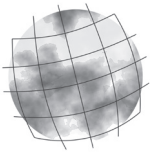
FOLIA GEOGRAPHICA

INTERNATIONAL SCIENTIFIC JOURNAL

ISSN 1336-6157 (hard copy), ISSN 2454-1001 (online)



FOLIA GEOGRAPHICA

Volume 62, 2020, No. 1

VYDAVATEĽSTVO PREŠOVSKEJ UNIVERZITY

International scientific journal for theory, research and practice
of geography and related disciplines

FOLIA GEOGRAPHICA

Volume 62, 2020, No. 1

This journal is available online:

http://www.foliageographica.sk

Publisher:

University of Prešov, Ul. 17. novembra 15, 080 01 Prešov, Slovakia, IČO 17 070 775

ISSN 1336-6157 (hard copy)
ISSN 2454-1001 (online)

EV 4949/14

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FOLIA GEOGRAPHICA • ISSN 1336-6157 (hard copy) • ISSN 2454-1001 (online)

ANALYSIS OF NATIONAL DEVELOPMENT USING LABOUR MARKET MODEL: A CASE STUDY OF KHAF

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Received: November 14, 2019 | Revised: December 1, 2019 | Accepted: December 25, 2019
Paper No. 20-62/1-547

Abstract
Active and efficient sectors of the economy play a pivotal role in the development process. Growth in different economic sectors shows the overall progress of the economy and the people's quality of life and social welfare. Economic and social changes will be more tangible if these situations are manifested in labour and the reduction of the unemployment rate. The present study uses labour market analysis and economic growth during three censuses (1986 to 2011) to determine the development rate of the Khaf city. In particular, the study scientifically and systematically examines the trends related to employment changes, lack of jobs analysis, receiving and sending immigrants, and the causal relationship between immigration and lack of jobs. The study utilises descriptive-analytical research in which data was gathered from formal and bureau resources. The data were analyzed using Statistical Package for Social Sciences (SPSS) software, descriptive and inferential statistics methods. Findings show that growth in employment sector attracts significant immigration in the city and changes in the labour force (DL) depend on the participation rate (DA) rather than natural changes in the labour force (DN). The finding of the study shows that decades from 1986 to 2006 had the worst development conditions due to the lack of job opportunities whereas from 2006 to 2011 witnessed the best development conditions due to introduction of additional jobs openings. In terms of the growth rate of economic sectors, the periods of 1986 to 1996 and 1996 to 2006 had the best and the worst growth rate respectively.

Key words
Development analysis, Labour market model, Immigration, employment, Khaf city, Iran.

INTRODUCTION

Since the 18th century and after the industrial revolution, the downgrading of agricultural production caused people to migrate to cities and subsequently, the population of cities increased. This trend caused problems such as unemployment, workforce abundance, traffic increase and lack of housing infrastructure. Subsequently, these problems change the economic, social and cultural systems around the world, which was more visible in cities (Shie, 1987). Therefore, careful attention

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to the various changes in population structure and its impact is more necessary by the day (Friedman, 2002). Among the indicators of demographic changes employment is more important because the high rate of employment can show the level of community welfare and living facilities (Amin Beidokhti, 2003).

According to the interaction of demographic changes' indicators in Iran, indicators have been distributed unevenly showing rural migration and unemployment (Office of Family Health and Population, 2000). Numerous actions and programs were considered to solve these problems but because the interaction in the cyclical process (Field and McGregor, 1997) of decision-making was not considered, the efforts did not result in tangible findings. Indeed, what was taken into account is planning in residential complexes in general and urban areas in particular, was mainly concentrated on physical dimensions. Other aspects neither have been a cause of concern nor have found their real importance. For example, the issue of employment has been seen as an essential part of these plans but has received less attention in practice. However, for now, these planning are so important that not only the city but also its sphere of influence on economic examinations and providing employment has been considered recently.

In general, awareness and knowledge of the structure and function of the economy of a city, including urban planning (Matlovičová, Tirpáková and Mocák 2019) and territorial marketing (Matlovič and Matlovičová 2016). at various level and analysis of land-use are necessary. Perhaps that is why some consider the creation of an urban centre with the infrastructure such as water availability, power generation, manufacturing activity, income and general economic mobility (Farhoodi and Muhammadi, 2006). The primary purposes of economic studies are knowledge of the business combination, evaluation of economic life and prediction of the future state of the local economy through which we can anticipate regional growth and development of spatial-physical manifestations in the appropriate form of visualisation (Todaro, 1999). Accordingly, the basis of inclusive development of urban studies is its economic studies in which employment, population, income, and ultimately need for living spaces are determined.

OBJECTIVES

This paper aims to analyse labour market conditions and growth rates of economic sections of Khaf, identifying opportunities and obstacles in the development of the city and suggesting viable solutions. In this regard, the study tries to find out the answers to the following research questions: What procedure has the city labour market passed from 1976 to 2010? What is the relationship between the processes of attracting migrants, immigration status and labour supply? How was the growth of economic sectors during the last three-decade census? What impact has each of the economic sectors had on job creation and subsequently on the changes in

demand in the labour market? Furthermore, the research also tries to answer the differences in the changes in employment and migration between Mashhad as the provincial capital and Khaf?

THEORETICAL FRAMEWORK

Labour market calculations

Calculation of the technology job market is a tool with which we can show the approach to supply and demand for labour. The fundamental element in the calculation of the labour market is the lack of job which occurs due to the imbalance between supply and demand for labour. With the use of this method, it is possible to indicate the effects of changes in employment on migration, unemployment and traffic (Tyler and Rhodes, 1989).

CALCULATION OF THE COMPONENTS OF THE LABOUR MARKET

The main components in the calculation of the labour market include population (P); working-age population (W); total employment (E); total unemployed (U); total net migration out of (M); and (C) as the total commuting out of the net.

$$DL= L - L\text{-}1+YXM \quad (1)$$

DL: (changes in the labour force). If it is positive, this means that the supply of labour has increased and vice versa.

$$DN= (W\text{-}W\text{-}1) \times Y\text{-}1 + XMY\text{-}1 \quad (2)$$

DN: (natural changes in the labour force). In the case of being negative, the number of people who were not in the working age in the previous decade now enters into working age. Another element that must be indicated in this case is participation changes in the labour force which can be calculated by using the following model.

$$DA= W(Y\text{-}Y\text{-}1) + XM\ (Y\text{-}Y\text{-}1) \quad (3)$$

DN: (participation rate). If it is positive, participation will be more, and if it is negative, it will show the reduction of participation.
Another factor is DE or changes in labour demand.

$$DE=E\text{-}E\text{-}1 \quad (4)$$

DE (changes in labour demand). If it is positive, it will show an increase in demand and, if it is negative, it will show a reduction in demand.

$$DS= DL\text{-}DE \quad (5)$$

DS (lack of jobs). If the sign is positive, we are facing a shortage of jobs, and a negative sign shows surplus jobs in the studied population.

$$DU=U\text{-}U\text{-}1 \quad (6)$$

DU (changes in unemployment). The positive sign indicates unemployed population growth and the negative sign shows the unemployed population decline (Ajza Shokuhi, 2002).

SHARE CHANGE METHOD

Share change analysis for the first time was proposed by Dunn (1960) as a way to determine the areas in which changes can be observed in economic variables and particular employment (Mayor et al., 2007). One of the significant advantages of this technique is its simplicity. Moreover, because this technique does not require many initial data, it can be used in all areas (Yassin et al., 2005). This advantage gains particular importance in third world countries, including Iran, which is facing a lack of detailed and updated statistics.

DATA AND METHODS

The study is based on analytical, documentary and library resources. The statistics and data were obtained from the results of population and housing censuses for the years 1986, 1996, 2006 and 2011 of the Statistical Centre of Iran and Management and Planning Organization of Khorasan Razavi. In the first part, relationships between job creation opportunities (labour demand), and the size of the labour force, migration, unemployment and traffic are shown by calculations of the labour market. In the second part, data from agriculture, industry and services were calculated by the share change model with the three elements of overall reference economic growth (A) relative growth sector in the total reference economy (B) the performance of each section of the city in relation to the same section in reference level (C). Finally, the employment situation and immigration of Khaf are compared to Mashhad's.

The study area

Khaf is located 250 km away from the southeast of Mashhad, the Center of Razavi Province, and shares 123km common border with Afghanistan. The city is limited to Tayabad and Torbat Heidarieh in north, Gonabad and Torbat Heidarieh in the west, Ghenat in south and Afghanistan in its east (Fig. 1). The city has mild and dry weather; the highest temperature recorded in the summer is 42 degrees celcious, and the lowest temperature in winter is -10 degrees celcious. The city's annual rainfall is 185 mm. The area of this county is 9796/79 km which is 8/42 percent of Khorasan Razavi's area. The county is located at an average height is 960 m above the sea level with a temperature varying between 1/3 and 31/7 Celcious; the city has 60 glacial days due to being on the fringe of the desert. According to the Population and Housing Census in 2011, the population of the city was 121859, of which 56365 people are residents of the city (46/25 percent) and 65494 live in rural areas (53/74 percent).

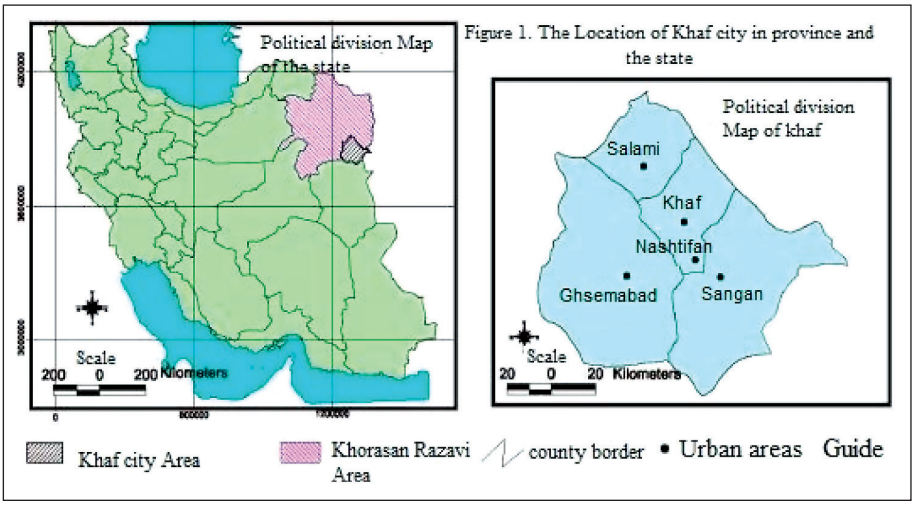

Figure 1
Location map of Khaf in Iran and Khorasan Razavi

Population and its evolution

According to the census, the changes in the population of Khaf city was significant during the last three census periods and it is quite irregular. For example, while the population of the city during the period between1966-1976 had the growth rate of over 6.1%, in 1986-1996 it experienced negative growth of about 0.7%. Detailed information about these developments during the year's between1956 – 2011 is presented in table 1 and Fig. 1 respectively.

Table 1 Population changes in Khaf from 1956 to 2011

Year	Population	Number of Households	Decade	Growth Rate
1956	34342	7215	---	---
1966	42861	9420	56-66	2.2
1976	77995	17527	66-76	6.1
1986	95451	21943	76-86	4.1
1996	92158	21684	86-96	-0.7
2006	110387	26599	96-06	1.2
2011	121859	30850	06-11	2.9

Source: *Statistical Yearbook of Khorasan Razavi, 2011.*

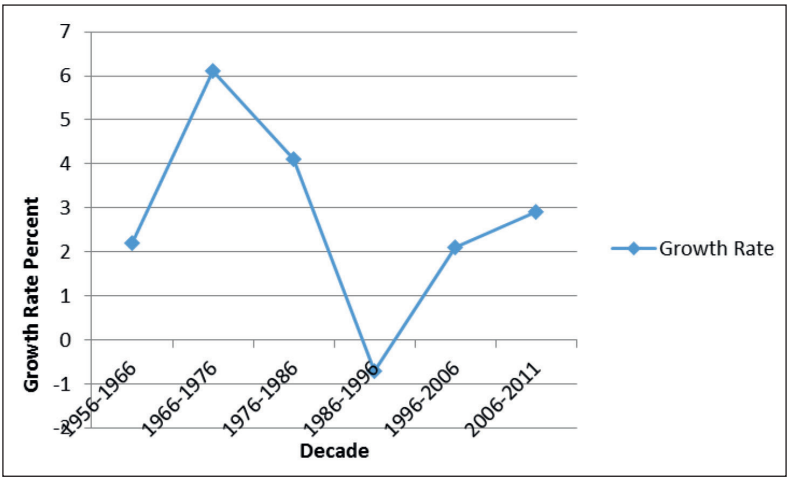

Figure 2
Changes in the population growth rate from 1956 to 2011,
KHAF Statistical Centre of Iran (1956 to 2011).

