing in the new core curriculum for a primary school, divided into the abovementioned school subjects.

Fig. 1: A multidisciplinary model of implementing regional education at Polish primary school on the example of the learning objectives of the new core curriculum regarding "Little Homeland".

Source: own study based on the analysis of the content of the core curriculum.

The strongest correlation of the content of education enabling a comprehensive understanding of country's regions at various scales concerns geography and Civic Studies (Świętek, 2018). Table.1 summarizes the educational content of both subjects, which, when combined, enables a proper and comprehensive spreading of information about regions to the students at various scales. Sections of geography core curriculumcorrespond with those of Civic Studies core curriculum. During geography classes, regions are spatially separated, whereasduring Civic Studies classes they are defined according to social groups living in their area ("Little Homeland" (geography) – "local community" (Civic Studies), "own region" (geography) – "regional community" (Civic Studies)).

Tab. 1: Educational content related to the region included in the core curriculum for a primary school

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XIII. "Little Homeland": area, geographical environment, attractiveness, identity. Pupil:

1) defines the area identified as its own "Little Homeland" as a symbolic space in the local dimension (e.g. a commune-city, a village, a district of a large city or a local system with undefined administrative boundaries);
2) recognizes in the area the main characteristic objects that determine attractiveness of "Little Homeland"
3) presents in any form (e.g. a multimedia presentation, a poster, a film, a photo exhibition) attractiveness of "Little Homeland" as a place of residence and business activity on the basis of information found in various sources;
4) designs, based on its own field observations, activities aimed at maintaining values of the geographical (natural and cultural) environment and improving the living conditions of the local community;
5) identifies with "Little Homeland" and feels co-responsible for shaping the spatial order and its development.

XII. Own region: sources of information about the region; dominant features of the natural environment, a demographic structure and the economy; tourist attractions; an international cooperation. Pupil:

1) indicates the location of its geographical region on the map of Poland;
2) characterizes the natural environment of the region and defines its main features on the basis of thematic maps;
3) recognizes rocks in its own region;
4) presents the main features of the demographic structure of the population and economy of the region on the basis of retrieved statistical data and thematic maps;

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VI. Local society. Pupil:

1) enumerates the tasks of local government; presents the main sources of income and expenditure directions in the commune budget;
2) presents how the commune (a city / a district) office is organized; indicates in which department one can handle selected matters; presents possibilities of settling matters via e-office; uses official forms – completes the application for a temporary identity card;
3) lists the constitutive and executive bodies in the commune (a city / a district); shows how they are chosen and how they can be revoked; gives the powers of these authorities;
4) indicates who is the head of the commune / a mayor / a city president and a chairman of the commune / a city council; finds in local media information on public activities of persons discharging functions in local government bodies;
5) finds and presents information about its commune, events and people from its history;
6) recognizes the social problems of their local community (e.g. resulting from the demographic, economic and infrastructural situation); makes judgments about these problems.

VII. Regional community. Pupil:

1) finds and presents basic pieces of information about its region, events and people from its history; locates its own Voivodship and its powiats (counties) as well as other Voivodships;
2) lists the tasks of the powiat(county) and Voivodship self-government;

5) presents in any form (e.g. a multimedia presentation, a poster, a film, a photo exhibition) the natural and cultural values of the region; 6) designs a route for sightseeing tour of its own region based on sources of information found and, if possible, conducts it in the field; 7) shows relationships between elements of the geographical environment on the basis of field observations carried out in a selected place of its own region; 8) discusses forms of cooperation between its own region and foreign partner regions.	3) indicates in which department of the powiat authorities certain cases can be dealt with; uses official forms – fills out the passport application (a regional office delegation); 4) lists the constitutive and executive bodies of the powiat (county) self-government and the Voivodship; shows how they are chosen and how they can be revoked; lists the tasks of these bodies; 5) presents the traditions and customs of its regional community.

Source: own study based on the analysis of the core curriculum.

There are also diverse forms of implementation of the content of regional education at schools, which by the place of realization can be divided into school and out-of-school. School forms of implementing regional education include:

- subject lessons at school (mainly geography),
- extracurricular activities at school and school events,
- educational projects.

Non-school forms of regional education implementation include:

- subject lessons in the field,
- extracurricular activities and school events outside school,
- educational paths,
- school trips,
- out-of-school educational projects.

The conditions and a manner of implementing education specified in the new core curriculum, both for geography and Civic Studies, create an obligation to implement the objectives of education in a diverse way, emphasizing fieldwork during geography classes and educational projects during Civic Studies classes. Regional education fits perfectly into such an implementation of the educational objectives of the abovementioned subjects, offering teachersa wide spectrum of opportunities for regional education.

REGIONAL GEOGRAPHY WITHIN THE LIMITS OF THE UNIVERSITY EDUCATION ON THE EXAMPLE OF GEOGRAPHY AT THE PEDAGOGICAL UNIVERSITY OF CRACOW

Further education connected with regional geography in Poland is continued by a small number of students who undertake studies at Faculties of Geography. In these studies, regional geography is animperative element of the education program. The autonomy of universities and the freedom of institutes in drawing up plans and core curricula means that an intensity of regional education at individual geographical studies in Poland varies. However, its indispensable part is always an implementation of stationary courses in regional geography and regional field exercises.

In order to present the method of organizing regional education at the university level in geographical studies, the authors will make use of the core curriculum currently implemented in the field of geography at their home scientific unit, which is the Pedagogical University of Cracow. Studies in geography at the Institute of Geography of the Pedagogical University of Cracow are two-level. They consist of three-year Bachelor's and two-year Master's studies. At both levels of study, students pursue courses in the overall study plan as well as additional courses in accordance with the chosen specialty. In this analysis, the authors will consider courses appearing in the overall study plan, as these are implemented by all geogrephy students, regardless of the chosen specialty. Students of geographical studies at the Pedagogical University of Cracow are educated in the field of regional geography within full-time courses and numerous field exercises. Courses in the field of regional geography are carried out at both undergraduate and graduate studies. Undergraduate students stand a chance of encountering regional geography at each year of study.

During the first year of study, they take part in four-day regional field exercises in the Silesian Upland, the Małopolska Upland and the Cracow-Częstochowa Upland. After completing them, students are able to observe, describe, draw and interpret various physico-geographical elements of the Lesser Poland and the Silesia-Cracow Upland and present the mutual relations of these elements. They also learn about socio-economic processes occurring in the aforementioned areas. During the first year, students also take several days of physical geography, topography and geology exercises in their own region.

During the second year of study, students learn about the Carpathian Mountains, taking part in five-day regional field exercises. Students likewise take field exercises in socio-economic geographyof Cracow and the surrounding area. During the course, students conduct research in the city in which they study, becoming familiar with the research process used in the socio-economic geography, starting from a research preparation by means of collecting material as well as ways and possibilities of analysing collected data. During classes, students independently or in a group conduct their own research in the field on a topic assigned by the teacher.

During the third year of studies, students take three full-time courses constituting the basis of knowledge about regional geography of Poland and the world. These are as fol-

lows: Polish regional geography (economic), Polish regional geography (physical) and the regional world geography. They also take a course in "local history" within which they not only study the forms, directions and methods of sightseeing, but above all become familiar with the heritage and its interpretation on the example of selected geographical or tourist regions of Poland. During the third year, students also undergo six-day regional field exercises in the Lake District and the Baltic Coast. During the classes, students learn about the main features of the landscape, natural phenomena and socio-economic issues of the South Baltic Coastal District and the Lake District, as well as improve the skills of observation, documentation and interpretation of selected features of the geographical environment in the field.

At Master's studies students also take part in regional field exercises every year. During the first year, these are five-day field exercises in the Sudetes. During the course, students learn to observe, describe, draw and interpret various physical and geographical elements of the Silesian Upland, the Silesian Lowland and the Sudetes and present the mutual relations of these elements. They also learn about socio-economic processes occurring in these areas. In addition, students undergo five-day field exercises in the physical geography and five-day field exercises in the socio-economic geography in the region.

During the last year of geographical studies, students develop their knowledge and skills in regional geography of Europe and the world. They do it during such courses as: regional geography of Europe and regional geography of non-European countries. They learn about the diversity of major countries in the world in terms of the natural environment, population phenomena and processes, and political and economic issues. They study how to identify and interpret the relationships between individual elements of the geographical environment, historical past and socio-economic conditions shaping the contemporary regional diversity of major countries in the world. During full-time classes, students also deepen their knowledge about the richness of subsequent regions of Poland in the second part of the "local history" course. In practice, they get to know south eastern Poland, taking four-day regional field exercises in the Lublin Upland and in the Bieszczady mountains. During these exercises, students learn about the diversity of the geographical environment of the Lublin Upland and the Eastern Carpathians, discover mutual relations between its elements, determining the impact of historical conditions on the socio-economic development of this area and the level of tourist development.

Table 2 summarizes the courses in regional geography implemented in accordance with the current study plan in the field of geography at the university where the authors work. Analysis of studies has shown that regional geography in the described field is widely implemented through the realization of basic stationary courses, but most importantly – by getting to know Polish regions in practice – during regional field exercises.

Tab. 2: Courses in regional geography in the field of geography (the Pedagogical University of Cracow)

Degree of study	Year of study	The name of the course
Bachelor's	I	Regional field exercises – the Lesser Poland and the Silesia-Cracow Upland
Bachelor's	II	Regional field exercises – the Carpathians Field exercises in the socio-economic geography
Bachelor's	III	Regional geography of Poland (economic) Regional geography of Poland (physical) Regional geography of the world Local history course Regional field exercises – the Lake District and the Baltic Coast
Master's	I	Regional field exercises of the Sudetes Field exercises in the physical geography Field exercises in the socio-economic geography
Master's	II	Regional geography of Europe Regional field exercises the Lublin Upland, the Bieszczady mountains Regional geography of non-European countries Local history course

Source: own study based on the study plan analysis.

REGIONAL GEOGRAPHY BETWEEN UNIVERSITY EDUCATION AND SCHOOL PRACTICE

Specificity of the Pedagogical University of Cracow, regarded as the best university for teacher training in Poland, including geography teachers, means that students of the teaching specialization must carry out their major studies taking into account changing school requirements. A great importance of regional education at a Polish school means that students of geography of the teaching specialization, in addition to a substantive preparation within regional geography, are also prepared to implement its assumptions in school practice at specialty courses.

Geography and the Civic Studies students (teaching specialty) at the Pedagogical University of Cracow are simultaneously being prepared to teach geography and the Civic Studies at a primary and a secondary school. Their knowledge and skills both in geography and other selected social sciences means that they are substantively prepared for an effective implementation of regional education in school practice. This is also the purpose of the directly dedicated "Regional Education" course outside the core curriculum – as part of the teaching specialty. The "Regional Education" course is implemented during the third year of undergraduate studies. Regional education is a mixed course

– some classes take place at the university and some in the field. As part of the course, students:

- study the objectives and tasks of an interdisciplinary model of regional education,
- seek and structure content in the field of regional education according to the new core curriculum on the example of the Lesser Poland Voivodship,
- study methods and forms of education used in the process of regional education,
- design course scenarios from an interdisciplinary and modular perspective,
- practically verify and evaluate the designed scenarios of classes during field exercises in Nowa Huta in Cracow.

Among the various forms of implementation of regional education at school, the one that, on the one hand, allows one to get to know "Little Homeland" and, on the other hand, is easily feasible within limited financial capabilities of students and teachers' time is the educational path in the area of the student's town. During the regional education course, students learn to design such a path in an exemplary area of Nowa Huta in Cracow.

The educational path is a walking trail, marked out in such a way that its route includes as many attractive natural and cultural objects as possible. Didactic paths can be thematic or interdisciplinary, while regional education uses the latter to draw on the richness of the region using the knowledge from various fields. The right selection of positions for the path is key to getting to know the region. The purpose of creating educational paths is to learn by observing objects in their natural environment, which is not possible in the classroom. The objective of the path within the field of regional education is to select in a small area nearby points (4-5 hours on foot in the field) enabling one to get to know the region by raising various geographical issues and performing related exercises. During the regional education course, students design tasks for students within the boundaries of particular parts of the area of Nowa Huta in Cracow. The stands are purposely selected so as to create the opportunity to discuss various regional topics and are within a short distance. Students are divided into groups of 2-3 people. Each group receives a position and designs exercises for students. Designed exercises are carried out and evaluated by students during fieldwork.

Within the educational trail around Nowa Huta, which, according to the authors, is an example of "good practice" in regional education, eight positions have been designated: Tadeusz Sendzimir Steelworks, Jan Matejko's Manor House, Nowa Huta Lake, the Cistercian Abbey in Mogiła, the Church of St. Bartholomew, Nowa Huta Meadows, the Central Square, the Lord's Ark Church.

The path begins at the gates of Tadeusz Sendzimir Steelworks, currently owned by ArcellorMital Poland. At this position students discuss various geographical problems: the issue of a location of the steel mill (natural and non-natural location factors), the current state of heavy industry in Poland and Europe, the restructuring of the energy industry in Poland, the problem of a sectoral unemployment, and industrial environmental pollution.

The second position of the educational trail is Jan Matejko's Manor House in Krzesławice. The manor house once located outside the city borders facilitates the analysis of the topic of urban development of the city of Cracow, and the person of the Polish painter Jan Matejko (documenting the most important moments of Polish history in paintings) is a contribution to stimulating sense of national identity.

The third position of the educational trail is Nowa Huta Lake. This artificial recreational reservoir creates opportunities to address the issues of recreational areas in the city and artificial reservoirs. At the lake, students carry out measurements of water purity and the size of geographical objects using Geographic Information System (GIS).

The fourth position of the path is the Cistercian Abbey in Mogiła, one of the oldest and largest stone sacred buildings in Poland, in the rank of a minor basilica, is a symbol of the rich and centuries-old historical past of the region. Issues concerning medieval economy and urbanization as well as issues in the field of geography of religion (centers and pilgrimage routes in Poland) are discussed here.

The fifth object on the route is the wooden Church of St. Bartholomew, being a valuable monument along the Wooden Architecture Trail in southern Poland wherethe necessity and difficulties of protecting wooden monuments in Poland is discussed.

The sixth position of the path is Nowa Huta Meadows, the 57 hectare first ecological site in Cracow, allowing students to raise issues related to: ecological sites as forms of nature protection in the city, coexistence of people and protected species, migration routes of birds, habitat diversity of meadows, and management in protected areas. Students recognize protected species of birds and plants here.