RESULTS AND DISCUSSION

Analysis of labour market situation in Khaf

If we look at a city or town as a system, it is requird to identify its behaviour, in order to change guide and plan such a system. By behaviour, we mean the process of intended area or system in terms of development over time. Identification of these processes and mechanisms of transformation of a city requires consideration of "time". Here, the analysis of the labour market situation of Khaf city during the four decades from 1976 to 2011 census is discussed. With the labour market calculations, the following findings were obtained (Table 2).

Table 2 Calculation of the labour market of Khaf, 1976-2011

Decade	DL	DN	DA	DE	DS	YXM	DU
1976-86	261	1191	-520	820	-599	-799	241
1986-96	887	684	248	1262	-375	-170	-205
1996-06	1541	990	212	1241	300	-364	664
2006-11	1850	1092	537	1701	-405	-987	210

Source: *Iranian Formal Database (2012)*

Table 2 proposes different realities; one of the most important is that the labour market city in the first and second decades faced with a shortage of job and in the third decade with surplus jobs. In terms of lack of jobs, the first decade with the

shortage of 3832 cases was the worst. In this decade, changes in labour demand (DE) was negative means the number of employed people did not increase. In the second decade, despite the lack of jobs, about 8876 people were added to the employed population. More detailed examinations show that from 3832 cases of shortage of jobs in the first decade, about 1000 cases must be found in demand for labour (DE) and the rest in increasing of the labour force (DL). About 3832 cases of shortage of jobs in the first decade caused out migration of almost 4,000 people from the city. In the second decade, despite the lack of jobs, the city observed out migration as well as immigration from other cities. The city provided with surplus jobs of about 4200 cases in the third decade and the best condition to solve the lack of jobs (DS) situation and the most immigration from other cities occurred in the same decade. As Fig. 3 shows, the relation between lack of job and (DS) and out-migration (YXM) indicates positive corelation among the changes in the lack of jobs and out-migration.

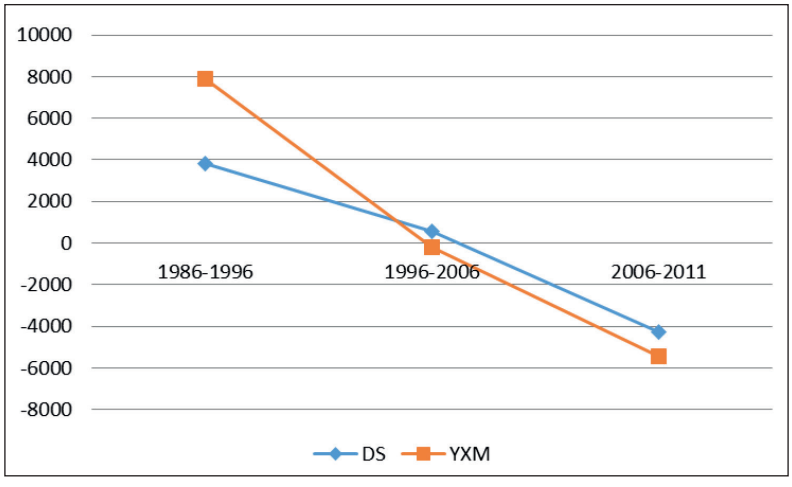

Figure 3
The relationship between lack of job (DS) and out-migration (YXM) in the labour market during 1986-2011 in Khaf city

In general, lack of jobs from the first decade to the third decade was decreasing; it means over the period lack of jobs in the city was reduced. The trend of out-migration is also the exact function of the trend of lack of jobs. From the first to third decade, out-migration was reduced and in the second and third decade's in-migration was increased. We conclude that in-migrations of this city have been entirely dependent on the lack of jobs and whenever surplus jobs provided, the area has had in-migrations.

In continuation and to clarify other aspects of the development of the city, the relationship between lack of jobs (DS) and changes in employment (DE) in 1986-2011 is discussed. Comparison between the trend of lack of jobs and employment trends (Fig. 4) shows that the trend of employment has been consistent with the lack of jobs in recent decades. In the first decade, the lack of jobs caused a reduction in the demand for labour. In the second decade (1986-2006), despite lack of jobs, the situation was much better than the previous decade. In 2006-2011, changes in employment (DE) were positive and incremental; lack of jobs (DS) was negative and decreasing.

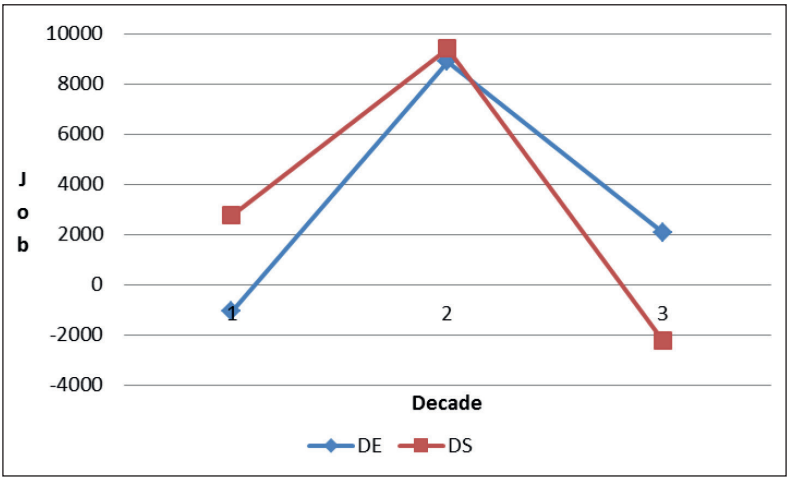

Figure 4
The relationship of the lack of jobs and employment changes in the labour market, Khaf, 1986-2011

Changes occurred in the context of employment and unemployment was laying the groundwork for other developments and conditions has affected the development of the city. One of the most critical cases in this connection was changes in the labour force (DL), participation rates (DA) as well as natural changes in the labour force (DN). Fig. 5 presents a detailed examination of this case and shows changes in the labour force (DL) are more dependent on natural changes in the labour force (DN) and DA and DL do not have noticeable relation with each other. We conclude that changes in the labour force (DL) are more dependent on natural changes in the labour force (DN) than on changes in participation rates (DA).

To determine the development of the city, clarifying the relationship among lack of jobs (DS), natural changes in the labour force (DN) and changes in participation rates (DA) will also be necessary. According to Fig. 6, in decades between 1986-1996 and 1996-2006 lack of jobs (DS) was positive and the city heavily faced

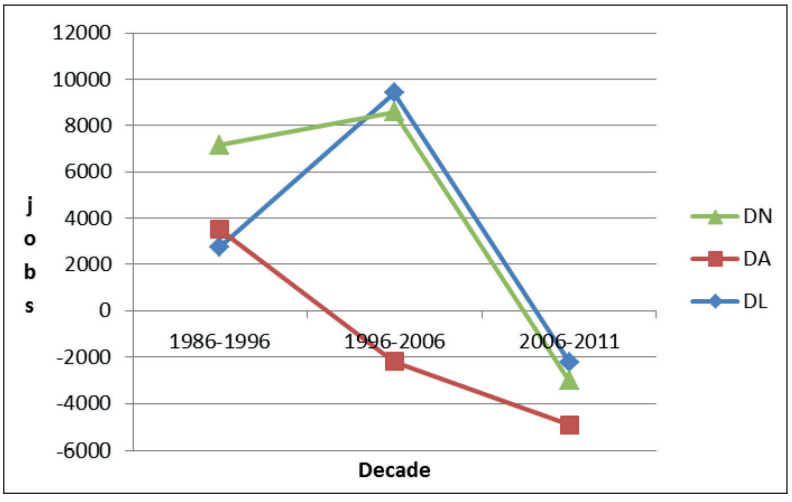

Figure 5
The relationship between DL, DA and DN in 1986-2011 Khaf

with a shortage of jobs. In this period, natural changes in the labour force (DN) had a positive and incremental process. Changes in participation rates (DA) were positive in the first decade but negative and decreasing in 1996-2006.

In 2006-2011 lack of jobs (DS) and changes in participation rates (DA) were negative and decreasing; there was a convergence to some extent between lack of jobs and participation rate and natural changes in the labour force (DN) were

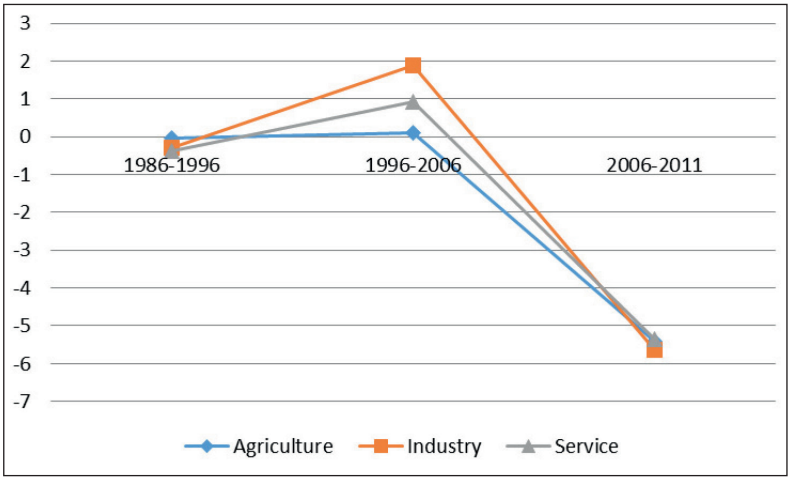

Figure 6 Relationship among lack of jobs (DS), natural changes in the labour force (DN) and changes in participation rates (DA) in 1986-2011

also positive, but it decreased in comparison with previous decades. In these two decades, changes in participation rates (DA) had more impacts on natural changes in the labour force (DN) than lack of jobs (DS).

Analysis of the situation of economic sectors in Khaf

As mentioned earlier, one of the most important factors in the development of the city is changes in the economic sectors. The fluctuations of economic sectors can indicate the economic situation of the city. Fig. 7 shows that in the first decade, all sectors had negative growth but this process reversed in the second decade. In this period, the highest growth was related to the industrial sector with 1/9. In the third decade, which is the worst decade in terms of economy, negative growth was above five and its main reason was high negative growth of reference economy.

Table 3 The economic status of Khaf during 1976- 2011

Decade	Khorasan Razavi			Khaf		B	C	A+B+C	Average
1986-1996	start	end	A	start	end				
Agriculture	421095	43728	0.21	9680	9420	-0.24	-0.11	-0.14	-0.26
Industry	379696	470003		5230	5113	-0.24	-0.26	-0.29	
Services	455039	592094		5515	5314	-0.25	-0.33	-0.37	
1996-2006	start	end	A	start	end				
Agriculture	437278	492279	0.14	9420	10311	-0.04	0.01	0.11	0.97
Industry	470003	537507		3113	10378	0.88	0.88	1.9	
Services	592094	709718		5314	8331	0.42	0.36	0.92	
2006-2011	start	end	A	start	end				
Agriculture	492279	427227	-5.65	10311	10825	0.05	0.18	-5.42	-5.47
Industry	537507	517170		1378	9160	0.07	-0.07	-5.65	
Services	709718	783539		8331	11068	0.10	0.21	-1.78	
Ave. Agr.			-1.76			-0.07	0.02	-1.78	
Ave. Ind.						0.23	0.18	-1.34	
Ave. Ser.						0.09	0.8	-1.59	

To determine the reasons for the city's economic fluctuations, the mechanism of win or lose changes in economic sectors in the whole city (C) also has to be indicated. The importance of this indicator is that it reveals the situation of economic sectors toward the situation of the whole country. According to Fig. 7 and Table 5, it can be said that in the second and third decades (C) in agriculture and industry is positive. In other words, in these two decades, industry and agriculture growth rate were higher in the city than in the province. In the first decade, this process was reversed and services part in all decades had negative growth except in the second

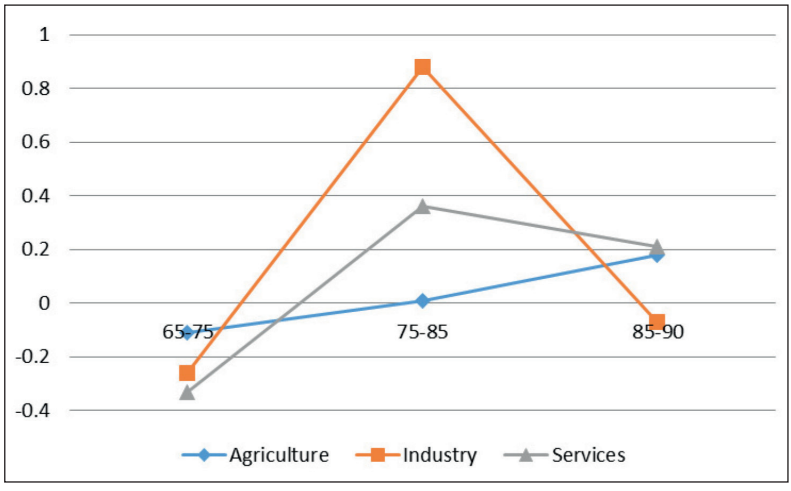

Figure 7
Fluctuations in the local growth rate of three economic sectors (A+B+C)

decade and even in later decades especially in the third decade it experienced high negative rate. This condition shows that this part of the city in comparison to the province was not in good condition. The second decade is the only decade in which all three economic parts of the city were above the same sectors at the country level. In general, it can be said that the changes in the agricultural and industrial sectors were more stable than the service part.

As mentioned earlier, in shift share method, winning or losing the state of economic sectors is associated with their positive or negative characteristics (C). Thus, regardless of a mixed or single loss of economic sectors, it is noted that agriculture, industry and service sectors were economic losers during two decades. This suggests that the condition of the industrial sector was undesirable during all these decades, but the agriculture and services sectors had better conditions during the same decade(Table 4).

Table 4 Losing or winning of economic sectors of Khaf during the five-decade census, 1986-2011

	Frequency of decades regarding situations of economic sectors					
Economic Sector	Winner	Mixed Winner	Loser	Mixed Loser	Total (Winner and Mixed Winner)	Total (Loser and Mixed Loser)
Agriculture	1	1	0	1	2	1
Industry	0	1	1	1	1	2
Services	1	1	0	1	2	1

Analysis of the development of Khaf

For analysis of the development of Khaf, labour market conditions and growth rates of its economic sectors were analysed. For this purpose, two important variables, including labour market conditions and growth rates of economic sectors, were taken into consideration. With a blended looking at the conditions of two variables, lack of jobs (DS) the average rate of growth of local economic sectors variable (average of (A+B+C)), we can get a better picture of regional development of the city in the census(Table. 5).

Table 5 Comparison of the development of Khaf during 1986-2011

Decade	DS	Medium Growth	Description
1986-96	Lack	-0.26	Negative growth during the three decade
1996-06	Lack	0.97	Positive growth in the first decade
2006-11	Excess	-5.47	No lack of jobs and positive growth during the decades

Overview of comparison of employment and immigration changes in Khaf and Mashhad

In the beginning, during the recent three decades, the two variables of the labour force (DE) and migration (M) are compared in Khaf and Mashhad. Fig. 8 shows the demand for labour and migration in Khaf and Mashhad.

Table 6 Comparison of employment and Immigration changes in Khaf and Mashhad

Decade	Job application change		Immigration	
	Khaf	Mashhad	Khaf	Mashhad
1986-96	-1067	-2532	17610	309584
1996-06	8876	260983	-2562	-231450
2006-11	2087	339604	-1139	-12279

Table 6 presents, the trend of employment in the last three decades is completely different for Khaf and Mashhad (Fig. 8). In general, in the most census labour force (DE) was positive and incremental and its rate was positive except in 1986-1996. On this basis, two main results of this process are worth mentioning: Firsstly, the amount of labour demand in Khaf is much less than in Mashhad. Actually, while the highest demand for labour in Khaf is about 8876, this amount for Mashhad is more than 339604 cases; and secondly, as Fig 9 shows, the speed of labour demand rise in Mashhad is more than Khaf. In general, Khaf had a decreasing trend in 2006-2011 in comparison to decade 1996-2006.

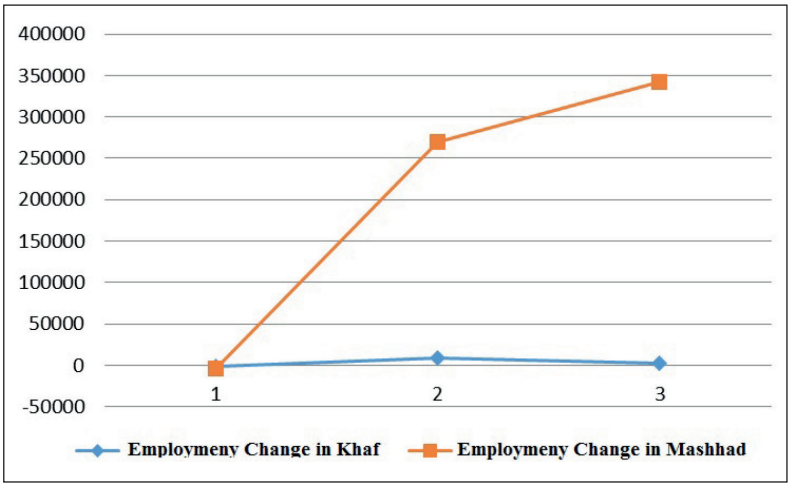

Figure 8
Changes in employment in Khaf and Mashhad
Source: *Census of the Statistical Center of Iran, 2012*

As mentioned earlier, one of the variables, which is important in regional development, is the issue of out-migration and in-migration (Fig. 9). For a more detailed explanation of this situation, the comparison of changes of in-migration in Khaf and Mashhad is employed.

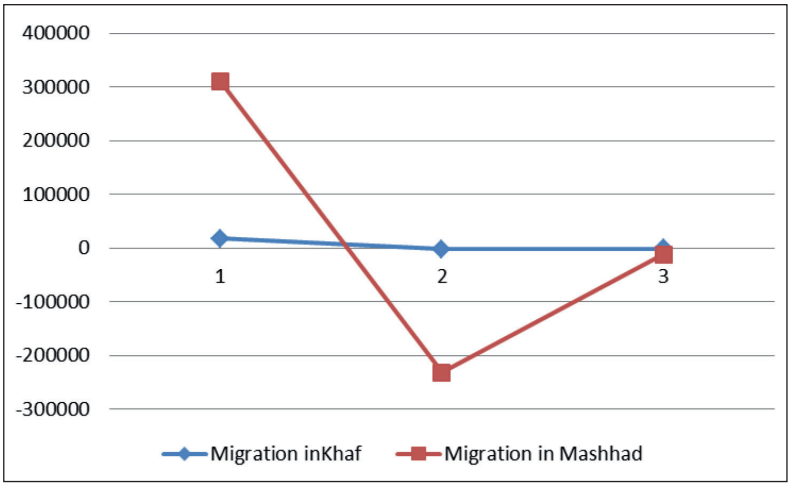

Figure 9
Migration in Khaf and Mashhad
Source: *Statistical Centre of Iran, 2012*

During 1986-1996 both the cities had out-migration, and the tilt of these changes was very high. Both cities in the second decade (1996-2006) had in-migration but with more growth in Mashhad and the third decade (2006-2011), the in-migration of two cities was the same.

CONCLUSIONS

This study aimed to analyse the development of Khaf using the market model. To this purpose, three factors of changes in the labour force, the natural supply of labour and participation rate were used. The performed analysis revealed the following results:

First of all, in-migration in Khaf was dependent on surplus jobs in the region and the results of labour market showed that this city didn't have out-migration in any periods except the first decade (1986-1996). As the study showed, changes in the labour force (DL) of Khaf were more dependent on participation rate (DA) than natural changes in the labour force (DN). The analysis of the lack of job in the first and second decades also showed that this factor was more dependent on participation rate (DA) than natural changes in labour force (DN). However, in the third decade participation rate (DA) and natural changes in labour force (DN) had the same rate in impact on lack of jobs. In two periods under review, the situation of the local growth rate of the services sector was better than the growth rate of the industrial sector, while the industrial sector had a better condition than agricultural sector. Generally, the ultimate findings showed that the agricultural sector had a worse situation than the services and industrial sectors. In the four-decade census, services, industrial and agricultural sectors were economic winners in 1986-1996, 2006-2011, 2006-2011 respectively. In relation to the development, we can say that good conditions were not observed in the first and second decades (1986-1996, 1996-2006) due to lack of jobs, but the third decade (2006-2011) had better conditions due to surplus jobs. In terms of economic sectors' rate of growth, decades 1996-2006, 1986-1996 and 1996-2006 were in the highest and lowest situation, respectively. Changes in the labour force (DL) in each of the last three decades in Khaf were decreasing and positive. However, Mashhad as the provincial capital in this period had very different conditions so that changes in the labour force (DL) in this city were negative during 1986-1996 and positive as well as incremental during 1996-2006 and 2006-2011. The assessment of the trend of migration in Khaf and Mashhad showed that both cities had out-migration in the first decade and in-migration in the second and third decades. However, the rate of in-migration in Mashhad was more than Khaf.

REFERENCES

AAZA SHAKOHI, M. (2002). The Role of Employment in the Development of New England Cities. *Geographical Research Quarterly*, 67, 122-137.

KHORASAN RAZAVI GOVERNORATE (2015). The Eye of the Size of the Province's Development in 1400. *Mashhad: Khorasan Razavi Province, Office of Planning*.

AMIN BEIDOKHTI, A. A. (2003). Semnan Province Comprehensive Employment Development Studies. *Semnan: Semnan Management and Planning Organization*.

TODARO, M. L. (1999). Third World Economic Development. Translated by Gholam Ali Farjadi. *Tehran: Institute for Advanced Research in Planning*.

OFFICE OF FAMILY AND POPULATION HEALTH (2008). Population Operational Program. Tehran: *Department of Population and Family Planning*, Ministry of Health.

FARHOODI, R., MOHAMMADI, A. (2006). Analysing and Predicting Development in Sanandaj City Using Gain Coefficient and Gini Coefficient Shift Model. *Geographical Research*, 55, 202-189.

SHIE, I. (2018). Introduction to Urban Planning. *Tehran: University of Science and Technology*.

FARID, Y. (2002). Population Geography. *Tabriz: University of Tabriz*.

FIELD, B., MCGREGOR, G. (1997). Forecasting Techniques in Urban Planning. Translated by Fatemeh Taghizadeh, *Tehran: Management and Planning Organization*.

IRAN STATISTICAL CENTRE (2006). Khawaf County Statistics. *Tehran: Iran Statistics Center*.

IRAN STATISTICAL CENTRE (2086). Khawaf County Statistics. *Tehran: Iran Statistics Center*.

IRAN STATISTICAL CENTRE (2096). Khawaf County Statistics. *Tehran: Iran Statistics Center*.

IRAN STATISTICAL CENTRE (2011). Khawaf County Statistics. *Tehran: Iran Statistics Center*.

MATLOVIČ R., MATLOVIČOVÁ K. (2016): The position of tourism and territorial marketing in the context of paradigmatic change to tertiary geography education in Slovakia. *Geojournal of Tourism and Geosites* 18 (2), pp. 133-144

MATLOVIČOVÁ K., TIRPÁKOVÁ E., MOCÁK P. (2019): City Brand Image: Semiotic Perspective. A Case Study of Prague. *Folia Geographica*, Volume 61, No. 1, pp. 120 -142

MAYOR, M., LOPEZ, A., PÉREZ, R. (2007). Forecasting Regional Employment with Shift-share and ARIMA Modelling. *Regional Studies*, 41, 4, 543-551.

TYLER, P., RHODES, J. (1989), *A* Model With Which to Forecast Employment and Population Change of the Regional and Sub-Regional Level. *London: Belharea Press*.