The penultimate position of the educational trail around Nowa Huta is the heart of the district in the form of the Central Square. The urban assumptions of the socialist city and architectural styles are discussed in the context of an implementation by the communist authorities of the vision of an ideal socialist society and the contemporary consequences of the infrastructure solutions used for residents.

The last position of the educational path is the Catholic church of the Lord's Ark, whose building permit had been asked for years during an anti-church communism, and which was eventually built by the inhabitants of Nowa Huta with the support of the then bishop of Cracow, Karol Wojtyła (later Pope John Paul II). The Lord's Ark is a place where issues of political changes in Poland, martial law and Solidarity are discussed.

CONCLUSIONS

Teaching regional geography among geography students (teacher candidates) has been a priority for many years, both in the field of widespread full-time courses and regional field exercises in different regions in Poland. Students have the opportunity to study in detail not only their own region, neighboring regions, but also those further from Cracow, often less available to them on a daily basis.

After the introduction of the new reform of the education system in 2017, there was a slightly greater opportunity for primary school students as well. It's not only about teaching Geography, but also about the possibility of correlation with other subjects, especially Civic Studies. In the past, such opportunities likewise existed, but in practice the implementation of educational paths, including regional education, was not always fully realized at all schools. The focus was more on the implementationof specific subjects rather than on the correlation of those subjects.

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DIDACTIC ASPECT OF TEACHING ENVIRONMENTAL GEOGRAPHY (THE DRAFT OF ENVIRONMENTAL GEOGRAPHY TEXTBOOK FOR PRIMARY SCHOOLS)

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Abstract: Nowadays, we can observe that there is still not sufficient amount of textbooks in various areas of Education. One of these areas is also Environmental geography which is an important part of geography lessons at primary school. Therefore, our main intention in this contribution is to introduce design of the textbook for Environmental geography. Textbook that we have created introduces and solves environmental problems on global, regional and local level in a very detailed way. The aim of the textbook is to applicate all of the dimensions of environmental geography into each class at the second grade of primary schools in Slovakia. We have created didactic material which helps teachers during their teaching, as well as material interesting and engaging for students. The proposed textbook could be motivating because of many additional illustrations, various games and tasks using not only classical, but also modern didactic methods.

Key words: environmental geography, textbook, didactic methods

INTRODUCTION

Nowadays, environmental problems fall into the most discussed topics not only among scientific or specialized society, but also among society as a whole. These problems are the result of considerably negative human impacts on environment, which affect each of its segments. There is an obvious connection among particular environmental problems and their growth during the last decades. Firstly, there are just local problems which grow into regional and finally into global dimensions. Therefore, education of children is very important and leads to better knowledge, responsibility and protection of environment. Environmental geography has a significant role in solving environmental problems. It represents a part of geography which stands at intersection within environmentalism. The main function of environmental geography is to characterize, explain and suggest changes in the relationship between human being and environment. Environmental geography and its topics have their role in education of geography at the second grade of primary school, mainly in regional geography. Particular topics are specified in the National Curriculum (Štátny vzdelávací program, Geografia, 2010) or more precisely in updated version of this document (Inovovaný štátny vzdelávací program, Geografia, 2014). Environmental topics are put into education of geography through cross-sectional themes of environmental education (ŠVP, Environmentálna výchova, 2010). A little attention is paid to environmental topics in geographic textbooks. We can observe the same situation within textbooks for environmental education. The lack of textbook is partially solved by teachers who try to make their own didactic materials or organisations which deal with environmental education.

The aim of this paper is to introduce a draft of the textbook designed for environmental geography at the second grade of primary school. The content and character of the textbook might contribute to improvement of environmental education or environmental problems.

THEORETICAL AND METHODICAL APPROACHES

The study of environment has got an irreplaceable role and importance in Slovak geography. First articles which deals with environmental problems were written by geographers from Slovak Academy of Sciences in Bratislava – Mazúr (1977), Urbánek (1977) and Drdoš (1978) in the eighties. The articles on explicit environmental problems is systematically observed in works of Hanušin, Lehotský (1998), Huba (1993, 1994), Ira (1992) and the others in the nineties. In Slovak geography, the term "Environmental geography" was used for the first time by Drdoš (1991). He described environmental geography as one of the basic direction of geographic research. The object of the research was defined by Drdoš as a knowledge of natural four-dimensional reality on the Erath´s surface, as a zone of contact and intersection of various natural materials for the purpose to protect human needs. Among these needs, the question of human survival (and a whole biosphere) predominates in the times of natural threat, created by technical civilisation. From this period of time, many summarizing papers in scientific or specialized

literature were made to conduct a survey of interest in environmental issues in Slovakia (e. g. Drdoš, 1994, Huba, 2009, Ira, 2007). Many researches were also made at university geography departments, e.g. papers written by Machová and Tremboš (1995), Minár and Tremboš (1995), Spišiak and Bartková (1998), Čižmárová (1997, 1998), Drdoš and Michaeli (2001, 2005), Drgoňa and Kramáreková (1995).

Basic knowledge of environmental geography is contained in didactic literature designated for primary schools, mainly in regional geography topics in geography textbooks. The knowledge is clearly defined in geographical education standards in National Curriculum (2010), or more precisely in updated version of this document (2014). Except of these standards, geography implements also cross-sectional themes of environmental education.

The textbook, as a classical didactic material, is still the most effective form of teaching geography. Therefore, environmental issues were put to geography education through this typical didactic material. Principles of composition of the textbook proceeded from the theory of textbooks, as well as from works written by Zujev (1986), Průcha (1998, 2002), or Turek (2014). Comparison of old and a new concept of the term "textbook" was described in Sikorová (2010), Mikk (2000), Johnsen (1993), or Janko (2012). Mladý (1988) also deals with the question of how the textbook might be designed.

DIDACTIC ASPECTS OF TEACHING EVIRONMENTAL GEOGRAPHY

In comparison with the other geographical disciplines, environmental geography deals with environmental problems to the largest extent. Its main task is to characterize, interpret and suggest the changes in the relationship between human being and environment in a space-time connection, with a sense of sustainable development. Throughout environmental geography, students will find out not only current facts, but they also learn how to analyse, explain and search for possible ways of solutions which are arisen from potential of the landscape and human interests. Simultaneously, their environmental awareness, knowledge and action are developed.

The Role and Importance of Environmental Geography

We regard environmental geography as a sub-discipline in geography, which stands in intersection with environmentalism, and was created as a result of growing specialization in each discipline. Environmental geography deals with geographic study of environmental problems and interaction between environment and human society (Drgoňa, Kramáreková, 2005). We proceed from thesis of Hagget (1976) who considers geography to be a science of the relationship between human being and environment. Therefore, environmental geography is considered to be a specific attitude to solve this relationship, focused on each structure of environment in its space-time changeability.

Environmental geography represents sub-discipline, which takes into account that historical basis of scientific solutions for environmental problems of human being were

originated by geography, which also forms concept of geographic surrounding. According to Mičian (2008), there are plenty of reasons why geography deals with environmental problems. Firstly, geography falls into the most equipped science because it concentred on study of interaction between nature environment and society from the beginning. Secondly, geography stands at the boundaries of natural, social and technical sciences. Another reason is that it has traditionally the widest range of solutions, and also sees the problems in their complete and specialized reality – the landscape reality. So that, geography sees spatial aspects of environmental problems in the background of systematic theory, which we can consider to be the main contribution of geography into interdisciplinary environmentalism.

Environmental Topics in Geography within the National Curriculum for the Second Grade of Primary School

Content of geography directions and education standards are clearly, in very detailed way, characterized in National Curriculum which was formed in 2010 (ŠVP, Geografia, 2010) and its updated version formed in 2014 (IŠVP, Geografia, 2014). In both documents, geography at second grade of primary schools is a part of the field called "Human being and a society". The content of geography, as a school subject, focuses on environmental problems and solves the relationship between nature and human society because of the growth of problems which arise from human activities and their impact on natural landscape and society. During the process of education, students achieve experiences how to react to changes in surround, they learn how to understand and solve these changes in the future. We can find environmental topics mainly in regional geography. The knowledge of regions consists of three parts. First of all, there are basic information about region in the context of the Earth. Then the second part deals with the evaluation of physical geographical, human geographical conditions and the individuality of regions and their comparison to Slovakia. Last but not least, there are various environmental curiosities which contain interesting facts about a region. We focus on National Curriculum (2010) in more detailed way because of its content, which is oriented on environmental topics more than updated version (2014). Despite the fact that the National Curriculum (2014) tries to be more innovative, environmental topics are significantly reduced.

Except of the geography´s own education and content standards, cross-sectional themes of environmental education are also implemented into its content (ŠVP, Environmentálna výchova, 2010).

Tab. 1: Environmental Topics in Geography within the National Curriculum for the Second Grade of Primary Schools

Thematic Unit	Environmental Topics
Australia and Oceania	Ozone hole, Natural sources (the problem of fresh water), UNESCO heritage and nature reservations

America	Nature protection – national parks, cultural monuments, Greenland - icebergs, Origin and activity, Problems of life in big cities, Causes of deforestation in South America
Africa	Problems in Africa (poverty, diseases, disturbances, pests), Extension of deserts (Sahel), Education system and Health care in Africa, National Parks
Asia	Extreme population growth of certain areas in Asia, Boom of industrial production (Asian Tigers), The threat of typhoons, Earthquakes and floods
Europe	Emissions, Smog, Ecologization of industrial production, Transport´s impact on environment
Slovakia	Nature pollution, Disasters and nature threats

Source: ŠVP Geografia, 2010

Crucial role of environmental education at the second grade of primary school is to encourage students, through various school subjects, to comprehend the relationship among organisms and also between human being and environment. The main idea is to improve and comprehend an inevitable changeover to sustainable development of society, which enable observation and awareness of dynamic relationship between human being and environment. Ecologic, economic and social aspects are mutually interconnected in this relationship. The final process is student´s understanding, as a basic requirement of active approach to effective protection and sustainable state of environment.

The Draft of Environmental Geography Textbook

The main aim of this paper is to introduce our draft of Environmental geography textbook which is designated for students at second grade of primary school. Syllabus of the textbook is divided into three main parts, which are based on geographic dimensions of the environment – global, regional and local levels. At the global level (Fig. 1), the textbook deals with worldwide environmental problems, such as climate change, deforestation, use of natural sources, water pollution, and the others. Regional level of previously mentioned problems (Fig. 2) presents the problems in Slovakia, and the local level introduces the problems in north-west part of Slovakia – the Rabča village.

1. 5 Znečistenie vody

Každý deň sa vo svete vypustí do vody vyše 2 miliónov ton priemyselného, poľnohospodárskeho či biologického odpadu. Celosvetovo je ohrozených až 24% cicavcov a 12% vtákov, ktoré žijú vo vnútrozemských vodách. Významným faktorom, ktorý vplýva na znečistenie vody je poľnohospodárska výroba, ktorá sa zvyšuje v dôsledku rastu populácie a jej potravinovej spotreby. Viac než 1/3 ľudí priamo pociťuje nedostatok pitnej vody.

Zdroje znečistenia vody:

- ťažké kovy z priemyselnej výroby (nikel, chróm, meď, zinok, olovo, ...),
- poľnohospodárstvo (chemikálie určené na podporu rastu plodín, pesticídy),
- kontaminácia arzénom (veľmi negatívne účinky na zdravie človeka, najviac v Bangladéši, Indii, Vietname a Kambodži),
- baníctvo (najviac znečisťuje vodné zdroje ťažba uhlia a lignitu),
- ropné havárie,
- farmaceutické spoločnosti, ktoré vypúšťajú odpad do vody (najviac v USA a Európe).

Fig. 1: Processing the topic of water pollution at the global level

Podzemné vody

Vodný zákon označuje ako podzemné vody tie, ktoré sa nachádzajú pod povrchom zeme v pásme nasýtenia, a sú v kontakte s pôdou, alebo pôdnym podložím. Podzemné vody sú určené najmä na zásobovanie obyvateľstva pitnou vodou.

Vedeli ste, že ...

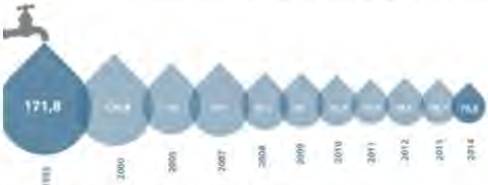
Žitný ostrov, ktorý sa nachádza na juhu Slovenska je najväčším riečnym ostrovom v Európe a zároveň najväčšou zásobárňou pitnej vody v celej strednej Európe.

Aký je stav kvality podzemných vôd na Slovensku?

Hodnotením chemického stavu, ktoré prebiehalo v rokoch 2009-2012 sa zistilo, že v SR má 85,7% podzemných vôd dobrý chemický stav, zatiaľ čo až 14,3% majú zlý chemický stav. Podľa dostupných informácii z monitorovania podzemných vôd v roku 2011 pozorujeme prekročenie prípustného množstva železa (66-krát), mangánu (54-krát) a ďalších prvkov. Oblasť dolného Váhu vykazuje najvyššie percento prekročení prípustného množstva prvkov v rámci všetkých monitorovaných oblastí. Najmenej sú znečistené podzemné vody v horských a podhorských oblastiach.

Zásobovanie pitnou vodou

Počet obyvateľov SR, ktorí sú napojený na verejný vodovod sa neustále zvyšuje, zatiaľ čo spotreba pitnej vody klesá. Kvalita pitnej vody je dlhodobo na vysokej úrovni. Podľa meraní v roku 2014 až 99,6% pitnej vody je vyhovujúcej. Slovensko nemá problémy s ochoreniami v dôsledku zlej kvality pitnej vody. Na obr. 22 môžeme pozorovať výrazný pokles spotreby pitnej vody, najmä kvôli zvyšovaniu cien a meraniu spotreby.



Obr. 20 Spotreba pitnej vody v domácnostiach v SR

Fig. 2: Processing of the topic – water pollution at the regional level

The textbook deals with environmental problems at each level, which are ordered according to the components of the environment – air, water, soil, rocks, flora and fauna.

The draft of the textbook is designed in such way that students are motivated and also interested in knowing new facts about environment. Except of the main body of the text, there are also various supplementary texts, tasks, interesting facts, suggestions for a discussion, didactic games or manuals for experiments. The textbook also offers tasks for revision and strengthening of achieved knowledge. The content of the textbook significantly goes beyond geographic standards in National Curriculum. Various tasks force students to search for another information and achieve more knowledge about environment on their own. The priority of the textbook is to take cross-sectional themes into account and connect environmental problems with other fields of study, e.g. biology (Fig. 3), or history (Fig. 4). Students use not only achieved knowledge, but they also work with geographic atlas or the Internet. The aim of the textbook is to enrich geography education with environmental problems and introduce possible solutions to each problem.