YASSIN, M., ALAVI, J., SOBRAL, F., LISBOA, J. (2005). A Shift –Share analysis Approach to Understand the Dynamic of the Portuguese Tourism Market. *Journal of travel & tourism marketing*, 17, 4, 11-22.

FOLIA GEOGRAPHICA • ISSN 1336-6157 (hard copy) • ISSN 2454-1001 (online)

ONLINE INFORMATION PREMISE IN THE DEVELOPMENT OF BIHOR TOURIST DESTINATION, ROMANIA

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Received: November 19, 2019 | Revised: February 15, 2020 | Accepted: February 19, 2020
Paper No. 20-62/1-553

Abstract
Tourism represents one of the sustainable alternatives with well-defined roles and functions in the shaping and development of local economies and tourist destination identity respectively. In this context, the transmitted information plays a major part. In the present case, the study focused on the analysis of the information delivered by the local actors from Bihor tourist destination in the online environment. The website pages belonging to the main local actors were analysed to quantify qualitatively and quantitatively the information from the online environment as a premise for the development of Bihor tourist destination. 686 possible local actors were identified, 140 public actors and 546 private activities whose sites were analyzed by the perspective regarding the information

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about tourist destinations in the studied area. The results have highlighted some crucial aspects regarding the local actors'attributions concerning the information typology in the process of construction and strengthening of the tourist destination image.

Key words
Tourist information, tourist destination, local actors, online environment.

INTRODUCTION

Bihor Tourist Destination overlaps the administrative territory of the homonymous county located in the west of Romania. Due to the relatively equal distribution on all three relief units and the millennial past of this region, the tourist offer includes a wide variety of attractions and ways to spend the free time. Through its historical and cultural values, the city of Oradea is without a doubt the pearl of this tourist destination, attracting the most tourists every year at the destination level. Among the multitude of buildings and palaces built in the most diverse architectural styles, the fortress from Oradea is individualized as a true emblem of the city; this is also indicated by the fact that it is positioned in a place of honor on the city's flag.

The fortress represents at the same time one of the defining elements for the society, both at the Bihor County level and at the national-european one. This is due to the geopolitical context in which they appeared and evolved and also from the roles and functiones they performed over time (Botezat and Tomescu, 2016). Among these, we can notice the political and military ones, of spiritual convergence and identity assertion. The historiographic analysis of Oradea Fortress has emphasized close links with the evolution of Oradea town, basically the fortress has influenced the political, religious, social and economic state of Oradea and the whole Bihor County respectively. Dating back to the 12th century, when the monastery on the Crișul Repede bank, erected by the Hungarian king Ladislau I, was fortified with stone walls (Borcea et al., 2007; Badiali et al., 2018) Oradea Fortress has endured through centuries to this day by its major contributions to the local community progress and well-being. It must be noticed that the local traditions and military functions associated to Oradea Fortress were established on the basis of another fortress situated in its immediate proximity, Biharea Fortress from the 2nd century.

Currently, Oradea Fortress has gone through a long renovation and preservation process, getting back partly its glamour and grandeur from another time. Although it does not perform its previous functions and attributions, it received new gnoseological, cultural and touristic functions. These last ones represent the objective of this present study.

Amid globalisation and the transition of the human society from an industrial one to an informational one (Herman, 2012) based on knowledge, there is the matter of information and its accuracy. Tourism, which claims to be more and more

an economic branch in full expansion with real possibilities of local and sustainable development of tourist destination, cannot make a compromise (Ianoş et al., 2012; Drăghici et al., 2015; Herman et al., 2017, Herman et al., 2018b; Ilie et al., 2017; Grecu et al., 2019, Dehoorne et al., 2019). As an economic branch, tourism is a cohesive human activity which capitalises on the specific assets of a given area in a continuous exchange of substance, energy and information. Taking into consideration the vast amount of tourist information available online (Xiang et al., 2015; Nelson, 2014) and the fact that this represents an essential tool of everyday life, the internet represents a qualitative and quantitative premise with a major impact on the shaping, evolution and dynamic of the tourist destinations (Doolin et al., 2002; Choi et al., 2007; Seabra et al., 2007; Dwivedi, 2009; Law et al., 2010; Matlovičová and Husárová, 2017; Lv and McCabe, 2020; Sun et al., 2020, Matlovičová and Sovičová 2010). In this situation, the existence of the Oradea Fortress, an important element that makes up the cultural heritage (Ilies et al., 2016; Ilies et al., 2018a, b; Ilies et al., 2019; Indrie et al., 2019) of Oradea and Bihor County, considerably increases the attractiveness of this destination, making it viable for both cultural tourism and leisure. The existent information concerns the destination by influencing the tourists' decision-making process regarding the choice of the tourist destination (Jacobsen and Munar, 2012; Standing et al., 2014; Matlovicova et al., 2019, Matlovičová and Kormaníková 2014) and each structural element separately, in our case Oradea Fortress, as a representative element, generating tourist motivation for Bihor destination.

In the light of informational society doubled by the perspective of information dissemination online, there is the matter of information quantity and quality (Križman and Belullo, 2007; Vičič and Šukljan, 2016; Kopmaz et al., 2019; Varelas, 2019). It is well-known the fact that the online, virtual space has gained significant magnitude, and new perspectives to enlarge this space are foreseen in the future, in which there is the risk to get lost, unless we have the required education, without making the difference between reality and virtual space (Van den Bos and Nell, 2006). Moreover, amid transmitting a residual type of information (outdated and sometimes incorrect) the potential tourists are faced with difficulties regarding the perception of destinations they are going to travel to. Overcoming these difficulties requires a good coordination of all the actors involved in the tourist promotion process and the understanding of the necessity to respect the 'copyright' when delivering information regarding an object, process or tourist act. The necessary information to determine the tourist consumption must be qualitative, in optimal quantity and from primary sources as much as possible. Primary sources are those which deliver the information in close relation with the reality in the field, coming from local, responsible actors involved in tourism (public and private) without suffering any interpretations or alterations. To avoid the accumulation of residual type

of information it is advisable to be only one responsible (transmitter, in this case The Museum of Oradea), the rest of the actors focusing more on the relay function of dissemination of primary information and not on that of issuing.

The basic researches are constituted in support of the decision-making assistance, the results obtained have a special role in understanding the role of information in developing a tourist destination. This type of analysis represents a dynamic X-ray of a tourist attraction, realized by the actors directly involved in the promotion and capitalization of the tourist destination. The importance of this analysis is given by the increasingly important role of information in the online environment in decision making.

METHODOLOGY

Study area

Bihor tourist destination comprising eight areas of maximum concentration of resources and tourist infrastrucure (Oradea, Băile Felix, Pădurea Craiului, Stâna de Vale, Padiș, Vârtop, Crișurilor Plain, Ierului Valley and Barcăului Valley), overlaps the

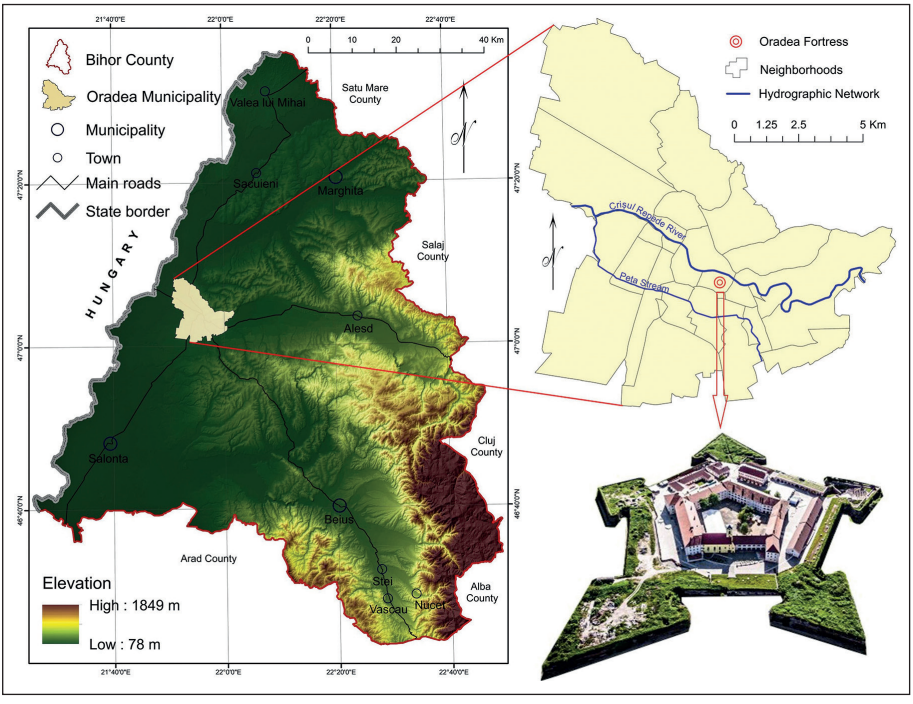

Figure 1
Physico-geographical location of Oradea fortress

homonymous territorial administrative unit being located in the north-west of Romania (Herman et al., 2019, Herman et al., 2017). Morphologically, it is represented by three major units of relief (Western Plain, Western Hills and Apuseni Mountains), whereas hydrographically, it overlaps the hydrographic basin of Crișul Repede River, left tributary of Tisa River (Figure 1).

The favourable physico-geographical features contributed to the humanisation of this area from time immemorial. Located at the contact of great empires, the history of this land is closely linked to that of Biharea and Oradea fortresses, and the central European space in which they functioned (Herman et al., 2016, Herman et al., 2018b).

Data analysis

Methodologically, the present study aims to identify the manner and extent to which this gem, Oradea Fortress, is promoted touristically online as an informational part corresponding to the websites of the main actors from Bihor tourist destination. As a result of the analysis of the above mentioned area, regarding the existence of local actors with roles, functions and attributions in the tourist promotion, were identified 686 possible local actors, 140 public actors (Bihor County Council, 101 town halls representing the territorial administrative units, 13 tourist information and promotion centers and 25 museums and collections) and 546 private actors (56 tourism agencies, 459 tourist units with accommodation functions and 31 NGOs) (Table 1). Therefore, the present study targeted the analysis of each actor's websites (366 web pages) separately (excepting the actors that do not have a web page) from november to december 2019, to identify the quantity (existence of information) and quality of information (presenting the objective, timetable, charged fee and the link to the primary source of this information, to the issuer) regarding Oradea Fortress as a tourist attraction with cultural identity.

For each type of information (regarding the existence, presentation, timetable, fee and link) was given a score equal to 1 so that each actor could cumulate a total of 5 points. Considering the fact that the primary information starts from a unique source (issuer The Museum of Oradea) in the process of quantification of the information delivered by the other local actors with relay functions, it was given the maximum score (5 points, major role) by the mere recording of the analysed attraction and the redistribution of the potential virtual visitors towards the main source of information, The Museum of Oradea respectively. Based on the maximum acquired score (5 points for each actor) it was established a value scale regarding their role in the promotion of Oradea Fortress, as follows: 1 – very small role; 2 – small role; 3 – average role; 4 – big role; 5 – very big role.

RESULTS AND DISCUSSIONS

The Museum of Oradea located in Oradea Fortress, nr. 39 – 41, Emanuil Gojdu Square, is the source institution, the main issuer regarding the primary information concerning the analysed tourist attraction. The information of tourist interest delivered by websites is complete and well-structured targeting the location, the presentation of the attraction and the possibilities of carrying out the tourist act (timetable and charged fees).

As a result of the analysis of Bihor tourist destination, there were identified 686 local actors that could be involved in the tourist promotion process (546 actors from the private sector and 140 actors from the public sector) out of which only 366 benefit from web pages (127 public actors and 239 private actors) (table 1).