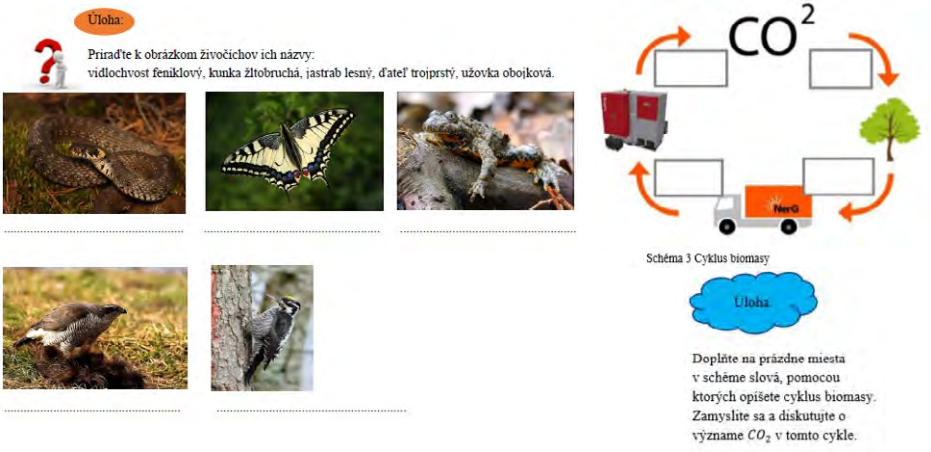


Fig. 3: Fill in the blank spaces

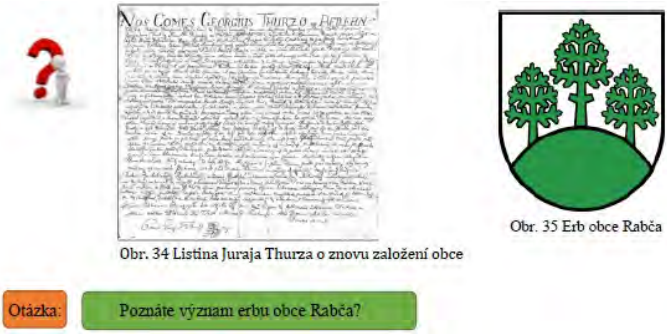


Fig. 4: Do you know the meaning of Rabča´s heraldry?

The textbook is appropriate for each phase of the lesson. It consists of parts whose priorities are to motivate students, introduce and revise the knowledge. Except of the main and supplementary texts, textual part of the textbook also contains links to various webpages (Fig. 5) or applications, which can be downloaded to student´s tablets (computers) or smartphones (Fig. 6). Moreover, the textbook incorporates plenty of elements, using information and communication technologies.

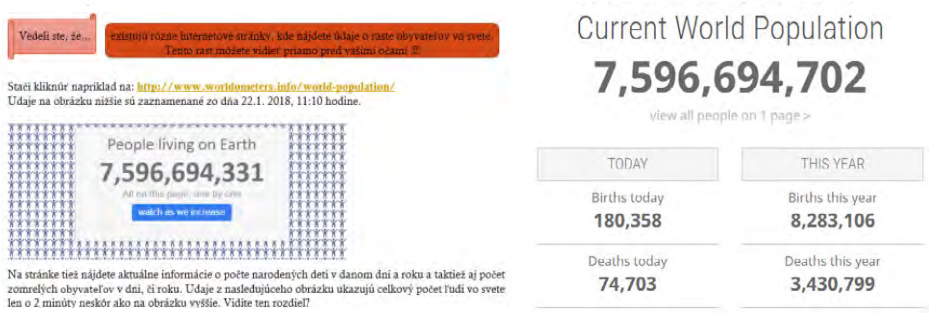


Fig. 5: World population

Fig. 6: Waste atlas

The textbook is also supplemented by substandard parts such as comics, which point out environmental problems in a funny way (Fig. 7).

Fig. 7: Comics

In addition, the textbook contains also several didactic games which are designated mainly for group work, contribute to socialization of students and strengthen class relationships (Fig. 8 and 9). It is possible to play the games indoors but also outdoors, where students can clearly observe the changes made by human being.

Fig. 8: Ozone layer Expert

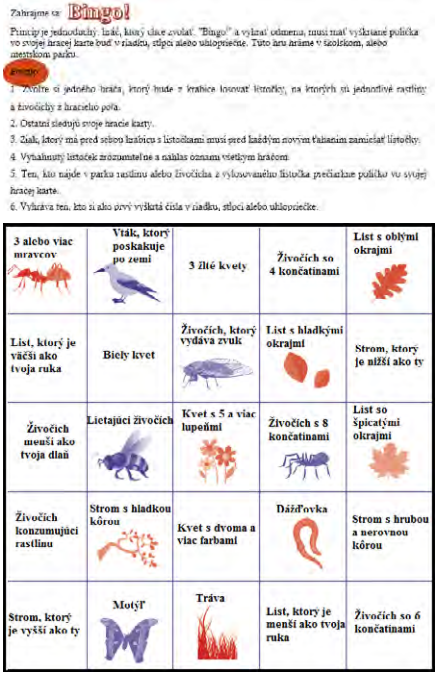


Fig. 9: Bingo

The other interesting segments of the textbook are experiments, which are appropriate not only for school setting but also for home setting. The main task of the experiments is to allow students to experiment at the lessons and see the real problems, by which we support illustrative nature in geography classes. Various methods, such as statistical analysis and working with graphs, are used in experiments. Last but not least, the textbook offers practical, everyday advices or instructions for students and also their parents, which can contribute to improvement of environmental conditions, not only at local level but also at regional and what is more, at global one.

CONCLUSION

Textbooks are considered to be a significant source of education in our country. The character of the textbooks forms the human being and their vision of the world, they teach to know an oddness of the environment in a very detailed way. The textbook has become a symbol of the school. It is the most important source of education, and simultaneously one of the basic educational resource which has its own form. Because of its important role in education, the textbook is one of most crucial teaching aid for a pupil and also a support for a teacher.

In this paper we introduced the draft of environmental geography textbook which might be used as the resource for second grade students in primary schools but also for the first grade students within a school subject – national history. The textbook is appropriate to be a supplementary literature within environmental education. It is very important to emphasize, that the draft of the textbook covers wider-ranging and more detailed area of environmental problems as we can observe in National Curriculum for second grade students in primary schools.

The textbook is designed to catch student´s attention and to force them to study not only at a lesson but also at home. We have tried to make all of important information about environmental problems easily available for every student. In addition, the textbook also offers topics for group or individual work and forces students to carefully perceive their environment, and try to solve environmental problems. The main aim of the work was to encourage students to be interested in today´s environmental problems.

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Zhrnutie

V súčasnom období sledujeme stále nedostatočné množstvo učebníc vo viacerých oblastiach vzdelávania. Jednou z týchto oblastí je aj environmentálna geografia, ktorá je významnou časťou vyučovania geografie už na základných školách. V príspevku sme predstavili návrh učebnice Environmentálnej geografie, ktorá má prioritne slúžiť pre potreby žiakov druhého stupňa základných škôl, ale vybrané časti je možné využívať tiež na prvom stupni v rámci vyučovacieho predmetu vlastiveda. Učebnica je vhodná aj ako doplnková literatúra v rámci environmentálnej výchovy. Považujeme za dôležité zdôrazniť, že návrh učebnice v sebe zahŕňa oveľa rozsiahlejšie a detailnejšie riešené pole environmentálnych problémov ako nájdeme v rámci geografie a tém ŠVP pre druhý stupeň základných škôl.

Učebnica je koncipovaná tak, aby zaujala žiakov natoľko, aby s ňou samostatne pracovali aj mimo vyučovania geografie. Charakterom spracovania by mohla byť silne motivačná aj z dôvodu množstva obrázkových príloh, rôznorodých úloh a hier využívajúc nielen klasické ale aj moderné didaktické metódy. Jednoduchou ale pri tom zábavnou formou sa snaží sprístupňovať všetky podstatné informácie o vybraných environmentálnych problémoch v rámci troch základných dimenzií – globálnej, regionálnej i lokálnej. Vytvára námety na spoločnú i samostatnú prácu, vedie žiakov k pozornejšiemu vnímaniu svojho okolia a následnému riešeniu problémov životného prostredia. Hlavným cieľom bolo dosiahnuť, aby sa žiaci viac zaujímali o environmentálne problémy súčasného sveta, na základe čoho možno podporiť ich environmentálne povedomie, ktoré bude viesť nielen k lepšiemu poznaniu ale aj ochrane a starostlivosti o životné prostredie.

ENVIRONMENTAL VISUALIZATION OF SELECTED CZECH REGIONS: ANALYSIS OF GEOGRAPHY TEXTBOOKS

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Abstract: The aim of this paper is to evaluate the quality of environmental visualization of selected regions in Czech geography textbooks for primary and lower secondary schools. The method of quantitative content analysis of visuals was used. The categories of quantitative analysis were defined based on the content of the environmental and geographical curriculum, for example landscape type, emotional charge etc. The results show a relatively similar structure of environmental visualization between textbooks: emotionally positive visuals showing the protection of cultural-historical heritage and protection of nature dominate. The exception is the Moravskoslezský kraj, which is visually presented in a negative way compared to other regions. In textbooks there are a minimum of abstract visuals or visuals showing the tendencies of environmental components.

Key words: visual; geography textbook; environment; region; textbook analyses

INTRODUCTION

The importance of visuals in geography textbooks is increasing (Walford, 1995; Zhang & Foskett, 2003). Visuals are currently one of the key structural components of textbooks that organize and represent curriculum content, structure and spatially reduce textual information, help pupils interpret natural and social phenomena, and motivate them to learn curriculum content (Levin, Anglin, & Carney, 1987; Mikk, 2000; Knecht & Najvarová, 2010). In the textbooks of geography as well as in the focus of the environmental curriculum, emphasis is placed on the presentation of spatial differentiation of the curriculum content (Činčera, 2007; IGU, 2016). Region specificities are often visualized through different types of visuals that affect the perception of the region by the user (pupils, students) – (Barrett & Farroni, 1996). In some cases, visuals can lead to stereotyping of regions and thus also cause misconceptions (Wright, 1979; Hamann, 2007; Řezníčková, 2010; Kučerová, Kučera, & Novotná, 2018).

Geography can be described as one of the main bearers of the content of the environmental education curriculum, because both disciplines focus on spatial aspects of phenomena (Rickinson, 2001; IGU, 2016; VÚP, 2017). In the Czechia and abroad, the number of analyses of geography textbooks in terms of various aspects of environmental education has been increasing in recent years (e.g. Rickinson, 2001; Kidman & Papadimitriou, 2012). These studies are mostly focused on one of the basic components of the textbook – textual information. With some exceptions (e.g. Carvalho et al., 2011; Kučerová, Hátle, Novotná, & Bláha, 2014; Kučerová, Kučera, & Novotná, 2018), there is no basis for comparing the visualization of a larger number of regions and their environment (Wright, 1979; Meijer, 1997; Hamann, 2007). This study thus fills the lack of knowledge in the field of environmental visualization of selected regions in geography textbooks in terms of environmental curriculum objectives. The authors therefore ask two basic research questions:

- How is the environment of selected Czech regions visualized in textbooks of geography?
- How does the visualization of selected Czech regions fulfill the environmental curriculum?

AIMS AND METHODS

The aim of the present study is to assess the suitability of environmental visualization of selected Czech regions in terms of environmental education objectives defined in Czech curricula (MŽP, 2011; VÚP, 2011; VÚP, 2017). Results will be based on the analysis of visuals in geography textbooks for primary and lower secondary education.

This study falls within the field of curriculum research, specifically the study of textbook structure (O'Keeffe, 2013). Expert evaluation of visuals in geography textbooks is based on the quantitative content analysis (Krippendorf, 2004; Trahorsch, Bláha, & Janko, 2018). Within the content analysis it was a categorization of visuals according to their external features. The categories of analysis were defined based on the environmental curriculum (MŽP, 2011; VÚP, 2011; VÚP, 2017).

A total of eight current geography textbooks for primary and lower secondary education were included in the study (see References and Table 1). Textbooks from four publishing houses (ČGS, Prodos, Nova škola, SPN) were selected as these publishers offer interconnected geography textbooks for both levels of education, thereby ensuring to some extent consistency of results. A total of 238 visuals (see Table 1) were analysed from these textbooks, which were placed in chapters of regional geography of the Czechia, specifically in chapters about four regions: Plzeňský, Jihomoravský, Moravskoslezský and Ústecký kraj. These regions were chosen deliberately, because they differ in the intensity and use of the landscape by society. On the one hand, the Moravskoslezský kraj and Ústecký kraj have relatively damaged environment due to mining, heavy industry and energy, on the other hand, the Plzeňský kraj and Jihomoravský kraj have a relatively well-preserved environment. It should be noted that some environmental components of the Ústecký and Moravskoslezský kraj have improved in the last few decades.

Tab. 1: Number of analyzed visuals by textbooks

Citation	Publisher	Fevel of education	JM	MK	PK	UK
Matušková (2010)	ČGS	primary	2	1	1	1
Čechurová, Ježková and Borecký (2019)	SPN	primary	7	8	8	8
Smolová and Szczyrba (2008)	Prodos	primary	7	7	7	7
Štiková and Tabarková (2016)	Nová škola	primary	3	3	3	3
Kastner, Holeček and Krajíček (2016)	ČGS	secondary	8	8	8	8
Chalupa, Horník and Demek (2015)	SPN	secondary	13	13	7	11
Voženílek and Szczyrba (2015)	Prodos	secondary	11	11	13	11
Borecký, Novák and Chalupa (2013)	Nová škola	secondary	11	10	10	9
Total			62	61	57	58

Source: authors

Comment: JK – Jihomoravský kraj; MK – Moravskoslezský kraj; PK – Plzeňský kraj; ÚK – Ústecký kraj.

The categories of content analysis criteria must be clearly defined and different from each other (Krippendorf, 2004); their overview with brief definitions is given in Table 2. For each evaluated visuals, the area was measured, the relative area was calculated in relation to the book page size and then the visual was categorized according to the analysis criteria. This quantitatively oriented categorization of visuals was supplemented by a qualitatively oriented coding of the visualized phenomenon (Švaříček & Šeďová, 2014), which helped to better define the visualized phenomenon, including the geographic localization of this phenomenon.

Tab. 2: Review criteria and categories of analysis

Analysis criterion	Categories of analysis
Relationship between nature and society	Dominance of natural environment components on visuals
	Dominance of socio-economic components of the environment on visuals
	Natural and socio-economic components of the environment in balance
The emotional charge of the visuals	Positive
	Negative
	Neutral
Type of landscape	Natural
	Cultivated
	Degraded
	Devastated
	Unable to determine
Human activities and its consequences	Agriculture
	Industry
	Settlement
	Recreation
	Protection of cultural and historical heritage
	Protection of the nature
	Unable to determine
Ecological ethics	Anthropocentric ethics
	Biocentric ethics
	Ecocentric ethics
	Teocentric ethics

Prior to the application of the research tool, its proposal was submitted to two environmental education experts and submitted comments. Based on comments, the research tool has been modified to ensure its validity (Cohen, 2007).

Results of visual categorization were quantitatively analysed using statistical methods for nominal data (absolute and relative frequency; chi-square test of independence and good agreement). Nonparametric statistical tests were used to analyse the differences in the relative dimensions of the visuals as these data do not have a normal frequency distribution (Shapiro-Wilk test, $p < 0.01$) (Chráska, 2016).

RESULTS AND THEIR DISCUSION

The analysis results show a similar visual structure between evaluated textbooks. Photographs dominate in the textbooks (86 % of all visuals). On the contrary, the abstract and dynamic types of visuals are completely missing (see below). This structure of visual types does not fulfill the educational potential of the non-verbal component of textbooks (see Mikk, 2000; Levin, Carney, & Anglin, 1987).

Emotionally positive visuals prevail in textbooks (68% of all visuals). The visuals (mainly photographs) are focused on the protection of cultural and historical heritage (castles, urban reserves, UNESCO sites, etc.) – (25 % of all visuals), natural landscapes of protected areas (18 %) and settlements (14 %). Interestingly, though, there are more visually positive visuals, they occupy 17 % less relative area on the page than visuals with a negative emotional charge; this difference is statistically significant ($p = 0.01$).

However, the Moravskoslezský kraj is an exception to the above results; in the chapters of the Moravskoslezský kraj there is a higher proportion of visuals with negative emotional charge (28 % of all visuals in chapters about this region) and a higher proportion of visuals showing negative performance on environment of society (31 %). The region is thus still presented as an industrial focus, where industry negatively affects the environment. However, there is no visualization of the positive use of old industrial enterprises for new purposes (e.g. concerts, science centres, etc.).

In the past, the Ústecký kraj was also negatively presented in geography textbooks (Kučerová, Kučera, & Novotná, 2018). In the examined textbooks, however, this region is presented through visuals in a comprehensive way. The visuals focus on the agricultural landscape of the Poohří and České středohoří Mountains, the National park České Švýcarksko, as well as negative visuals showing surface mining of brown coal and heavy industry (e.g. chemical plant in Litvínov, etc.). Table 3 show overall results of analyses.

Tab. 3: Results of visual analysis according to criteria and regions

Analysis criterion	Categories of analysis	JM	MK	PK	UK
Relationship between nature and society	Dominance of natural environment components on visuals	26	21	23	33
	Dominance of socio-economic components of the environment on visuals	53	49	56	33
	Natural and socio-economic components of the environment in balance	21	30	21	34
The emotional charge of the visuals	Positive	77	52	75	67
	Negative	5	28	9	12
	Neutral	18	20	16	21

Type of landscape	Natural	18	7	19	8
	Cultivated	37	39	23	48
	Degraded	11	18	14	14
	Devastated	15	13	23	16
	Unable to determine	19	23	21	14
Human activities and its consequences	Agriculture	8	2	2	9
	Industry	0	20	11	7
	Settlement	15	11	14	16
	Recreation	2	11	0	2
	Protection of cultural and historical heritage	34	18	30	17
	Protection of the nature	18	10	21	22
	Unable to determine	19	21	16	21
	Others	4	7	6	6
Ecological ethics	Anthropocentric ethics	55	57	61	48
	Biocentric ethics	15	7	19	12
	Ecocentric ethics	23	28	11	31
	Teocentric ethics	0	0	0	0
	Unable to determine	7	8	9	9

Source: authors

Comment: ÚK – Ústecký kraj; MK – Moravskoslezský kraj; JK – Jihomoravský kraj; PK – Plzeňský kraj. Results are given as a percentage for each region.

The analysis of results also showed differences between textbooks for primary and lower secondary schools. The visuals in textbooks for younger pupils are positively focused (e.g. natural and cultivated landscape, positive emotional charge, etc.) and thus do not show a negative impact of society on the environment (see Fig. 1). Although the proportion of negative visuals in textbooks for primary school is lower, the chi-square test did not show a statistically significant relationship between the emotional charge of visualization and school grade ($p = 0.21$). This visual structure also corresponds to the worldwide accepted view on the elimination of negative emotions in environmental education in younger pupils (Hicks & Bord, 2001).

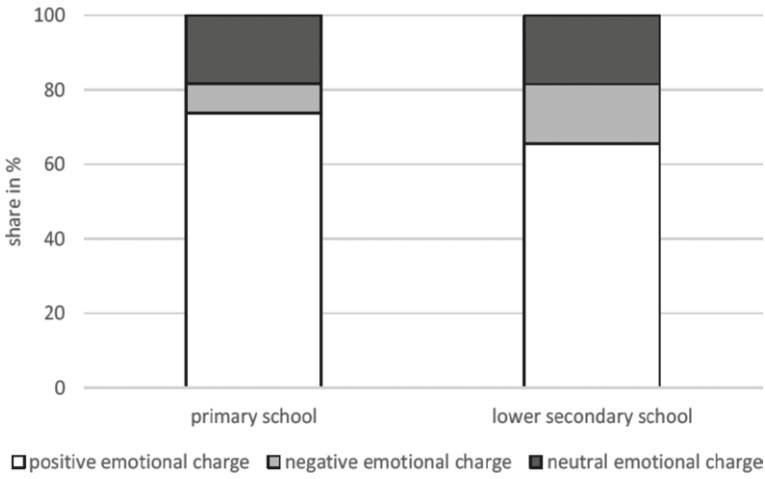

Fig. 1: Visualization structure between school levels according to emotional charge

CONCLUSION AND RECOMMENDATIONS

The results of the analysis indicate that the educational potential of visuals is not fully exploited. In visualization of the environment, there is a marked lack of greater differentiation of the visual content; visuals do not show the state of the environment in selected regions and the impact of society on it from multiple points of view (complexity of visualization). The problem is also the predominance of realistic visuals (photographs) and the absence of abstract types of visuals. Visualization can lead to the stereotyping of regions and could cause misconceptions (see also Barrett & Farroni, 1996; Haman, 2007); for example, the visuals of the Moravskoslezský kraj focus too much on the negative impact of society on the environment and, with some exceptions, do not take into account other (and mostly positive) characteristics of the region.

Last but not least, in some respects visuals do not contribute to the environmental curriculum. Authors should therefore consider the inclusion of abstract, developmental and content different visuals. For example, visuals do not show the positive effects of society on the environment or changes of environment over time.

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Shrnutí

Učebnice geografie jsou jedním z důležitých nositelů obsahu environmentálního vzdělávání. V učebnicích geografie mají jedno z důležitých postavení i vizuálie, které mj. zobrazují nebo znázorňují specifika regionů. Vizualizace regionů může mít zásadní vliv na mentální model žáků a v některých případech může vést až ke vzniku miskoncepcí. Právě určitá struktura vizualizace životního prostředí regionů může dát uživateli (žákovi) relativně objektivní pohled na environmentální problematiku daného regionu; naopak nevhodná vizualizace tohoto fenoménu může vnější image regionu značně deformovat a být příčinou stereotypizace a nadměrné generalizace obsahu učiva. Cílem předkládané studie je tedy zhodnotit strukturu vizualizace životního prostředí vybraných regionů Česka ve vztahu k environmentálnímu kurikulu.

V rámci tohoto výzkumu bylo využito expertní hodnocení vizuálií v osmi učebnicích geografie (čtyři učebnice pro primární školu a čtyři učebnice pro nižší sekundární školu); celkem bylo analyzováno 238 vizuálií umístěných u čtyř záměrně vybraných krajů: Jihomoravský, Moravskoslezský, Plzeňský a Ústecký kraj. Bylo využito metody kvantitativní obsahové analýzy vizuálií dle pěti kategorií analýzy (emotivní náboj, činnost společnosti, typ krajiny, lidské aktivity a jejich důsledky, ekologická etika); kategorie analýzy byly stanoveny na základě obsahu a cílů kurikula environmentální výchovy. Kvantitativní analýza byla doplněna kvalitativní analýzou zaměřenou na činnost společnosti a lokaci vizualizovaného fenoménu.

V učebnicích převažují fotografie, naopak minimální význam mají abstraktní typy vizuálií. Plzeňský a Jihomoravský kraj je prezentován značně pozitivně (např. fotografie zaměřené na kulturně historické dědictví a ochranu přírody). Naopak u kapitol Moravskoslezského kraje jsou umístěny z velké části vizuálie s negativním emotivním nábojem, devastovanou a degradovanou krajinou. Relativně komplexně (lidské aktivity, emotivní náboj) je vizualizován Ústecký kraj. V učebnicích pro mladší žáky je umístěn větší podíl pozitivních vizuálií, naopak vizuálie s negativním emotivním nábojem a negativními důsledky lidské aktivity jsou eliminovány.

V některých aspektech je vizualizace regionů ve sledovaných učebnicích relativně jednostranná (např. převaha fotografií, socio-ekonomických činností apod.). Autorům učebnic lze doporučit diverzifikaci zaměření vizuálií a ukazovat tak pozitivní i negativní vlivy na životní prostředí. Tím mohou eliminovat nebezpečí vzniku miskoncepcí prostou stereotypizací regionu na základě vizuálií v učebnicích. Jistě by pomohlo i zařazení vývojových tendencí vybraných složek životního prostředí. Potenciál vizualizace v učebnicích geografie pro primární a nižší sekundární stupeň tedy v současné době není plně využit.

RETAIL AND SHOPPING BEHAVIOR IN SMALL TOWNS IN SLOVAKIA (EXAMPLE STUDY OF ZLATÉ MORAVCE TOWN)

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Abstract: In the past 15 years we have been involved in the rapid development of retail in Slovakia. Its globalization trends, materialized in shopping malls, often built on a ‚green field' along major communication lines, have had a significant impact on commercial suburbanization. The „pulling" of large-scale retail centers on the outskirts of the city significantly affects the state and further development in the central part of the city, with frequent consequences (deadening) of traditional retail zones, many times leading to their disappearance. The new shopping zones change the mode of the time fund and the adopted daily cycles of shopping life for both urban and rural populations and promote consumerism. A number of elements adapt to this phenomenon, e.g. transport networks and parking facilities, opening hours of shops, monitoring the convenience of purchases through prices in leaflets between the traditional and new zone, synergy of non-commercial services, spending leisure time. Nowadays we are witnessing the penetration of foreign retail companies into the medium-sized to small towns of Slovakia and its changes in concentration, integration and internationalization. The aim of the paper is a brief description of the retail network in the typically small Slovak town of Zlaté Moravce. The next section presents the results of a survey of consumer buying behavior and evaluation of its conclusions.

Key words: retail network in the town of Zlaté Moravce, shopping behavior, consumer typology

RESEARCH METHODOLOGY, DATA, AND RESEARCH AREA

Shopping is a common process in human life. According to Burt and Sparks (2003), we all buy and many have weekly, if not daily, contact with some form of retail. Shopping is the second most important human leisure activity (Goss, 1993). It represents a frequent activity of modern life in the city, where retailers meet the basic material needs of their customers and try to stimulate their desires Leach (1993). Retail, which according to Kretter (2006) includes all activities related to the sale of goods or services to end consumers for non-commercial use, affects the viability of the city. Shopping space is also becoming a socially important place. They are a place where people meet and communicate. From an economic point of view, these are areas where retailers make a profit and at the same time provide employment and serve as an essential link in the chain linking producers and consumers (Miller, 1995). At the end of the 20th century and the first decade of the 21st century, interest in studying the internal relationships between spatial models of retail localization in an urbanized environment and customer shopping behavior increased. Shopping is a common process in human life. According to Burt and Sparks (2003), we all buy and many have weekly, if not daily, contact with some form of retail. Shopping is the second most important human leisure activity (Goss, 1993). It represents a frequent activity of modern life in the city, where retailers meet the basic material needs of their customers and try to stimulate their desires Leach (1993). Retail, which according to Kretter (2006) includes all activities related to the sale of goods or services to end consumers for non-commercial use, affects the viability of the city. Shopping space is also becoming a socially important place. They are a place where people meet and communicate. From an economic point of view, these are areas where retailers make a profit and at the same time provide employment and serve as an essential link in the chain linking producers and consumers (Miller, 1995). At the end of the 20th century and the first decade of the 21st century, interest in studying the internal relationships between spatial models of retail localization in an urbanized environment and customer shopping behavior increased.

The pilot survey sample consisted of 102 respondents. Among them are women who generally prefer to buy rather than men. The ratio of women to men is 52: 48%. The respondents were dominated by middle-aged 40–49-year-olds, who accounted for 43.14%. The younger generation up to 30 years of age accounted for almost one fifth (18.63%) and the age category of 50+ years accounted for more than one tenth (11.76%). Most respondents have completed secondary education, of which higher (49.02%) and lower 19.61%. 31.37% of respondents had university education. Respondents with basic education in the survey were not represented. Employees predominate in the structure by activity category (61.76%). The second largest group consists of entrepreneurs, with a total of 24 (23.53%). We found lower representation in the students surveyed (7.84%), the unemployed (2.94%), the same in maternity leave (2.94%) and the least retired (0.98%).

The structure and assortment of respondents' purchases is strongly influenced by the financial situation of their households. Almost half (47.06%) of respondents live in households with monthly income from 1001 to 2000 euros (47.06%), one third (34.31%) declared income to 1000 euros and only less than one fifth (18.63%) is more than 2000 euros.