Table 1 Consulted local actors involved in the process of promotion and capitalisation

Type	Local actors	Number of local actors	Number of local actors with web page	Units that promote
Public actors 140 127 5	Museums and collections	25 (3,7%)	12 (3,2%)	1 (2,3%)
	Bihor County Council	1 (0,1%)	1 (0,2%)	1 (2,3%)
	Local Town Halls	101 (14.7%)	101 (27.6%)	1 (2,3%)
	Tourist Information and Promotion Centers	13 (1.9%)	13 (3.6%)	2 (4,6%)
Private actors 546 239 38	Tourism agencies	56 (8,2%)	56 (15,3%)	2 (4,6%)
	Tourist units with accommodation functions	459 (66.9%)	163 (44.6%)	30 (69,9%)
	NGOs	31 (4.5%)	20 (5.5%)	6 (14%)
Total 686 366 43	Total	686 (100%)	366 (100%)	43 (100%)

The analysis of each actor's web pages separately has highlighted the fact that only 43 (12%) of the consulted actors (by the websites analysis method) contributes to the collective effort to promote Oradea Fortress regarded as a tourist attraction with cutural identity with roles and functions in the generation of tourist motivation on the one hand and in the increase of the duration and diversity of tourist act on the other hand. Of the total of actors that are concerned with the promotion of the establishment, 38 (88%) belong to the private sector while only 5 (12%) units come from the public sector (Table 1, 2, Figure 2). Moreover, the analysis of the ratio between the proportion of the cosulted actors (have web pages) and those

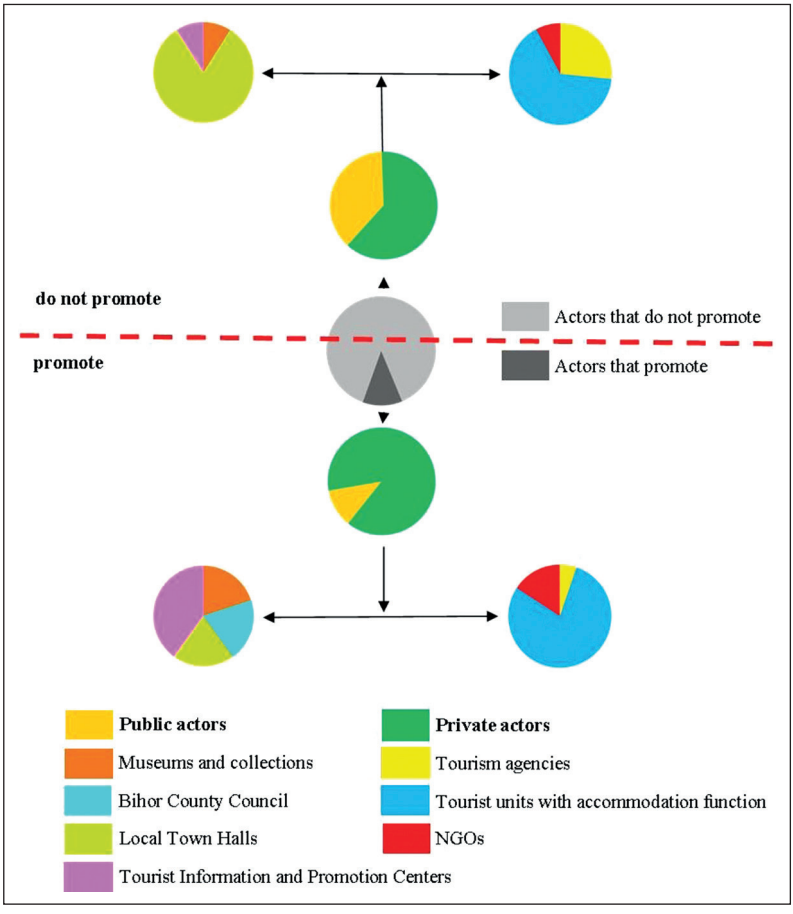

Figure 2
Conceptual model of the proportion of local actors in the tourist promotion

involved in the tourist promotion of the fortress, emphasises the superiority of the private actors (15,8%), in relation to the public sector (3,9%) (Table 1, Figure 2).

The quantification of the information obtained following the consultation of the local actors' websites targeted the following typical categories related to quality regarding tourism and tourist activity: location, presentation, timetable, charged fees and the link to the primary source of this information.

The location is an essential aspect that the prospective tourists have in mind both before and during the tourist act; recent studies in the field (Xiang et al., 2015; Jacobsen and Munar, 2012) indicate the tourists' propensity to draw up an itinerary of the trip based on existent information. They seek the location of the tourist attractions at a general level and also in relation to an element of reference

(accommodation unit, the route they are going to take, the tourist attractions they intend to visit etc.).

The online presentation of the information about the tourist attraction involves a great responsibility, the decision of coming to Bihor destination and the tourist's satisfaction with the tourist product depending on the way in which this is done. The responsibility of the dissemination of the general details regarding the main characteristics of the fortress is taken by only 15 actors (35%) of the total of 43 that take into account the promotion of the establishment (Table 1, 2).

The information regarding the timetable for visiting the analysed attraction and the charged fee is the responsibility of the Museum of Oradea. It is essential for the growth of the tourist satisfaction. Being characterized by an increase dynamic susceptible at the same time to changes occurring over time, it is recommended that this information should be delivered only by the issuer (The Museum of Oradea), the rest of the actors having the mission to address it, becoming informational relays.

The analysis of the relay function (link) was identified at 8 local actors (19% of the actors that have web pages), 4 private actors and 4 public actors (Table 2).

Table 2 Interpretation of the data in a comparative summary of the rooms

	Type of facility	Name of facility	The existence of information	Presentation of the attraction	Time table	Fees	Link	Score	Role
Public actors	Museums and collections	The Museum of Oradea	1	1	1	1	1	5	very big
	Bihor County Council	Bihor County Council	1	1	1	1	1	5	very big
	Local Town Halls	Oradea Town Hall	1	1	1	1	1	5	very big
	Tourism Information and Promotion Centers	The Fortress Center	1	1	1	1	1	5	very big
		Alesd Centre	1	0	0	0	0	1	very small
Private actors	Accommodation units	Atrium Hotel	1	0	0	0	0	1	very small
		Avalon Renting Rooms	1	0	0	0	0	1	very small
		Bulevard Hotel	1	0	0	0	0	1	very small
		Caro Hotel	1	0	0	0	0	1	very small
		Continental Forum Hotel	1	1	0	0	0	2	small
		Eclipse Renting Rooms	1	0	0	0	0	1	very small
		Hanul Cappsha Villa	1	1	1	1	1	5	very big
		Imperial Rooms Renting Rooms	1	0	0	0	0	1	very small
		Junior Hostel	1	0	0	0	0	1	very small
		Lyra Hotel	1	1	1	1	1	5	very big

Private actors	Accommodation units	Panoramis Residence Villa	1	0	0	0	0	1	very small
		Phoenix Guesthouse	1	0	0	0	0	1	very small
		Qiu Hotel Rooms Renting Rooms	1	0	0	0	0	1	very small
		Recidency Guesthouse	1	0	0	0	0	1	very small
		Casa Stoica Guesthouse	1	0	0	0	0	1	very small
		Magic Guesthouse	1	0	0	0	0	1	very small
		Empire Guesthouse	1	0	0	0	0	1	very small
		Ami Hotel	1	0	0	0	0	1	very small
		Vital Hotel	1	0	0	0	0	1	very small
		Carmena Camping	1	0	0	0	0	1	very small
		Carmena Guesthouse	1	0	0	0	0	1	very small
		Carmena Renting Rooms	1	0	0	0	0	1	very small
		Casa Alma Renting Rooms	1	0	0	0	0	1	very small
		Casa Veronica Guesthouse	1	0	0	0	0	1	very small
		Lotus Therm Hotel	1	1	0	0	0	2	small
		Miorita Guesthouse	1	0	0	0	0	1	very small
		Nikolas Guesthouse	1	1	0	0	0	2	small
		Veronica 1 Guesthouse	1	0	0	0	0	1	very small
		Casa Porojan Guesthouse	1	1	1	0	0	3	average
		Beverly Hills Guesthouse	1	0	0	0	0	1	very small
	Tourism agencies	Eximtur	1	0	0	0	0	1	very small
		ChristianTours	1	1	0	0	0	2	small
	NGOs	The Foundation for the Protection of Historic Monuments from Bihor County	1	1	1	1	1	5	very big
		The Association for the Promotion of Tourism in Oradea and the Region - APTOR	1	1	0	0	0	2	small
		Astroclub Meridian 0 Association	1	1	0	0	0	2	small
		Varadinum Foundation	1	1	0	0	0	2	small
		The Cultural Foundation the International Theatre Festival Oradea	1	0	0	0	0	1	very small
		Aiesec Association Oradea	1	1	1	1	1	5	very big
Total			43	16	9	8	8	84	very small

Based on the information obtained following the consultation of the local actors' websites from Bihor tourist destination that promote Oradea Fortress (43 actors) an assessment of their role was performed particularly (for each actor separately) and generally (overall and on types of actors) according to the methodology developed in the current study.

The analysis of the local actors (with web pages) in the tourist promotion of Oradea Fortress highlights their weak implication. This comes from the proportion of local actors and their role taken in the promotion of Oradea Fortress: very small 63%); very big (19%); small (16%); average (2%) and big (0%) (Figure 3).

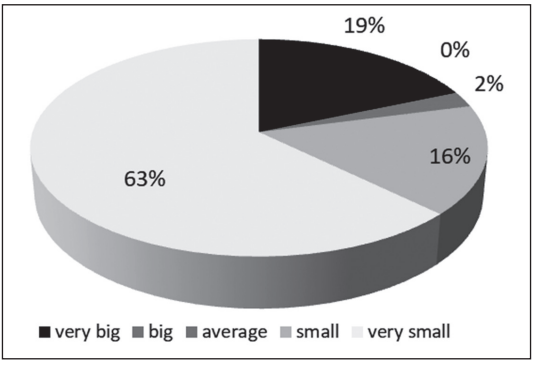

Figure 3
The proportion of local actors according to their role in the promotion of Oradea Fortress

If most of the actors concerned with the promotion of the facility come from the private sector, the analysis of the local actors based on typical categories highlights the ones belonging to the public sector. Thus, the public actors play an important part in the promotion of Oradea Fortress while the private ones play a very small to small part (Table 3).

Table 3 The role of the local actors involved in the promotion of Oradea Fortress

Local actors	Type	Score	Number of units	Average score	Role
Public actors 4,2 big	Museums and collections	5	1	5	very big
	Bihor County Council	5	1	5	very big
	Local Town Halls	5	1	5	very big
	Tourist Information and Promotion Centers	6	2	3	average
Private actors 1,6 (very small to small)	Tourism agencies	3	2	1,5	very small to small
	Tourist units with accommodation functions	43	30	1,4	very small
	NGOs	17	6	2,8	small to average
Total 1,9 (very small to small)	Total	84	43	1,9	very small to small

In order to complete the global picture regarding the local actors' role in the promotion of Oradea Fortress (very small to small role), as a defining element for Bihor tourist destination, the information obtained was corroborated with the total number of local actors (with and without web pages). The obtained results diminished considerably the local actors' role at general level by the growth in the number of actors that do not promote Oradea Fortress tourist attraction in any way.

CONCLUSIONS

The information is an essential component in the tourist promotion process, on the way it is conceived, transmitted and received depending the decision of tourist purchase and consumption. Therefore, it is a major collective responsibility that should be assumed by all local actors. Nevertheless, from the analysis of the tourist information regarding Oradea Fortress from Bihor destination by the local actors (686 actors) in the online environment using their own web page (366 pages), it emerges the very small role played by them in the promotion of the mentioned attraction as part of Bihor tourist destination.

From the analysis of the 43 local actors on typical categories, a better situation could be considered regarding the public actors in relation to the private ones (Table 3). Nevertheless, from the analysis of each actor it is noticeable the existence of eight actors with very big role, four from the private sector and four from the public one.

Through the proposed methodology and the results obtained, the study contributes to the development of the methodologies established in the integrated development of the local economies with a dominant tourist function (Botezat and Tomescu, 2016)

Therefore, it is evident that the effort to promote Oradea Fortress as part of Bihor tourist destination by the local actors is insignificant and requires the quantitative (number of actors) and qualitative (type of information) involvement regarding the information conception and distribution through web pages and more. Other actors have contributed to the tourist promotion of Oradea Fortress through social and media networks with major impact in the decision-making process of travelling to Bihor tourist destination.

REFERENCES

BADIALI, F., ILIES, D.C., CASTALDINI, D. (2018). A tale of a city, through its urban landscape and cultural heritage in the heart of Europe: The case study of Oradea City (Romania). *GeoJournal of Tourism and Geosites*, 21(1), 88-102.

BORCEA, L., CORNEA, L., FODOR, J. et al. (2007). Istoria Orasului Oradea (History of Oradea City) (In Romanian).

BOTEZAT, E.-A., TOMESCU, A. (2016). Drafting a cultural strategy based on cultural content - Fortress of Oradea case. *Knowledge Horizons – Economics*, 8(2), 43-46.

CHOI, S., LEHTO, X.Y., MORRISON, A.M. (2007). Destination image representation on the web: Content analysis of Macau travel related websites. *Tourism Management*, 28(1), 118-129.

DEHOORNE, O., OLĂU, V.M., CACIORA, T. (2019). Tourist resources assesement in Pădurea Craiului Mountains. *Folia Geographica*, 61(2), 163-171.

DOOLIN, B., BURGESS, L., COOPER, J. (2002). Evaluating the use of the Web for tourism marketing: a case study from New Zealand. *Tourism management*, 23(5), 557-561.

DRĂGHICI, C.C., PINTILII, R.D., PEPTENATU, D. et al. (2015). The role of SPA tourism in the development of local economies from Romania. *Procedia Economics and finance*, 23, 1573-1577.

DWIVEDI, M. (2009). Online destination image of India: A consumer based perspective. *International Journal of Contemporary Hospitality Management*, 21 (2), 226-232.

GRECU, A., GRUIA, A.K., MARIN, M. et al. (2019). Specificity of Sustainable Structural Dynamics of Local Economy in Romanian Tourist Resorts. *Sustainability,* 11(24), 7155.

HERMAN, G.V. (2012). The Role and the Importance of Historical Monuments in the Diversification of Touristic Services in Oaş Land. *Forum Geografic, Studii şi cercetări de geografie şi protecţia mediului*, 11(2), 229-234.

HERMAN, G.V., BAIAS, Ş., MĂDUŢA, F. (2016). Aspects Regarding the Brownfields from Oradea City, Bihor County, Romania, pp. 25 – 40, in *Brownfields, friches urbaines et recompositions territoriales La durabilité en question*, Olivier DEHOORNE, Huhua CAO, Dorina ILIES, PUAG – Publibook.

HERMAN, G.V., CACIORA, T., DUMBRAVĂ, R. et al. (2019). Geographical Considerations Regarding the Tourist Information and Promotion Centers from Bihor County, Romania. *GeoJournal of Tourism and Geosites*, 27(4), 1439–1448.

HERMAN, G.V., DEAC, A.L., CIOBOTARU, A.M. et al. (2017). The role of tourism in local economy development. Bihor County Case Study. *Urbanism Architecture Constructions*, 8(3), 265-274.

HERMAN, G.V., PEPTENATU, D., GRAMA, V. et al. (2018a). Tourism and Local Development. Study Case: Băile Felix-Băile 1 Mai Tourism System, Bihor County, Romania. *Analele Universitatii din Oradea. Seria Geografie*, 28(1), 131-137.

HERMAN, G.V., TĂTAR, C.F., PUŞCAŞ, B.D. (2018b). Assessing the importance of the Jewish urban cultural heritage in Oradea, Bihor County, Romania. *Forum Geografic*, 17(2), 151-158.

IANOŞ, I., PEPTENATU, D., PINTILII, R.D. et al. (2012). About sustainable development of the territorial emergent structures from the metropolitan area of Bucharest. *Environmental Engineering & Management Journal (EEMJ),* 11(9), 1535–1545.

ILIE, A.M., HERMAN, G.V., CIOBOTARU, A.M. et al. (2017). The role of tourism in structural dynamics of the economic profile of Sighisoara city. *Urbanism Architecture Constructions*, 8(4), 377-386.

ILIES, A., WENDT, J.A., ILIES, D.C. et al. (2016). The patrimony of wooden churches, buit between 1531 and 2015, in the Land of Maramureș, Romania. *Journal of Maps,* 12(sup1), 597-602.

ILIES, D.C., ONET, A., MARCU, F. et al. (2018a). Investigations on Air Quality in the Historic Wooden Church in Oradea City, Romania. *Environmental Engineering & Management Journal (EEMJ)*, 17(11), 2731-2739.

ILIES, D.C., ONET, A., WENDT, J.A. et al. (2018b). Study on microbial and fungal contamination of air and wooden surfaces inside of a historical Church from Romania. *Journal of Environmental Biology*, 39(6), 980-984.

ILIES, D.C., ONET, A. HERMAN, G.V. et al. (2019). Exploring the Indoor Environment of Heritage Buildings and its Role in the Conservation of Valuable Objects. Environmental Engineering and Management Journal, 18(12), 2579-2586.

INDRIE, L., OANA, D., ILIES, M. et al. (2019). Indoor air quality of museums and conservation of textiles art works. Case study: Salacea Museum House, Romania. *Industria Textila*, 70(1), 88-93.

JACOBSEN, J.K.S., MUNAR, A.M. (2012). Tourist information search and destination choice in a digital age. *Tourism Management Perspectives*, 1, 39–47.

KOPMAZ, B., KITAPCI, N.S., KITAPCI, O.C. et al. (2019). Dental Websites as New Media Tools for Patients in Dental Health Tourism. *Acta Informatica Medica*, 27(2), 128-132.

KRIŽMAN, PAVLOVIĆ, D., BELULLO, A. (2007). Internet-An agent of tourism destination image formation: Content and correspondence analysis of Istria travel related websites.

LAW, R., QI, S., BUHALIS, D. (2010). Progress in tourism management: A review of website evaluation in tourism research. *Tourism management*, 31(3), 297-313.

LV, X., & MCCABE, S. (2020). Expanding theory of tourists' destination loyalty: The role of sensory impressions. Tourism Management, 77, 104026.

MATLOVIČOVÁ, K., HUSÁROVÁ, M. (2017). Potential of the heritage marketing in tourist destinations development. *Folia Geographica*, 59(1), 5-35.

MATLOVICOVA, K., KORMANIKOVA, J. (2014): City brand-image associations detection. case study of Prague. Conference: *SGEM 2014*, Psychology and Psychiatry, Sociology and Healthcare, Education, Vol II, Book Series: International Multidisciplinary Scientific Conferences on Social Sciences and Arts, pp.: 139-146.

MATLOVICOVA, K., SOVICOVA, I. (2010): External Image Analysis of the City of Presov. *Geographia Cassoviensis*, Vol. 4, Issue: 2, pp. 107-113

MATLOVICOVA, K., TIRPAKOVA, E., MOCAK, P. (2019). City brand image: semiotic perspective a case study of Prague. *Folia Geographica*, 61 (1), 120-142.

NELSON, V. (2014). Representations of a Destination Brand in Online Tourism Information Sources: The Case of Slovenia. *Tourism Culture & Communication*, 14(1), 41–52.

SEABRA, C., ABRANTES, J.L., LAGES, L.F. (2007). The impact of using non-media information sources on the future use of mass media information sources: The mediating role of expectations fulfillment. *Tourism Management*, 28(6), 1541-1554.

STANDING, C., TANG-TAYE, J.-P., BOYER, M. (2014). The Impact of the Internet in Travel and Tourism: A Research Review 2001–2010. *Journal of Travel & Tourism Marketing*, 31(1), 82–113.

SUN, Y., LIANG, C., CHANG, C.C. (2020). Online social construction of Taiwan's rural image: Comparison between Taiwanese self-representation and Chinese perception. Tourism Management, 76, 103968.

VAN den BOS, M., NELL, L. (2006). Territorial bounds to virtual space: transnational online and offline networks of Iranian and Turkish–Kurdish immigrants in the Netherlands. *Global Networks*, 6(2), 201-220.

VARELAS, S. (2019). Netourwork Framework: A New Era in Strategic Innovative Networking System for Tourism Enterprises. In Strategic Innovative Marketing and Tourism (pp. 819-825*). Springer, Cham.*

VIČIČ, J., ŠUKLJAN, T. (2016). Motivating cultural heritage artifacts presentation using persuasive technology. *Informatica,* 40(4), 457-561.

XIANG, Z., MAGNINI, V.P., FESENMAIER, D.R. (2015). Information technology and consumer behavior in travel and tourism: Insights from travel planning using the internet. *Journal of Retailing and Consumer Services,* 22, 244–249.

FOLIA GEOGRAPHICA • ISSN 1336-6157 (hard copy) • ISSN 2454-1001 (online)

COMPARISON OF IMPLEMENTATION OF RURAL DEVELOPMENT PROGRAMMES FOCUSSING ON DIVERSIFICATION IN SLOVAKIA IN THE YEARS 2007-2013 AND 2014-2020

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Received: December 2, 2019 | Revised: February 21, 2020 | Accepted: March 27, 2020
Paper No. 20-62/1-548

Abstract
The European Union is aware of the importance of agriculture for rural economy and this is the reason why the EU decided to support this sector by means of rural development programmes. The objective of this paper was to compare the support of the development of multifunctional agriculture in Slovakia by the measures of the Rural Development Programme of the Slovak Republic 2007-2013 and the Rural Development Programme of the Slovak Republic 2014-2020 focussing on agricultural diversification. In the elaboration of the paper we used statistical data and information from the databases of the Agricultural Paying Agency and the National Rural Development Network. The data were analysed at the NUTS 3 (regions) and LAU 1 (districts) level of Slovakia. The main indicators under review were the number of applicants for the non-repayable financial contribution, the number of approved and completed projects and the number of entities, which implemented the projects. In the study we also focussed on financial indicators - the overall sum of the approved and granted contribution for the monitored measure, the share of the approved and granted contribution from the EU, the share of the approved and granted contribution in the overall contribution for the SR, the average number of the approved and completed projects in the individual programming periods and the average amount of granted contribution per completed project. The intensity of diversification support at the level of regions was examined on the basis of the granted contribution allocated to agricultural land. In the first programming period between 2007 and 2013 diversification was promoted in support measure 3. 1. In the year 2013 the Agricultural Paying Agency recorded in this measure 239 approved projects. The support of diversification into non-agricultural activities was in the second programming period 2014-2020 included in Submeasure 6. 4. In the year 2018 it was 173 projects that were approved. In the following years 2019 and 2020 more agricultural entities are likely to participate in the call under the current Rural Development Programme of the Slovak Republic 2014-2020 and diversify their production into non-agricultural activities. The Common Agricultural Policy of the European Union awards subsidies for measures promoting diversification in form of rural development programmes. The measures aim at improving the quality of life of rural population and the support of rural economy.

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Key words
The Rural Development Programme, diversification, non-agricultural activities, regions, the Slovak Republic.

INTRODUCTION

In recent years a change has been seen in the traditional understanding of agriculture in connection with its transformation to multifunctional agriculture. The weakening relationship between agriculture and the rural areas is being explained by the transition from production agriculture to post-production (multifunctional) agriculture (Věžník et al. 2013). The changes in agriculture are motivated by the current form of the Common Agricultural Policy, which desists from providing funding to production and favours environmental protection, creation and maintenance of the landscape, food safety and good conditions for breeding farm animals (Ward et al. 2008). The support of diversification into non-agricultural activities is a part of this transformation of agriculture and at the same time it is one of the goals of the European agricultural policy, whose objective is also to keep the farmers in the rural regions (Tóthová and Fiľa, 2014).

The measures focussing on diversification and thus fostering the multifunctionality of agriculture are becoming a part of agricultural policies across the globe and the European Union (EU) is not an exception herein. The EU is aware of the importance of the primary sector when it comes to achieving food safety and levelling regional disparities. Many Slovak farmers face problems due to i.a. low prices of agricultural commodities, their sale and an instable market. For the farmers diversification presents a wide range of options how to extend their primary production orientation by other the so called non-agricultural activities and thus find a suitable solution for stabilizing their income. The support of development of multifunctional agriculture is being implemented also in form of the measures under the Rural Development Programmes. By implementing new non-agricultural activities the agricultural entities diversify their production and thus contribute to the development of multifunctional agriculture in Slovakia. The activities in multifunctional agriculture add to preserving the environment, sustainable development and the development of rural areas. Czimbalmos et al. (2013) share a similar view when considering the increase in the degree of farm diversification and expanding the European model of multifunctional agriculture as the best solution to the current crisis in agriculture.