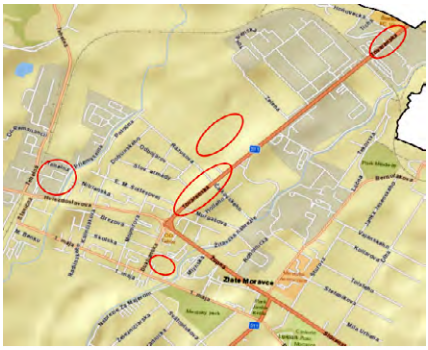
RETAIL NETWORK OF ZLATÉ MORAVCE TOWN AND ITS SPECIFICS

Zlaté Moravce as the center of the district and the historical center of Horné Požitavie provides business services not only for its own population, but also for 33 villages of its background (29,168 inhabitants). This small town with 12,145 inhabitants (in 2018, Municipal office, Zlaté Moravce) has a relatively well developed retail network consisting of 220 stores with a sales area of 28,802 m^2. The average value of the area parameter (PASF) of the city is very high with 2371.51 m^2 of sales area per 1000 inhabitants (2018). According to the minimum equipment standards (Vitkova 2001) for cities with 100,000 inhabitants, retail saturation values are 800 m^2 / 1000 inhabitants and abroad from 750 to 2500 m^2 / 1000 inhabitants. In a 2005 work, Szczyrba states that the EU cities have set a standard of 1000 m^2 of sales area / 1000 inhabitants. Even in comparison with the latest data for European states, it can be stated that Zlaté Moravce with the achieved value of 2371.51 m^2 of sales area / 1000 inhabitants. According to the latest survey (GfK, 2019), Europe-wide sales growth peaked with a steady annual security of 1.13 m^2 per capita, which in our opinion is 1130 m^2 / 1000 inhabitants. In this context, it seems that the construction of hypermarket Kaufland in Zlaté Moravce was not necessary at all. The current state of the retail network of the town reflects two stages of development – before 1989 (socialist period) and after 1989. Therefore, we divided the retail zones into: i) old, established before 1989, ii) new, established after 1989.

Both types of these zones are permanently dynamically reshaped according to changed consumer requirements. The dominant part of the retail units of the old zones is concentrated in the downtown with the traditional retail network, in addition to the grocery stores selling various kinds of goods such as clothing, footwear, electronics, books, hardware, florist, goldsmith, textile, sides of the main (Župná) street, which leads to the small square of Andrej Hlinka (Fig. 1).

The square of the center is known every year by the traditional Zlaté Moravce fair. On the square and its side streets after the revitalization after 1989, respectively are being restored commercial spaces in former residential yards. The "Janko Kráľ Court" now houses several stores mostly with clothing, sporting goods and electronics, which in the past served as a housing and warehouse space (Fig. 2). In addition to the revitalization of the downtown, it is also densified by retail operations and service facilities.

Source: Horná, 2019



Source: Horná, 2019

Fig. 1: Retail Zone Location in Zlaté Moravce

Old Zones of Zlaté Moravce town (before 1989)

New Zones of Zlaté Moravce town (after 1989)

Source: Pečadný, 2017

Source: Horná, 2019

Fig. 2: Janko Kráľ Court before 1989 and today

Janko Kráľ Court in 1949

Janko Kráľ Court at present

E. g. a free market place, known as "mexikoplac", was created in the open space after the redeveloped family houses next to the bus station. The year-round market offers, besides seasonal fruit and vegetables, flowers and seedlings, also local products and in the last 20–30 years also cheaper textiles, clothing and footwear. Before the establishment of this marketplace, the same function was fulfilled by the spacious road in the upper part of Janko Kráľ Street, parallel to Župná Street. The local market was twice a week and focused on selling local, mainly food products, fruits, vegetables. At the beginning of the 21st century, the construction of Coop Jednota, with a sales area of 1,500 m^2, made this purchasing activity possible under new supermarket conditions.

After 2004, the retail network of the town was supplemented by the construction of operations of foreign retail chains Billa (2005), Tesco, Lidl, Kaufland (2016) and others with industrial products. These new retail facilities were built either on the plots after the settling of outdated and unmanaged housing stocks with gardens within the town or on agricultural land in the case of Kaufland and Vendo Park. In the immediate vicinity of the center, a supermarket Billa (1,200 m²) was built at the bus station (partly on its former land and sanitation areas of non-adaptable houses). In a short time, the Tesco hypermarket (3000 m², Fig. 3) was added nearby, thus completing the space with the "socialist" Department Store Tekov (now also the Lidl store with 1440 m² is inside) and Department Store Centrum Žitava (now the headquarters of another Coop Jednota store).

Source: Pečadný, 2017

Source: Pečadný, 2017

Fig. 3: Location of Tesco hypermarket

Original space

Hypermarket Tesco at present

There are parking lots for both large-scale food new buildings. This "capitalist" completion was spontaneous, inconsistent with the land-use plan, and the formerly continuous, more or less uniform, green-lined housing estate was replaced by industrial-looking ground-floor halls surrounded by concrete areas. The resulting architectural-urbanistic impression is a broken picture of a formerly charming town despite additional efforts by the municipality to remedy (planting roses and greenery in public areas of the main street).

The largest retail area of 3642 m² has a Kaufland hypermarket in the newly built Vendo Park shopping area on the outskirts of the town between sports facilities and an older industrial zone (former Calex). There were also other specialized stores of consumer goods such as Teta drugstore, Deichmann, Planeo electro, Gate, Kik, Tedi, Pepco, motor vehicle stores (Beka Moto, Autoextra, Amax) and others.

SHOPPING BEHAVIOR OF INHABITANTS OF ZLATÉ MORAVCE

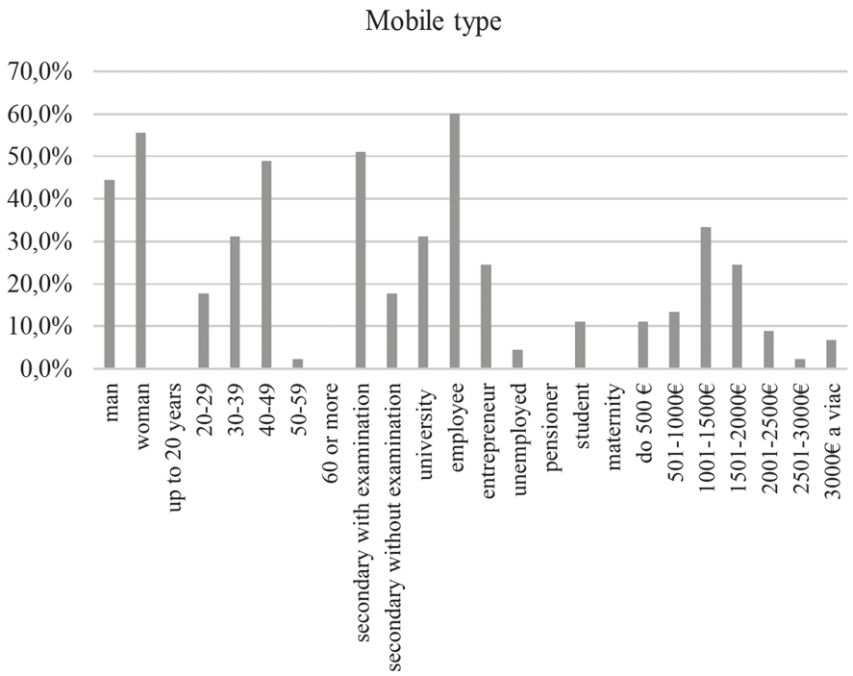
Consumer purchasing behavior is influenced by several factors such as gender, education, employment, religion, nationality, lifestyle, solvency, etc. The volume and value of the resulting purchase is also influenced by other factors such as location, price, product range, store availability, opening hours, parking spaces, sales culture, real household income, and others (Trembošová et al., 2016). A number of other objective and subjective factors influence purchasing behavior, so the respondents were given the option at their discretion to be included in one of the seven submitted consumer sub-types. Most of the respondents (66.67%) were included in the modern type of shopping, consisting of mobile, demanding, influenced subtypes. The traditional type includes conservative, savvy, loyal and undemanding buyers. Conservative, saving and loyal type of consumer, which is represented in the structure of respondents by a relatively balanced share (7.8%), slightly exceeds the undemanding type.

Mobile type

Consumer purchasing behavior is influenced by several factors such as gender, education, employment, religion, nationality, lifestyle, solvency, etc. The volume and value of the resulting purchase is also influenced by other factors such as location, price, product range, store availability, opening hours, parking spaces, sales culture, real household income, and others (Trembošová et al., 2016). A number of other objective and subjective factors influence purchasing behavior, so the respondents were given the option at their discretion to be included in one of the seven submitted consumer sub-types. Most of the respondents (66.67%) were included in the modern type of shopping, consisting of mobile, demanding, influenced subtypes. The traditional type includes conservative, savvy, loyal and undemanding buyers. Conservative, saving and loyal type of consumer, which is represented in the structure of respondents by a relatively balanced share (7.8%), slightly exceeds the undemanding type (Graph 1).

The mobile consumer profile is a respondent employee in the middle age category with upper secondary education and household income of between € 1001 and 2000.

Graph 1: Modern types of customer purchasing behavior – mobile type



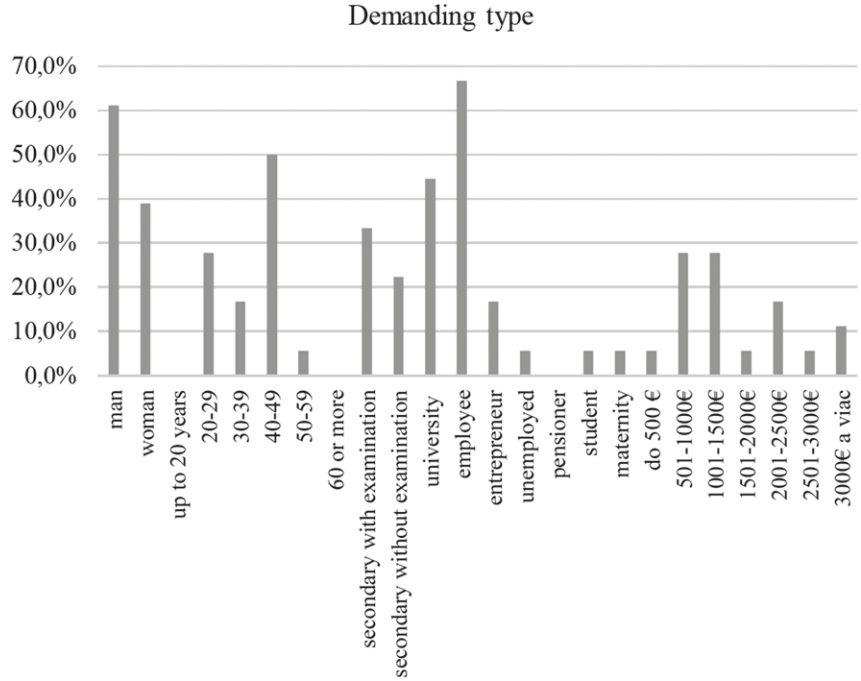
Demanding type

It is the second largest type of buying behavior of our sample surveyed. Up to 17.65% of respondents belong to a demanding subtype of a customer with high demands on the quality of goods and shopping comfort. He participates in modern purchasing behavior by one quarter. Unlike other types, more men than women applied for the demanding type. The ratio of men to women reached 61.11: 38.89. Men have greater demands on comfort than women, although they generally shop less than women. As in the previous type, half of the respondents were in the middle age group (40–49 years). Respondents aged 20 to 30 (27.78%) were more prominent than respondents aged 30–39, and older were only 5.56% of this survey sample. Most of the respondents achieved university education (44.44%) and secondary education with graduation (33.33%). 17.78% of those surveyed had lower secondary education. As in other types, the demanding type is dominated by employees (66.67%). Entrepreneurs achieved the lowest share (16.67%) in this structure compared to other types. Other groups by job classification are balanced (5.56%). The income of households of the demanding type of respondents is relatively balanced – up to 1000 euros, one third of respondents has, similarly to the income groups € 1001–2000 and 2000 and more. 5.56% of respondents in the group have less than 500 euros. The numerous equilibrium of individual groups according to income indicates that even a person with a lower income household can be demanding on the quality of goods,

environment, sales culture, etc. and not just the price of each product. He probably buys less and better. Richer consumers are inherently more demanding, more interested in buying high-quality, luxurious and fashionable products (Graph 2).

The profile of the demanding type of consumer is a respondent employee in the middle age category with university education and household income of € 1001–2000.

Graph 2: Modern types of customer purchasing behavior – demanding type



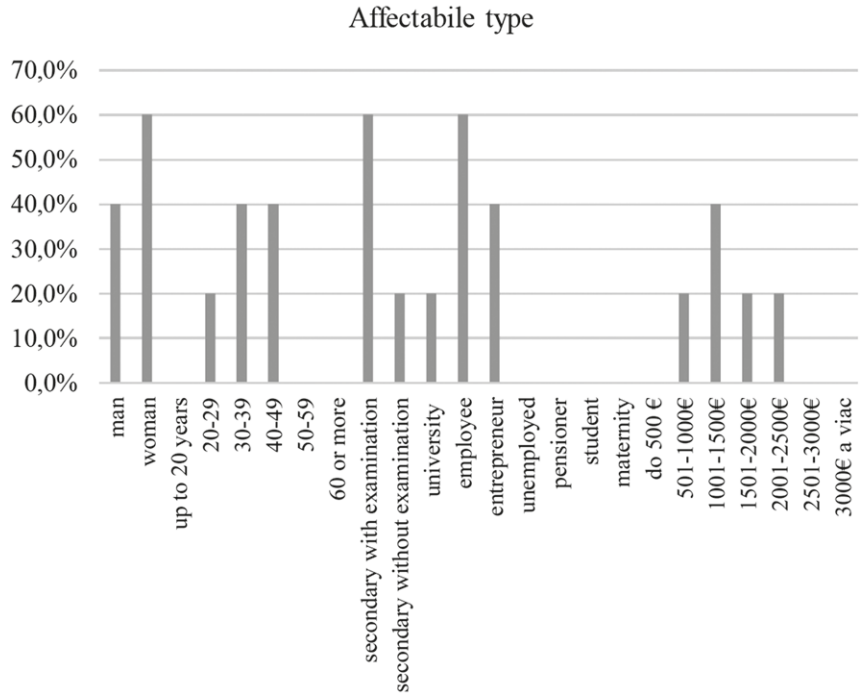
Affectable type

It is the third type of modern customer behavior. It is the least represented in the total survey sample with 4.9%. It is characterized by impulsive shopping the customer buys stock goods under the influence of advertising. Women are more influential than men in buying. In terms of gender structure, the type is characterized by a prevalence of women to men of 60: 40%, as well as a balanced representation of the age groups of 30–49 years. Of the other cohorts, only the 20–39year group (20%) is represented. Respondents with secondary education with graduation (60%) prevail in the educational structure. Polls with university and secondary education are equally represented (20%). The structure by occupation is dominated by employees (60%), followed by entrepreneurs (40%). Other groups in the structure are not represented. In terms of household income, respondents (60%) dominate the household income group from € 1001 to 2000. The other two groups

of households by income are represented by the same proportion of respondents (20%).

The respondent's profile is influenced by a middle-aged employee with a university degree and an income of € 1001–2000 (Graph 3).

Graph 3: Affectabile types of customer purchasing behavior



Conservative, saving, loyal, undemanding type

Consumers with these characteristics are among the traditional types of customer purchasing behavior. They have a relatively low representation in the survey group (8–10 respondents), so their opinions are only of an informative nature. Conservative, saving, loyal consumers reach the same share of 7.84% and the unpretentious type 9.8% of the whole surveyed sample.

In the group of the loyal type of respondents, women have a higher share, up to 87.5%. This type is characterized by frequent shopping in small quantities, preferring purchases in stores near the residence. It is preferred by respondents in the age groups 40–59, whose share in the sample of respondents is up to 87%. In terms of education, this type

is characterized by upper secondary education with graduation (75%). Most of them are employees with regular household income ranging from € 500 to 2000.

The savings customer is represented by 7.84% of respondents. We can know it by minimizing expenses, buying mainly goods that it needs. Women also predominate in the group (62.5%), but the proportion of men is higher (37.5%) compared to the loyal type. It is characteristic for age groups from 30 to 59 years. Up to 87.5% of the respondents achieved secondary education with a school-leaving examination. As in the previous groups, the majority of respondents (75%) are employees of different sectors of the economy. Half of the respondents are in the income category of € 500–1000. It is the low incomes of households that make them more economical when shopping, they buy less and especially the necessary goods. This trend is also pointed out by Singh and Kathuria (2012), according to which people with lower incomes generally buy poor quality, not healthy, non-branded products.

Conservative customers are typically low in impulsive purchases, making rational purchases. They represent the same proportion as the previous two types (7.84% of respondents). It is also characterized by the prevalence of women whose ratio is 75:25 to men. They are fairly well represented in each age cohort. Conservative respondents are predominantly consumers with higher education (62.5%). Once again, employees and entrepreneurs have a significant role in the employment structure. Their households' income is dominated by a group of up to EUR 1000, in which respondents under 30 years of age have a more prominent position, whose incomes are lower.

The last type of this group is influential, which relates to 9.8% of respondents. A low-phlegmatic customer is characterized by the fact that he has no demands on the shop, prices are indifferent, he does not travel for shopping. It predominates more in men than in women. Two groups of 30–39 and 40–49-year-olds make up 80% of respondents. This group consists of employees (70%) with lower secondary education and household income of € 1001–2000.

CONCLUSION

Stormy, rugged, dramatic, unique, exponential growth of business networks in Central and Eastern European countries after the collapse of the socialist camp - in many words, many experts from abroad also refer to the changes so far under the "free market" (Meyer, 2005; Traill, 2006; Machek, 2012; Viniczai, 2015). Using the example of a small Slovak town, we have documented that the recent development of retail is directly "boundless". The achievement of the saturation parameters of retail facilities (2016) compared to the highly developed states of Europe shows that some regulation by local governments and the state was long overdue. Certainly, the retail facilities in Zlaté Moravce also provide services to many visitors from a wide neighborhood of neighboring or nearby villages. They come to the county town for work, study, for doctors or for official matters. A large part of the regularly recurring visits is mainly devoted to shopping activities. Such behavior has been encoded in people from a distant past, not only the socialist one, which

has been accompanied by a lack of supply in the shops in general for a long time, but especially in small villages. In the district of Zlaté Moravce, the life out-the-settlements (Veľké Kostoľany and the surrounding area) still remains without any equipment, shops, health services, schools or other official institutions.

On the other hand, the current state of the retail network allows owners of foreign chains to increase their competitive pressure on traditional retailers of domestic origin.

By the end of the 20th century, Western countries' trade was highly developed, and the CEECs had the opportunity to apply everything positively in the area of retail development. Unfortunately, we have not been inspired at all in the field of regulatory mechanisms. Interestingly, the motives that decided multinational companies to enter the markets of post-socialist states include less restrictive, 'soft' or even absent local spatial planning rules and, on the other hand, expanding limits on the further development of retail outside the city in western countries. The case study confirmed the need to change our attitude regarding regulatory mechanisms in the field of retail facilities. It happens that even shortly after the construction of a new large shop, which can be situated in a lucrative location, the owner is forced to reduce costs by renting a part of the sales area to another user (eg Billa at the railway station in Bardejov). In this context, it seems that the construction of Kaufland in Zlaté Moravce was superfluous.

Analyzing the purchasing orientation of the Zlaté Moravce population, we found that the net monthly income of respondents' households is usually between 1001 and 1500 €. Up to 67% of respondents in Zlaté Moravce are shopping oriented in a modern fashion and the remaining 33% are traditional.

The profile of a typical consumer in Zlaté Moravce corresponds to an employed woman aged 40–49 with secondary vocational education. The results of this part of the paper are only informative, because for time reasons we were not able to provide a representative, sufficiently large sample for exploratory analysis.

Acknowledgement

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Zhrnutie

Búrlivý, robustný, dramatický, unikátny, exponenciálny rast obchodných sietí v krajinách štátov strednej a východnej Európy po rozpade socialistického tábora – takýmito slovami označujú doterajšie zmeny pod „taktovkou voľnej ruky trhu" mnohí odborníci aj zo zahraničia (Meyer, 2005; Traill, 2006; Viniczai, 2015). Na príklade malého slovenského mestečka sme dokumentovali, že nedávny rozvoj maloobchodu je priam „bezbrehý". Dosiahnutie parametrov saturácie obchodnou vybavenosťou (roku 2016) v porovnaní s vysoko rozvinutými štátmi Európy svedčí o tom, že určitá regulácia zo strany samospráv a štátu bola už dávno potrebná. Žiaľ v oblasti regulatívnych mechanizmov sme sa týmito štátmi vôbec neinšpirovali. Prípadová štúdia potvrdila nutnosť zmeny nášho postoja ohľadne regulatívnych mechanizmov v oblasti obchodnej vybavenosti. Stáva sa, že aj krátko po vybudovaní novej veľkoplošnej predajne, ktorá môže byť situovaná na priam

lukratívnom mieste, vlastník je prinútený znížiť náklady prenájmom časti predajnej plochy inému užívateľovi (napr. Billa pri železničnej stanici v Bardejove). V tomto kontexte sa zdá, že vybudovanie Kauflandu v Zlatých Moravciach bolo nadbytočné.

INQUIRY-BASED LEARNING AND ITS USING IN GEOGRAPHY AT THE SECOND LEVEL OF PRIMARY SCHOOLS

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Abstract: Current social needs emphasize the education of a person with creative thinking, capable of not only finding problems but also solving them. Different strategies are applied in the educational process according to the society's requirements for an educated individual. On this basis, the appropriate content of education, organizational forms, didactic methods and the use of the latest didactic techniques are also determined. One way to achieve this is to introduce other teaching methods, such as inquiry-based teaching, into the teaching process. Inquiry-based learning aims to make science lessons more effective, especially at primary schools, and at the same time seeks to attract students to study them. It has an irreplaceable role in new, modern and successful ways of teaching science. The aim of the paper is to design methodological sheets in the 5th year of elementary school in terms of inquiry-based learning and their application to the teaching process.

Key words: inquiry-based teaching geography, teaching proces, second level of primary school

INQUIRY-BASED LEARNING

Remembering of facts and information is not the most important skill in the world today. Facts are changing and information is readily available. It is important to understand and acquire them in a meaningful way. Educators should teach beyond the accumulated data and information and direct the teaching towards generating useful and applicable knowledge. Research is not just about finding the right answer, which sometimes doesn't even exist, but about finding the right views, attitudes, and the need to learn. Everyone can better develop their acquired skills and attitudes by continuing to create and explore knowledge throughout their lives.

School education may also include situations in which pupils research. Dostál claims (2015), that research is an activity in which pupils observe, deduce, offer possible hypotheses, try to verify them, and their conclusions can be interpreted differently by different researchers. Research hides the links between theory and practice and between textbook and reality.

According to the latest trends, students' research activities are also linked to other elements of teaching. Since they are perceived in a more complex way, we encounter the concept of inquiry-based teaching. It is a modern and characteristic concept of teaching that involves the activity of a teacher and research as an activity of a pupil through which he discovers the world. In terms of inclusion in the set of teaching methods, research-oriented teaching belongs to the activating method, which is analyzed in the contribution by Vojteková and Žoncová, 2018. It is a form of problem teaching and in the 21st century it should be important in terms of linking theory and practice as Bai and Song (2018) define.

Among other things, Votápková et al. (2013) defines inquiry-based learning as a learning by research and discovery and one of the effective approaches to problem-based teaching in which pupils learn the ways of thinking and procedures used in science. According to Peter (2010), inquiry-based learning is a way in which knowledge is acquired while solving a problem in successive steps, that include established hypotheses, choosing the appropriate methodology for examining a phenomenon, obtaining results and processing them, summarizing, discussing, and often collaborating with their fellow – pupils. From the sources of foreign literature, inquiry-based learning is a topic that is analyzed by the following authors (Lehtinen and Viiri, 2016), Nthontho (2018), Xenofontos et al. (2019) and others.

Abdi (2014) characterizes inquiry-based learning as an educational approach based on knowledge-based learning in the learning process, which can be made available to pupils in many activities. Teachers will thus replace traditional educational practices, emphasis on textbooks and lectures for question-oriented scientific facts.

In a simplified form, inquiry-based learning is when a teacher creates the conditions at school to allow a pupil to discover part of the knowledge to be learned. The teacher must be able to create a situation so that the pupils themselves are able to use the procedures to obtain new information. The result of the pupil's research is his subjective new discov-

eries, which the society already knows, but are new for him and are of great importance. By discovering this information, the pupil is more likely to remember it for a longer time, as if he only learned new knowledge from the teacher's interpretation. The great potential of inquiry-based learning is in the option to create pupils' ability to discover and search, thereby increasing their research potential. Experiment leads to better understanding of all terms and motivation of pupils to complement their existing knowledge. Research is also closely linked to everyday life and may be more natural and closer to pupils, as is reported by Caballero Garcia et al., 2018.

Leading of inquiry-based learning also has some disadvantages. Initially, pupils are not yet accustomed to this method and have insufficient skills for independent work, hypotheses or formulation of conclusions. Older teaching aids and a lack of didactic materials may also be a disadvantage. Last but not least, the teacher's unpreparedness may complicate this teaching. Whether a teacher is experienced and has a clear idea of inquiry-based learning can be very easily reflected in teaching (Dostál, 2015).

One of the uncertainties about teaching was the right time to introduce it. The best time is during the second half of the school age, ie at the second level of elementary schools and at high schools. Young age groups should continue to use the traditional way of teaching because the application of inquiry-based learning would be very demanding for their still insufficient knowledge, skills and abilities. This is stated by Vojteková and Žoncová (2017), who are devoted to the education of geography at the lowest level.

RESEARCH IN GEOGRAPHY

The requirements and needs of an advanced society related to higher science literacy of pupils, in particular their ability to think critically, to make responsible and beneficial decisions based on meaningful (scientific) reasoning, lead to reflections on the quality of science education not only in our country but also abroad. Meeting the needs of an advanced society can only be achieved by changing the predominantly transmissive teaching style to more inductive and motivational (Karolčík-Čipková, 2015). The use of research-based teaching in geography is addressed by Michaeli et al. (2014), who emphasized the need to involve these methods in teaching.

A good way to do this is to expose children to education in which they themselves are part of the learning process. Nowadays, children create their own ideas and ideas about science through the information they receive from the media. They provide an explanation of how and why certain natural phenomena occur. In some cases, they can only be intended to induce amazement or astonishment in children, rather than to correctly interpret a particular phenomenon. The current pace of change in the world requires truly effective education, especially in science and technology.

Improving science education in primary schools should improve the scientific culture of society and contribute to the development of the learned curriculum, the critical mind and a more creative solution to everyday problems. It is important that a primary school pupil can explain their knowledge of science and technology, for example their impor-

tance in everyday life or their function to improve the quality of life. One way to teach it and to achieve this important goal is to implement inquiry-based learning into the concept of geography teaching (McNeil, 2017).

Currently, inquiry-based learning is increasingly being applied to the teaching of geography at Slovak primary and secondary schools. In the Czech education system, which has been to some extent also the inspiration for the Slovak education system, it started to be used a little earlier. Various professional seminars and projects are organized for Slovak teachers, where they should be acquainted with inquiry-based learning. The aim of these projects and seminars is to acquire knowledge about research methods, practical skills and topics for working with pupils in science lessons and mutual exchange of experience of science teachers from primary and secondary schools in the use of research methods in teaching.

Inquiry-based learning occupies an important place in geography. It is related to a method of observation in which pupils study geographic phenomena, either by themselves or with the help of a teacher, what means, that they know the reality sensually. They are thus able to gather and classify facts, distinguish essential from non-essential, and ascertain the function of objects and phenomena. In this way, new knowledge, skills, abilities are acquired and content and performance standards are achieved (Dostál & Klement, 2014).

It is not always possible to go out because it is time consuming and requires nice weather. However, inquiry-based activities can also be applied in the classroom. Such activities include role-playing, class discussions, simulations, data collection, and Internet research. These are activities in contrast to passive listening, watching, reading or taking notes. In general, teachers should not lecture, but cooperate with pupils on geographic research processes. Research is very useful in teaching geography. It can be argued that exploratory organized teaching can be provided in a variety of ways – from structured research to open research and fieldwork.

When planning inquiry-based learning, the lesson should be divided into several stages, each of which should have a specific function. We know two of the most well-known models of inquiry-based learning, which we follow when organizing activities into one time-limited lesson.The first is the EUR model, which consists of 3 stages: Evocation, Awareness of meaning, Reflection. The second model is called the 5E model and consists of five phases: Engage, Explore, Explain, Elaborate, Evaluate. The teacher can choose any of them and plan a lesson according to it.