The objective of this paper was to compare the support of development of multifunctional agriculture in Slovakia by means of the measures under the Rural Development Programme of the Slovak Republic 2007-2013 and the Rural Development Programme of the Slovak Republic 2014-2020 focussing on diversification in agriculture.

THEORETICAL FRAMEWORK

Nowadays many farmers in Europe have difficulties gaining sufficient income from agriculture to cover their costs of living especially due to the complicated economic context, in which the prices of the principal agricultural crops are decreasing and the agrarian market prices are highly volatile. For many of them diversification into other non-agricultural activities (the European Parliament, 2016) presents a way of how to stabilize or increase their income. Diversification includes entrepreneurial activities that are carried out in the enterprise, which depend on agricultural land and capital activities of the enterprise (Maye et al. 2009). Diversification in agriculture is a key factor when it comes to achieving food safety and increasing employment in rural areas. It has an impact on both sides – the wider society but also the farmer, to whom it secures higher revenues and other entrepreneurial activities on his land. At present the rural areas hardly create any new jobs and the interest of young people to work in agriculture is very low. It is the non-agricultural activities of agricultural entities that open opportunities for creating new jobs. Špička and Picková (2007) state that diversification developed in the EU states between the years 2003-2005. As to the further gainful activities of the farmers the most common non-agricultural activities in the EU are the processing of agricultural products, food production, agrotourism and contract work. Also according to Arru et al. (2019) the recreational functions rank among the most important procedures for increasing the farmers' revenues and fostering the sustainability of rural areas. For Schöpe (2011) diversification is the fundamental sign heralding the change in the structure of agriculture. In practice for the agrarian sector it implies the creation of new branches, which can no longer be assigned to the original agricultural production, however they are dependent on the traditional sources of an agricultural enterprise. At present it is not easy to make agriculture thrive. The owners and managers engaged in the agricultural sector are therefore increasingly compelled to face challenges when it comes to searching for new and more stable sources of revenues. Applying the diversification strategy is one of the options how to improve the present situation. The more so as this strategy provides an important tool for enhancing the quality of rural infrastructure and creating new job opportunities in unconventional sectors and thus leads to reducing employment in the agricultural sector (Huml et al. 2011).

According to Tóthová and Fiľa (2014) diversification shall help agricultural entities extend their range of products, increase competitiveness and simultaneously obtain funding for further development of the entity. The farmers are considering what form of diversification to use, whether to stay in the agricultural sector and widen the existing production programme or try to diversify into non-agricultural activities. Hron et al. (2008) stress the importance of diversification for bolstering the competitiveness of small and medium-sized agricultural entities.

While the share of agriculture, forestry and fishing in the rural economies has gone down the importance of diversification has grown and its activities have been intensified (Boncinelli et al. 2018). The importance of diversification as a means of mitigating risks in agriculture is highlighted by Villa et al. (2019). According to Feliciano (2019) the diversification of the cultivated crops in terms of cost presents one of the most efficient methods how to reduce the instability of farm income. From the environmental viewpoint diversification of crops can stabilize the ecosystem through increasing biodiversity (Lancaster and Torres, 2019, Boltižiar et al. 2016). Those farmers who currently make use of more heterogeneous crop rotation are more likely to use crop rotation as a strategy for adapting to climatic changes (Roesch-McNally et al. 2018). Kołodziejczak and Kossowski (2011) claim that diversification of agricultural systems under the impact of the factors arising from the EU Common Agricultural Policy positively affects the agriculture in Poland, which is adapting to natural conditions.

Diversification in agriculture has a positive impact on creating new work places in rural areas and it can thus solve the problem of high rural unemployment. It focusses on the support of developing new forms of business, which present an alternative to agriculture. In comparison with the other EU states the structure of diversification in the production of agricultural entities in the context of Slovakia is insufficiently developed. The agrarian sector in the EU is characterized by a significant degree of diversification of its activities. More than 30% of farmers in the EU carry out another gainful activity beside their primary focus on agriculture (European Commission 2018).

DATA AND METHODS

An important driving force for rural development in Slovakia is the implementation of the measures under the Slovak Republic Rural Development Programmes (SR RDP). The Rural Development Programme is a programming document, which in particular deals with the absorption of funding from the European Agricultural Fund for Rural Development. This fund aims at supporting the European rural development policy and this is why it is used for funding all the rural development programmes in the EU Member States. For the purposes of our analysis we used the two most recent programmes orientated at rural development: the SR RDV 2007-2013 Axis 3: Quality of life in rural areas and diversification of rural economy, Measure 3.1: Diversification into non-agricultural activities (code 311) and the SR RDV 2014-2020, Measure 6: Supporting farm and business development and Submeasure 6.4: Investments in creation and development of non-agricultural activities.

The information sources for elaborating this paper were the internal materials and the data of the Agricultural Paying Agency (APA) and the National Rural De-

velopment Network. The data were analysed at the NUTS 3 (regions) and LAU 1 (districts) levels of Slovakia. We applied the ArcView programme for statistical data processing and cartographic visualization of the results.

In the study the following analytical instruments were used: basic processing of the statistical data set and its subsequent analysis, methods of thematic cartography, comparative data analysis, comparison of indicators at the level of regions of Slovakia (LAU 1 and NUTS 3) as well as deduction and synthesis of the knowledge obtained.

In order to compare the implementation of the measures related to the diversi-fication of agriculture under the Slovak Republic Rural Development Programmes 2007-2013 and 2014-2020 we monitored the following indicators: the number of applicants for the non-repayable financial contribution, the number of approved and completed projects and the number of entities that implemented the projects. The next indicators used for the SR were the overall sum of the approved and granted contribution for the monitored measure and the share of the approved and granted contribution from the EU. At the NUTS 3 level we calculated the share of the approved and granted contribution in the overall contribution in the SR, the share of the approved and granted contribution from the EU. We also determined the average amount of approved and completed projects in both programming periods and the average amount of the granted contribution per completed project. We examined the support of diversification at the level of regions on the basis of the granted contribution allocated to agricultural land.

RESULTS AND DISCUSSION

One of the possibilities how to promote entrepreneurial activities in rural areas is to invest in diversification in agriculture. In many countries around the world the public can more frequently encounter cases, in which entrepreneurship in rural areas is being diversified into a wider range of economic activities. This results in creating a higher degree of economic diversity and sustainable rural areas. The organisations and measures focussing on the strategy of diversification count on added value for rural economy and on the sustainability of the whole agrarian sector. The key task of the agrarian sector has always been to provide food to the world's population and thus to ensure food safety.

Rural Development Programme of the Slovak Republic 2007-2013

The necessity to support diversification in agriculture arises from the experience with implementing the pre-accession instrument SAPARD, the Sectoral Operational Programme Agriculture and Rural Development 2004-2006 and the Rural Development Plan of the Slovak Republic 2004-2006. According to A. Zverková and M. Zverková (2013) the rural development programmes in a significant way influence

the current trend of development and formation of rural landscape, which is prevailingly used for agricultural purposes. Within the framework of the SR RDP 2007-2013 the allocated amount was EUR 1 969 418 078. The programme was approved by the Slovak government on 21 March 2007. The priorities of the programme reflect the principal goals of the EU Common Agricultural Policy.

For the purposes of the content of this paper Axis 3 is of particular importance: Quality of life in rural areas and diversification of rural economy, which falls under the priority orientated at creating new jobs in rural areas. The selected Measure 3.1 Diversification into non-agricultural activities initially gives reasons for supporting the strengths such as for example the natural, recreational and tourism potential of rural areas. As to the weaknesses it is the decreasing employment in the agrarian sector and the departure of young people from rural areas to bigger towns due to higher earnings and better job opportunities. The diversification of rural economy thus presents a solution to preserving and improving the conditions and opportunities for the rural population. The creation of new work places and the development of business activities can give the rural population an opportunity to get engaged in not only agricultural production. The objective of Measure 3.1 is the support of new and existing forms of enterprise, which will use these possibilities and provide an alternative to employment in agriculture and thus contribute to a well-balanced rural and regional development. The main areas of diversification are: investments in recreational and accommodation facilities, agricultural building reutilisation in agrotourism, investments in manufacturing and selling facilities for non-agricultural products and investments in complexes serving for the development of recreational and relaxation activities (Ministry of Agriculture and Rural Development, 2007). Ociepa-Kubicka and Pachura (2015) emphasize the important role of EU funding when it comes to supporting tourism as a form of economic activity in rural areas.

When comparing the number of applicants for the non-repayable financial contribution (AfNRFC) from Measure 311 at the beginning of the programming period in the year 2008 and at the end of the year 2013 we come to the conclusion that the number increased by more than twenty times. In the year 2008 within the first call in the Slovak Republic 271 applications were filed, while the most came from the Banská Bystrica (62), Nitra (42) and Košice (38) Regions. In the second round of the call 538 projects were accepted. The most AfNRFC were recorded in the above-mentioned regions, Banská Bystrica (178), Nitra (131) and Košice (110). The Agricultural Paying Agency (APA) subsequently shortlisted the applicants and excluded projects, which had failed to meet the necessary criteria for being granted the support. In the year 2008 in the Slovak Republic only 10 projects were approved (3 projects in the Trnava and 2 in the Nitra Regions and the other regions had 1 project apiece). In the year 2010 it was 54 projects and in the year 2013 the

APA recorded 239 approved projects. 45 and more projects were approved in the Banská Bystrica and Nitra Regions. More than 30 projects in the Prešov, Trnava and Košice Regions, while only 1 project was approved in the Bratislava Region. The average success rate of the AfNRFC within both calls exceeded 30%. The largest amount of completed projects and the highest value of the granted contribution were recorded in the years 2010 and 2013, at the end of the programming period.

In the year 2008 the overall sum of the approved contribution for diversification of agricultural production in the SR amounted to EUR 12 266 071, while the share of EU funding presented 74.4%. When comparing the Slovak regions the highest share of the approved contribution amounting to 36.7% was seen in the Trnava Region. The second highest share (15.7%) was recorded in the Nitra Region. In the year 2008 at the beginning of the programming period no project had been yet completed. In the year 2013 at the end of the programming period the overall sum of the approved contribution in the SR exceeded the amount of EUR 107 924 531 and the EU co-funding share was higher (75.9%). When it comes to implementing the measures supporting diversification into non-agricultural activities there are considerable differences among the regions of Slovakia. The most successful regions according to the indicator – share of the approved contribution – were the Banská Bystrica (20.1%), Nitra (18.9%) and Trnava (18.2%) Regions. It is regions, which are the most used for agricultural production. Especially the Nitra and Banská Bystrica Regions are characterized by the highest share of agricultural land when compared with the other regions of Slovakia (NR - 22%, BB - 16%). Both these regions have the highest share of farms in agriculture (NR - 18%, BB -19%) and also the highest employment rate in agriculture (NR - 18%, BB - 14%).

In the year 2013 within the scope of the monitored measure 101 projects in Slovakia were completed, while the granted financial contribution amounted to EUR 51 544 171 and the share of EU funding presented 74,9%. The average value of the granted contribution per completed project amounted to EUR 510 338. The largest number of projects was completed in the Trnava (23) and Nitra (22) Regions. Into these regions the biggest volume of the granted funding was allocated amounting to approximately 20%. The funding of the EU supporting projects in the regions of Slovakia amounted to approximately 75%. The regions with the lowest total granted contribution, the Košice and Trenčín Regions, were granted more than EUR 600 000 per completed project. It is regions with the lowest number of com-pleted projects. The Trnava Region was granted the highest amount of funding from among the Slovak regions, EUR 11 933 194 and a completed project was awarded EUR 518 839. The Trnava Region together with the Trenčín Region recorded the highest intensity of support for the granted contribution for agricultural land (approx. EUR 4500 per 100 hectares of agricultural land). The higher values of this indicator were seen mainly in the regions situated in Western Slovakia.

The highest project success rate according to the indicator average number of approved projects in the 2007-2013 programming period was seen in the Nitra (27 projects), Banská Bystrica (22 projects) and Trnava (21 projects) Regions. The aforementioned regions also had the highest average number of completed projects (Nitra, Trnava - 10, Banská Bystrica - 6).

Based on the database of the National Rural Development Network (NRDN), which includes organisations and administrative bodies participating in rural development a map by regions of Slovakia was created, which shows the number of entities, which implemented projects under the SR RDP 2007-2013 (Fig. 1).