In order to be successful in the inquiry-based learning of geography, a student must learn to think geographically and to research. This process, according to www.esperanzaeducation.ca, 2019, includes the following capabilities:

- Determine the geographical significance of the problém
- Use different data including the primary source
- Identify common features and differences
- Analyze cause and effect
- Understand interactions and continuity

- Consider from a geographical perspective perspective
- Consider the ethical dimensions of geographical issues (or historical interpretations)
- Evaluate the resulting values.

Learning of geography through research does not just mean finding out the answer to a question. Geographical research depends on the formulation of questions in the basic steps of research. In order to be properly formulated, questions must meet the criteria of research questions. These are as follows:

1. criterion: the question must attract the pupil's attention
2. criterion: the question must include the concept of geographic thinking
3. criterion: the result of the question must be a lively, interesting and engaging research that will provide the correct answer to the question.

According to Dostál and Klement (2014), a rich and extensive component of inquiry-based learning is a geographic aid, eg. maps, globes, or other aids such as compass, or meteorological instruments. The portal www.www.gtansw.org, 2019 states that the following didactic geographic aids can also be used in inquiry-based learning as input components and research triggers. Their function is to attract, engage and motivate pupils to research. These may include:

- photography – analysis of reality from photography,
- two photos representing the same place, but for several years- study of time changes,
- illustration (drawing) – study of relationship, thoughts, links ...,
- map of the country – study of characters, features...,
- weather map – determination of weather forecast,
- concept map – presentation of concepts and ideas...,
- cartoons – discovery of critical thinking,
- symbolism – u nderstanding of symbols,
- visual metaphors – understading of thoughts, feelings...

With the aim to teach pupils new knowledge, it is important that pupils understand, reflect on, analyze the question, be able to orientate themselves in geographical resources, be able to select information to approach the answer and discover new knowledge. The components of this process are illustrated in Figure 1. Being good not only in geography but in any other discipline means, besides acquiring knowledge, also being able to justify, develop and evaluate arguments (www.gtansw.org.au, 2019).

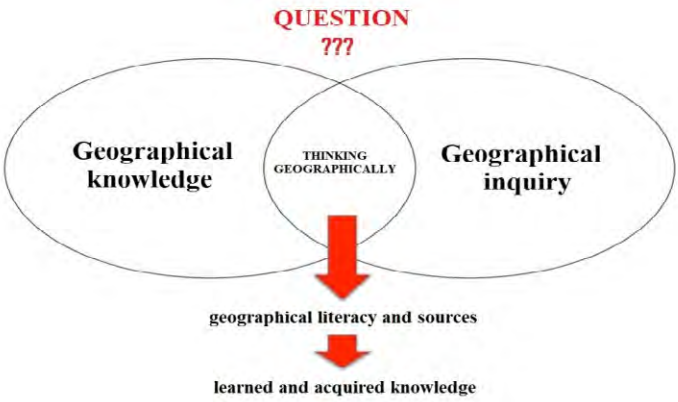

Fig. 1: Elements of inquiry-based learning in geography

Source: www.gtansw.org., 2019; elaborated by: Kabátová V., 2019

PROPOSAL OF METHODOLOGICAL SHEET

The themes in the 5th year geography are a very suitable prerequisite for the application of inquiry-based learning. A similar topic processes through inquiry-based learning, for example, Spronken-Smith et al., 2006. Our proposed methodology called (***What the wind can do***) is designed for pupils of the 5th grade of primary school who take over the theme of Wind activity at geography lessons. We divided the lesson into stages according to the EUR model. It serves to demonstrate and understand how wind can shape relief in nature and what we call individual shapes. The last part focuses on the creativity of pupils who will create their own rock city from the material, which is also the result of wind activity.

Due to the time limit of one lesson, pupils will work together on the first three assignments. They will be divided into 3 groups before the last entry.

Theme: Traveling around the world

Topic: Wind activity

Activity: What the wind can do

Grade: 5th

Timing: 45 min

Didactic methods and organizational forms: frontal teaching, interactive demonstration, group work

Teaching aids and didactic technique: box, foil, mat, straws, 500g wheat grits (2 pockets), smaller and larger stones, rock bridge, mushroom and gate (made of plasticine or aluminum foil, wrapped in sand paper), tray, sand (one bag), glass of water, worksheets

Performance standard

The pupil can describe the effects of wind activity in the desert, The pupil can name the rock formations that arise from the wind, The pupil can name examples of rocky places in the world, advantages and disadvantages of living in such cities.

Content standard

wind, sand dunes, rock gates, bridges, mushrooms, rock cities.

The course is divided into stages.

1. **Stage: Evocation (5 min)**

   At the beginning of the lesson, the teacher explains to the pupils that they will deal with the activity of the wind in nature through the scale model he has prepared for them. He places one table in the middle of the classroom and asks all the students to stand around him in a circle.

2. **Stage: Awareness (30 min)**

   a) Sand dunes

   Put a pad and a box of 250 g of wheat groats on the table so that it aligns its surface. For safety, the box is wrapped in transparent foil, only on its top is a rectangle cut in the size of 10x5 cm. Wheatmeal in this case is sand in the desert, so there are no other materials in the box, only pure wheat grits. Each pupil gets a straw and one at a time. Their job will be to blow through the hole into the grits. If they blow more, nothing happens because the foil will trap the grits. After the substitution of all pupils, the surface of the grits has changed and is no longer uniform, but there are various large transfer points. The teacher asks pupils what we call these dunes and which areas of the world are typical of.

   b) More durable material

   The pupils will spread around the table. The teacher adds an additional 250 g of grits to the box, so now there will be 500 g together. The teacher selects afew stones of different sizes and bury them into the grits anywhere. He tells the students that it is no longer a desert, but a classic soil in nature, which contains various large stones. The pupils will blow again through the straw into the wheat grits, blowing the grits from and around the stones, but they will not move.

   c) Rock formations

   The pupils again descend around the table and the teacher takes all the stones out of the box and puts them away. There are different shapes – bridges,

gates and mushrooms, which we have made. The teacher puts them into the box so that they keep their shape and sprinkle them with grits. Pupils start blowing through the straw one at a time, blowing into the grits, especially around the places where we have put our shapes, until they become visible.

d) My rock town

In this section, the pupils are divided into 3 groups. Each group gets a tray, a sand bag and a glass of water on the table. The teacher explains to them that sand is an enormous amount of material that has been accumulated by the wind through its activities and their task will be to model the rock town. They use water to dilute the sand to keep its shape.

Fig. 2: Samples of prepared models by: Kabátová V., 2019

Source: by: Kabátová V., 2019

The teacher asks the pupils what the shapes reminds them of and whether it is possible to find something like that in nature.

3. Stage: Reflection (10 min)

Worksheet: Match the pictures:

a)

b)

c)

d)

a) Rock mushroom , b) Sand dunes, c) Sand bridge, d) Sand gate

The discovery that pupils have been given a straw and that they will act as active observers in this teaching has encouraged them to work. When creating their own rocky town they enjoyed the opportunity to decide what to build here.

In the first three tasks it was very suitable to replace dry sand with softer wheat grits. Some of the pupils were blowing very hard into the straw, causing some of the grits to fly through their mouth. Because wheat grits are a kind of food, they could lick their mouths and eat grits. In the case of sand, they would have to go wash.

After this lesson, it is necessary to take into account the possible mess in the classroom (eg spilled grits / sand), so it is advisable to realize the lesson in the classroom with the floor, not the carpet, so that everything sweeps quickly during the break.

The proposed methodological sheet was applied to geography lessons at the Primary school with kindergarten in Kozárovce during continuous teaching practice. After realizing the activity connected with the inquiry-based learning we found out the feedback and pupils' responses to such activities.

The pupils of 5th grade liked that this form of teaching was more interesting and funny for them. The second reason is that they liked the activities and experiments from which

they could better remember the curriculum. Someones liked the way they formulated questions that made them thinking. As the atmosphere in the classroom was relaxed, they were not afraid to tell their observations, even though they were wrong.

CONCLUSION

At present, inquiry-based learning in the Slovak education system is becoming increasingly applied in the teaching process. Only in time it will become apparent which society we will raise with this activating method. Meanwhile, the assessment has been positive among pupils and also among teachers. It is realized in a pleasant climate, in which the teacher is not an authority, but only one who assigns tasks and guides them in solving them. Pupils can create hypotheses without a sense of failure because their role is to "explore" for new knowledge.

In the framework curriculum, geography is represented most in the fifth grade by two hours per week and in the other years by one hour per week. The educational standard of the subject Geography consists of a summary of achievements and contents so that the pupil has the opportunity to develop various cognitive activities. Inquiry-based learning has existed in geography for a long time through various research and projects.

However, we are increasingly aware that geography provides space for self-reflection, fieldwork, and self-hypothesis. It also provides us with an extensive component of geographic aids (globe, compass, meteorological instruments) that can be used for research or experimentation.

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Zhrnutie

V súčasnosti začína byť bádateľsky orientované vyučovanie v slovenskom školstve stále viac aplikované vo vyučovacom procese. Až časom sa ukáže, akú spoločnosť touto aktivizujúcou metódou vychováme. Zatiaľ dosahuje hodnotenie pozitívne medzi žiakmi a učiteľmi. Realizuje sa v príjemnej klíme, v ktorej učiteľ nie je autorita, ale len ten, čo zadáva úlohy a usmerňuje pri ich riešení. Žiaci si môžu vytvárať hypotézy bez pocitu zlyhania, pretože ich úlohou je „bádať" po nových poznatkoch.

V rámcovom učebnom pláne je geografia najviac zastúpená v 5. ročníku dvomi hodinami týždenne a v ostaných ročníkoch jednou hodinou týždenne. Vzdelávací štandard predmetu geografia je tvorený súhrnom výkonov a obsahov tak, aby žiak mal možnosť rozvíjať rôzne kognitívne činnosti. Bádateľsky orientované vyučovanie existuje v geografii už veľmi dlho prostredníctvom rôznych výskumov a projektov.

SECRET POTENTIAL OF THE ECOSYSTEM SERVICES IN LOWER SECONDARY EDUCATION IN SLOVAKIA

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Abstract: Declines in biodiversity have corroborated view of scientists to promote ecosystem services to gain support for conservation of the nature from people of all ages all over the world. The ecosystem services are sparsely characterized in education literature and they are not included in the most recent iteration of Slovak standards for lower secondary education. In this paper we are introducing the concept of ecosystem services and discuss why it is an important idea to teach in lower secondary education. Main aim is to present set of conceptual ideas of how to include interdisciplinary field of ecosystem services into geography. Our approach provides an opportunity to use several teaching methods to help students make connections between modern technology and ecological, geographical and social systems. Simultaneously, it is a brand-new approach of connecting students through modern technology and ecosystem services with landscape and improve their perception in the regional geography.

Key words: ecosystem services, secondary education, GIS

INTRODUCTION

Attention to the concept of ecosystem services (ES) has burgeoned during the past decade and has become an important part of the interdisciplinary discourse (Millennium Ecosystem Assessment, 2005; Brauman et al., 2007). According to Pyle (2003) people need to have a strong sense of connection to the nature and the natural processes in order to achieve a functional coexistence between nature and humans. Especially in the urban surroundings, today's youth are unaware of the connection between humans and nature simply because they have no contact with natural processes (Nadkarni, 2004).

Active connection of pupils with nature and landscape that surrounds them is part of an environmental education in lower secondary education. The environmental education is a compulsory part of education and school must ensure its implementation into formal education. One of its main goals is related to the concept of ES. It focuses on purposeful direction of pupils towards a comprehensive understanding of mutual relations between humans, organisms and the environment where ecological, economic and social aspects are interconnected.

The content of environmental education is defined in the State educational programme only by its aims. The teacher specifies and selects adequate educational tools to reach the goals of environmental education.

We are proposing education model for teachers based on exploring ecosystems and their importance for humans and other organisms that are in the vicinity of school or pupils' homes. This model uses the ecosystem approach (Christie et al., 1986; Vallentyne & Hamilton, 1987) and apply it in the environmental education that is realized through Project based learning, Outdoor education and is using Information and communication technology (ICT).

EKOSYSTEM SERVICES

ES are what nature produces without the help of humans, yet humans benefit from it, and often completely for free. The concept includes elements which contribute to human well-being such as food, photosynthesis, pollination or beauty and spiritual values. Organisms, processes and functions of the ecosystem influence the way we feel. ES have been divided into different categories, depending on how they affect us. The Economics of Ecosystems and Biodiversity - TEEB (2010) and Millennium Ecosystem Assessment – MEA (2005) are dividing ES into several groups: Supporting services help other processes in nature work properly. They are essential for life on the Earth (Photosynthesis, Soil Formation, Nutrition in nature, The water cycle, Habitats for different species, Maintenance of genetic diversity). Provisioning services are nature's services directly used by humans. There is often a market for goods like drinking water, food, fuel, medicine and health resources, raw materials, biochemicals and genetic resources. Regulating services are the natural services that allow nature to resist or fix temporary problems and protect humans from some difficulties (Erosion prevention and maintenance of soil fertility, Water purification, Biological control, Protection against natural disasters, Better climate,

Purification of the air, Pollination). Cultural services are the nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences. They make us glad, happy and make our life meaningful. The concept of ES can be used as an educational tool to better understand the values humans obtain from the nature and incorporate this knowledge into our consciousness as an important part when we purchase and act for a long-term and sustainable society.

ECOSYSTEM SERVICES IN EDUCATION

ES reveal value of ecosystems (nature) for people, therefore they are an important part of every one of us. It is necessary to build relationship between humans and nature from childhood and school is an appropriate environment for building this relationship.

The second level of elementary school is suitable to educate children about nature. It is described in the State Pedagogical Programme. The profile of a graduate for lower secondary education is based on several competencies that result from ES (competencies towards lifelong education; competencies to apply basic knowledge about science and technology; competencies in information and communication technologies; problem solving competencies; civic competencies) (Štátny pedagogický ústav, 2019).

The inclusion of ES into the content of lower secondary education brings several benefits. The first one is to create relationship between pupils and nature (environment) and realize its value. Another benefit is interconnection of curriculum. ES are connected to content of subjects like Biology (5^{th} grade – topic of Communities of organisms; 6^{th} grade – Life with man and in human settlements; 8^{th} grade – Environment of organisms and man; 9^{th} grade – Inheritance and variability of organisms; Exploring the abiotic characteristics of nature) and Geography (5^{th} grade – topics of We travel the Earth and Geographical excursions, fieldtrips; 6^{th} grade – Africa and Asia; 8^{th} grade – Slovakia; 9^{th} grade – Polar Regions; America; Australia and Oceania). On the other hand, they have great potential for fulfilling the goals of environmental education and building inter-subject relations.

Environmental education is according to the State pedagogical institute (2019) a cross-cutting subject. It means that as well as the other subjects it is a compulsory part of the education. The difference is in the choice of implementation into education and it depends on the decision of the school. The actual implementation of environmental education has several options: as an integrated part of the educational content of the educational areas and suitable subjects; as separate subject within the extension hours; as form of a project (in number of hours designated for the topic) or very effective form of a course.

We can use wide spectrum of options to implement environmental education into subjects through mapping of ES by pupils, for example:

Physics – (6^{th}, 8^{th} grade) topic of Exploring the properties of liquids, gases and solid matter; Light; Chemistry – (7^{th}, 9^{th} grade) topic of Matter and its properties; Carbon

compounds; **Technical education** – (5th, 6th, 9th grade) topic of Man and technology focuses; Technical materials and working procedures of their processing; Growing and breeding; **Foreign language** – (5th-9th grade) topic of Man and Nature, Animals/Fauna, Plants/Flora, Weather, Climate, Mand and the environment, Nature around us; **Slovak language and literature** – (5th–9th grade) topic of Essay; **Mathematics** – (5th–9th grade) topic of word tasks; **Computer science** – (6th grade) topic of Communication and cooperation – works with websites about nature; **History** – (6th grade) topic of Pictures of ancient word; Pictures of prehistoric word; **Ethic education** – (5th grade) topic of Ethical aspects of nature protection; **Religion education** – (9. grade) topic of Humans Responsibility for the World in which they live; **Music education** – (5th–9th grade) through singed, danced or played text about nature; **Art education** – (5th–9th grade) through draw about nature; **Physical education** – (5th–9th grade) topic of Sports activities (orientation according to natural phenomenon).

CONCEPT OF IMPLEMENTATION OF ECOSYSTEM SERVICES INTO EDUCATION

In general, the idea of implementation of ES into education is starting to be applied mainly abroad (Hutcheson et al., 2018; Ruppert & Duncan, 2017; Gregory et al., 2015). The implementation of ES into second level of elementary school is lacking attention in Slovakia. Our concept of implementing ES into education is based on mapping of the ES by pupils, transferring part of the lessons into nature (outdoors) and by using ICT technologies and tools. The whole methodology of this concept includes three interconnected educational techniques: Project based learning, Outdoor education and Information and communication technology (pic. 1).

Project based learning

Project based learning is a comprehensive approach to classroom teaching and learning that is designed to engage students in investigation of authentic problems (Blumenfeld et al., 1991). Pupils are intensively working on their projects, solving problems, asking questions, discussing their ideas, creating predictions, suggesting plans or experiments, collecting data for analyses, making conclusions or sharing their findings to other pupils. This is increasing the interest of pupils for this issue (Blumenfeld et al., 1991).

Outdoor education

Method of outdoor education should broaden the knowledge, skills and attitudes about the world we live in. The aim of outdoor activities is to provide pupils with educational opportunities outside of the classes that include direct contact with nature (Palmberg & Kuru, 2000). Hungerford and Volk (1990) claim that it is necessary for pupils to develop sense of ownership and take on the role of active citizens who can influence attitudes and behaviour of the older generation. We can achieve environmental education by using outdoor activities, during which they not only learn about nature but also experience it and build empathic relationship with nature and teacher, while creating conservation virtues.

Information and communication technology

Smitek (1998) consider information technology to by computing, telecommunication, transmission and organization technology used for collection, storage, verifying, evaluation, selection, distribution and timely delivery of necessary information. There is a wide spectrum of the ICT tools that can be used in education (Palmberg & Kuru, 2000; Kern, 2006; Somekh, 2007). Used methods and education forms are directly influenced by chosen ICT. GIS and mobile phones are a core element of mobile learning from the wide range of the ICT (Pic. 1).

Mobile learning

Mobile learning includes using mobile and wireless devices for learning purposes. Typical examples of devices used in mobile learning are mobile phones, smartphones, tablet computers, laptops or personal multimedia players (Kukulska-Hulme et al., 2005). Mobile learning isn't just about using these devices, but it is also about learning to understand in wider contexts (Walker, 2006). Kukulska-Hulme et al. (2005) sees basic disadvantages, besides physical attributes (network connection problem, low battery life, etc.), in personal safety concerns (exposure to emission, misuse of personal data, etc.).

Education by using Geographical information systems

GIS is a system of hardware, software, data, people, organizations, and institutional arrangements for collecting, storing, analysing, and disseminating information about areas in the earth (Dueker and Kjerne, 1989). GIS education in general comes down to just 4 simple ideas: create your own geospatial data, manage it, analyse it and display it on a map. These ideas show possibilities of GIS application everywhere where the spatial data linked with the earth surface is used. According to Jakab et al. (2017) it is possible to effectively use GIS not only in subject like geography, but also in other subjects like history, mathematics, chemistry environmental science and environmental education. It is necessary to consider GIS in learning process not only as technology, but also as a method thanks to which the world becomes an attractive place enriched with understanding.

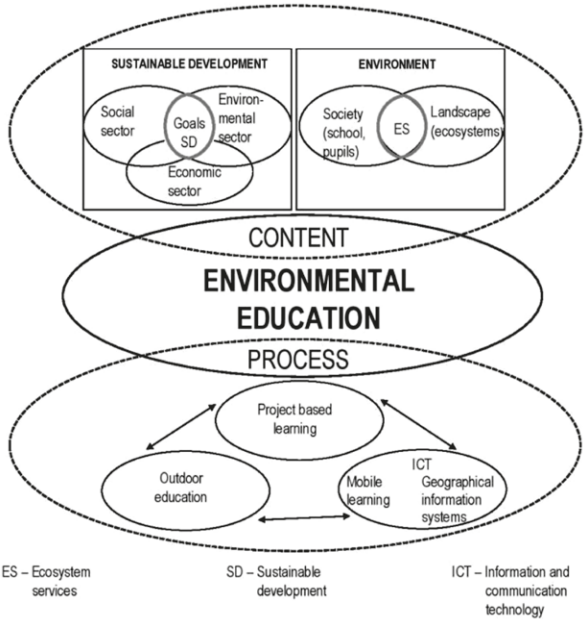

Fig. 1: The scheme of implementation of ES into education

METHODOLOGICAL STEPS OF MODEL REALIZATION

Our methodology of the concept of ES implementation into content of education is based on steps and methodology of integrated landscape management according to Petrovič et al. (2011). After adjustment for learning process it consists of 8 steps:

1. Problem – establishing given problem. Pupils' project should be based on authentic problem (Blumenfeld, 1991. Mapping of ecosystems and their services along with global EP (e.g. climate change, deforestation) and their influence on ecosystems and life of humans is a worldwide issue. The teacher in this step points to areas concerned with this issue (pic. 1).
2. Analyse of the current state – it is connected to search for necessary information by pupils and an evaluation of positive and negative elements of the problem. In this step we want to create an overview of existing ecosystems in selected area, collect information about their conditions, composition etc.
3. Synthesis – collecting all information about the issue gained in the past in other lessons and newly gained by independent work. It is based on previous two steps and it connects them. This step includes selection of ecosystems (e.g. creation of attitude scales), selection of mapped ES, selection of the area and way of mapping and selection of mobile apps to be used for mapping ES.

4. Realization – data collection. Pupils solve problems by their own mapping. The work is done directly the individual ecosystems, using ICT tools mainly mobile phones and their apps (Pic. 1). The focus is on getting to know and documenting individual elements of ecosystem and threats (e.g. illegal dump sites, illegal deforestation, invasive species). Besides photo documentation, pupils record position of individual objects and phenomenon to process them in the next steps in GIS. They can use one of many apps to map the problems (e.g. TrashOut for mapping illegal dump sites; Recycle Coach for better recycling; web page www.stromypodkontrolou.cz to protect nature; Environmental Study for learning through quizzes; Go Green Challenge for motivation through daily or weekly challenges for improving the ES status; "Ochránca prírody" as a play for kids since 6 years old; Environment Dictionary for secondary-school students to improve their knowledge about ES and their language skills.
5. Data processing – information that pupils collected in the previous step are now analysed, evaluated and utilized in their outputs. GIS is directly intended to process spatial data. Pupils can create map outputs, analyse area sizes, distances as well as map individual problems of ecosystems in GIS. Several web (GoogleMaps, mapy.cz) and desktop (QGIS) GIS apps can be used for learning purposes (Pic. 2). The outputs of this step are quantified values of individual ES (regulating, provisioning, cultural and supporting ES) and total average value of ES for individual mapped ecosystems.
6. Interpretation – finalizing and presenting the results, sharing information and creation of outputs for utilization results (e.g. letter to the Mayor, press release, background material for information boards).
7. Evaluation a proposition – evaluation of the situation, prospects for the future on how the problem could be solved, improved, eliminated or prevented from occurring. This step ends with concrete action, drawing attention to the problem and elimination of the problem (e.g. by ecosystem revitalization).
8. Identification of other problems – based on detailed analyse and by solving one problem could be revealed other connected problems that need to be fixed. E.g. by mapping illegal dump sites and proposing solutions, the question arises as to whether the trash will not pollute other ecosystems, such as aquatic?

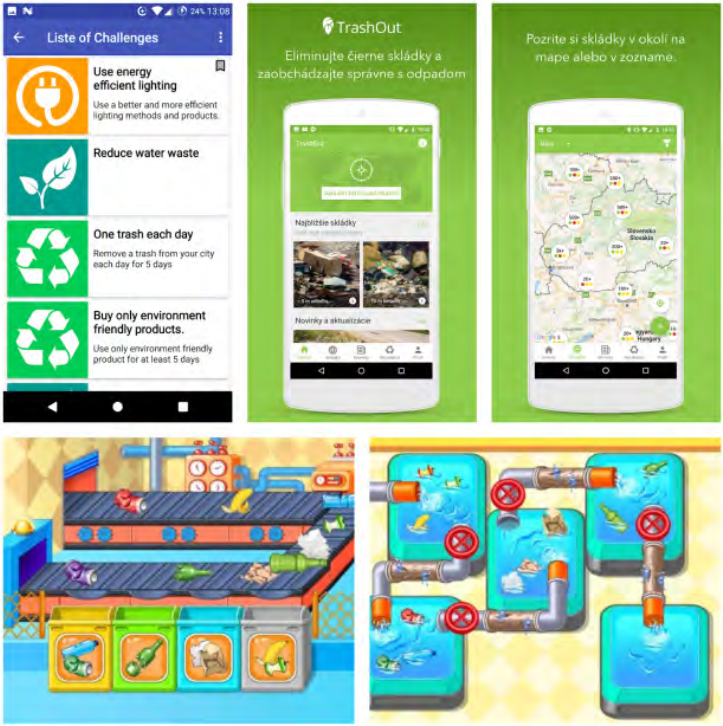

Fig. 2: The outputs from the apps

DISCUSSION

The International Union for Conservation and Nature (IUCN, 1970) considers environmental education as process of acknowledging values and clarification concepts to develop skills and attitude to understand and appreciate relationship between humans, their culture and the biophysical environment. It also includes the practice in decision making and formulating of the behaviour code connected to the environmental quality issues.

Global issues as well as consequences that global issues produce (such as climate change, Great pacific garbage patch) confirm the need for environmental education in all levels of education system as well as in informal education. Environmental education as cross-cutting theme should lead pupils towards sustainable development in the terms of Agenda 2030.

It is the effort to modernize and streamline education of environmental education that has become the motive for creating of our education model. The creation of the model was subordinated to the 4 basic priorities that overlap and complement each other. In addition to the environment and pupil are other priorities practice and future.

Focus on the environment

Our effort for this model was, in addition to solving interdisciplinary relations, solve over-subject relations such as nature protection and landscape protection, which in our case is addressed through environmental education. There are three levels of environmental education (Palmer, 1998): education about the environment, through the environment and for the environment. The theme of ES is concerning 10 goals of sustainable development of Agenda 2030: Good health, Quality education, Clean water and sanitation, Affordable and clean energy, Sustainable cities and communities, Responsible consumption and production, Climate action, Life belong water, Life and land, Partnership for the goals.

Focus on the pupil

Wide range of key competencies, such as confidence, skills, sensitive approach to the environment, responsible behaviour in the nature and social relations could be developed through combination of interdisciplinary relations and selected pedagogical approaches (Palmberg & Kuru, 2000). Project based learning could develop collaboration, communication, critical thinking, creativity, language skills, innovations, global relations, using technologies etc. (Mergendoller et al., 2006). There is a high potential for enhancing attractivity of education process and learning by using ICT, project based learning and outdoor education.

Focus on the practise

During project-based education pupils focus on solving problems based on real information, with real methodologies and ICT tools used in practise. The whole time they are working with spatial data collected and processed by them. According to Fitzpatrick and Maguire (2000) is GIS precisely the tool for collecting, storage, management, search, manipulation, analyses or visualization geographical or spatial data. Pupils can use this gained skills and know-how in their future occupation. Goodchild and Kemp (1990) confirmed that using GIS at schools motivates pupils to choose career in science and technology. This also touches the last priority of our model – focusing on the future.

Focus on the future

By developing a wide range of key competencies needed for the 21st century as well as developing their environmental consciousness we are preparing pupils not only for their professional life, but also for life in accordance with principles of sustainable development. Environmental education could become a real preventive tool for nature protection and landscape creation.

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Zhrnutie

Jedným zo základných cieľov článku bolo predstaviť model, ktorý ponúka študentom možnosť spojenia s prírodou a učenie sa o hodnotách ekosystémov, ako i lepšie hodnotenie ľudských aktivít, ktoré sú spojené s krajinou. Pomocou kombinácie rôznych pedagogických prístupov má tento model veľký potenciál rozvíjať širokú škálu doplnkových vedomostí, zručností a postojov a zvýšiť motiváciu študentov učiť sa o ich krajine. U detí, ktorých pohľad na prírodu je založený na filozofickom a emocionálnom spojení so životným prostredím, je pravdepodobnejšie, že budú ochotné robiť určité obete, aby „zachránili prírodu", ako tie, ktorým chýba tento postoj.

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