The majority of entities with completed projects were situated in the southwest, south and southeast of Slovakia, in the districts that are the most used for agricultural purposes. It is particularly the districts of the Nitra Region, e.g. Komárno, Nové Zámky, Nitra, the districts in the Košice Region, e.g. Trebišov and the Košice-okolie district and the districts in the Banská Bystrica Region, Rimavská Sobota and Lučenec. According to internal materials of APA more than 70% of the projects dealing with support of diversification of production dealt with the tourism sector. It was investments into recreational and accommodation facilities, primarily focussing on renovation, modernisation, construction and expanding the capacities of tourism facilities in rural municipalities or reutilisation of agricultural buildings as agrotourism facilities. These were followed by investments into facilities that manufacture and sell non-agricultural production. About

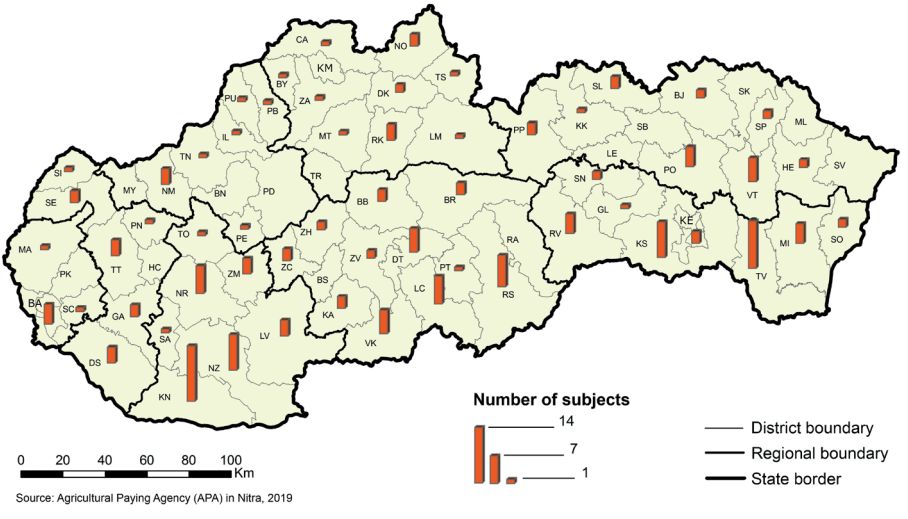

Figure 1
Number of entities implementing projects within the RDP 2007-2013 by districts of Slovakia
Source: *APA Regional Office and the National Rural Development Network Nitra*

10% were projects dealing with the generation of renewable energy, specifically the construction of biogas plants.

As to the prevalent type of the beneficiary of the non-repayable financial contribution from the viewpoint of legal form it was limited liability companies followed by natural persons - self-employed farmers and cooperatives (Fig. 2). Legal persons presented more than 70%.

In Poland Wojewodzka-Wiewiorska (2019) also dealt with the implementation of the Rural Development Programme 2007-2013 within the framework of Axis 3, whose measure aims at diversification into non-agricultural activities. The author observed regional differences in the allocation of funding for diversification in rural economy. The support within the RDV enabled the creation of several work places, especially in the area of services for agriculture and forestry.

The interest of agricultural entities for other gainful activities is increasing in proportion to the size of the land farmed by the entity and its economic strength. The diversification activities on the farms of legal persons, which in terms of size of the farmed land belong to bigger entities, are more extended compared to the farms of registered natural persons (Buchta a Federičová, 2010). In general also in the Czech Republic the enterprises of legal persons are more active in diversification, while the enterprises of natural persons usually tend to be more specialized (Eretová and Jančák, 2017). The size of the entity also affects the type of diversification. Large entities prefer rural tourism and adding value to their products.

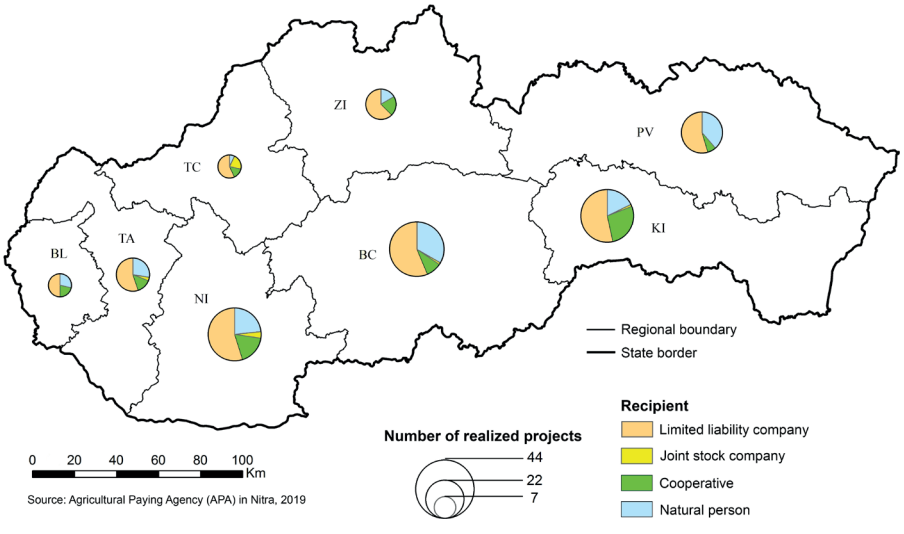

Figure 2
Structure of entities according to legal form with an implemented project within the RDP 2007-2013 by regions of Slovakia
Source: *APA Regional Office and the National Rural Development Network Nitra*

They dispose of a larger land area a part of which can be utilized for recreation or they have dispensable buildings that could be used for accommodating guests (Boncinelli et al. 2018). On the other hand, Hron et al. (2007) stress that it is only successful businessmen, who are typically also successful in implementing the diversification strategy. Those enterprises that have not succeeded in agrarian production cannot succeed in implementing the measure either as diversification per se does not present any universal guarantees of success.

From the point of view of the amount of the provided funding more funding was granted to trading companies, which are to a greater extent able to co-finance projects and thus meet the necessary preconditions for applying for more funding from the APA without facing any existential risk. As to the most frequent form of part-financing the projects the enterprises used a bank credit or a bank credit in combination with own finances. These enterprises in general if they show stability are favoured when applying for a bank credit. This is the reason why they could implement bigger and more demanding projects in contrast to natural persons (Bohátová, 2015).

Rural Development Programme of the Slovak Republic 2014-2020

The Rural Development Programme was approved by the European Commission on 13 February 2015. Its main objectives are competitiveness of agriculture, food industry and forestry, sustainable use of natural resources, measures in the area of climatic changes and finally a well-balanced spatial development of rural economy. The support from the EU encourages the creation of new jobs, competitiveness and supports animal production and specialized crop production. For the project support EUR 1 008 742 740 were allocated.

For the content of this study Measure 6 is important: Supporting farm and business development and Submeasure 6.4: Investments in creation and development of non-agricultural activities. The submeasure is a response to the need to maintain employment and creating new jobs in rural areas, including the support of income diversification in the area of agriculture, aquaculture and forestry. A varied development of business activities in rural areas will create new job opportunities for the unemployed and particularly for the young people, which will translate into economic growth, stabilization, strengthening rural economy and generating new jobs.

The SR RDP 2014-2020 describes the types of activities that will be supported. Diversification of rural economy will be concentrated into areas focussing on exploiting the potential for developing tourism and agrotourism (recreational and relaxation activities), providing services for the target group kids, seniors and persons with reduced mobility, processing and marketing products outside agri-

culture and food industry including complementary production and services of non-agricultural character (Ministry of Agriculture and Rural Development, 2014).

In the first two years of the SR RDP 2014-2020 Measure 3.1 from the previous programming period was finishing. This is why the years 2014 and 2015 saw an increased amount of applicants for the non-repayable financial contribution, a higher number of approved projects and completed projects. This resulted in a higher level of the granted contribution. In the year 2015 for instance 809 applicants were recorded, 209 projects were approved and 209 project were completed with a granted contribution of EUR 91 705 637. The most successful regions from the viewpoint of the number of completed projects and the share of the granted contribution were the Banská Bystrica (40.2%), Nitra (39.2%) and Prešov (34.2%) Regions. In the year 2018 the number of recorded AfRNFC presented 525. More than 100 came from the Banská Bystrica and Žilina Regions. The number of approved projects was 173 and they were supported with a financial contribution of EUR 106 107 845. The share of EU funding thus presented 74.6%. The majority of the approved projects were seen in the Banská Bystrica, Žilina (more than 30) and in the Nitra, Prešov and Trnava (more than 20) Regions. The aforementioned regions saw the highest share of the approved contribution - Banská Bystrica (26.3%) and the other regions over 15%. In the year 2018 in the SR 18 projects were completed. The granted financial contribution for projects amounted to EUR 6 185 754. The sum of EUR 343 636 was allocated to a single completed projects. The Nitra and Trnava Regions completed 4 projects each. The Banská Bystrica, Prešov and Žilina Regions completed 3 projects apiece. Up to a 30% share of the financial contribution was granted to the Banská Bystrica and Nitra Regions. It is regions with the highest granted contribution per completed project (Banská Bystrica - EUR 606 680 and Nitra - EUR 517 401). These regions recorded the highest amount of the granted contribution per 100 hectares of agricultural land (more than EUR 500). The share of EU funding in the project financing moderately fell down (74.6%), while the share of government support went up.

The highest project success rate over the whole monitored programming period between 2014 and 2018 according to the indicator average number of approved projects were seen in the Banská Bystrica (40), Nitra (32), Prešov (30), Žilina (27) and Trnava (25). On average over the whole programming period the most completed projects were in the Nitra (16), Banská Bystrica (15), Trnava and Prešov (13) Regions. In the years 2019 and 2020 we expect the number of approved projects to go up due to the growing number of applicants and the stimulating benefits related to the diversification measures. We expect the number of completed projects to rise. With regards to the low number of implemented projects under the SR RDP 2014-2020 also the database listing the NRDN entities

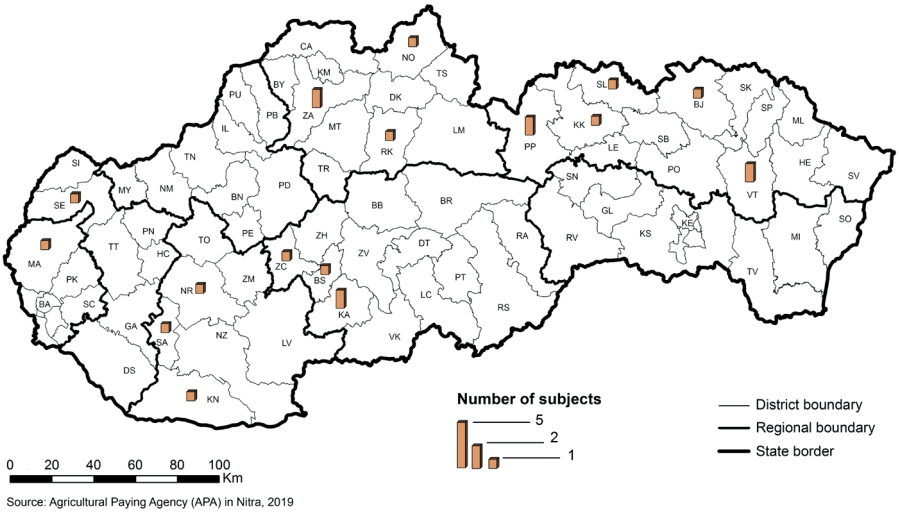

Figure 3
Number of entities implementing projects within the RDP 2014-2020 by districts of Slovakia
Source: *APA Regional Office and the National Rural Development Network Nitra*

is significantly smaller as opposed to the previous programming period. In the database 25 entities were registered and most of them came from the Prešov and Trnava Regions (Fig. 3).

According to the APA the programme primarily supported activities focussing on diversification activities leading to rural tourism and agrotourism and further processing of agricultural products. The most successful was the Dunajská Streda district, where 5 projects have been implemented so far. Project activities connected with processing and sale of agricultural products, contract work and renewable energy sources were directed to agricultural regions of Slovakia orientated at production. The projects of entities farming in the north of Slovakia in areas, which less concentrate on production, mainly dealt with work in forestry, wood processing and a very popular activity was agrotourism. Also according to Eretová and Jančák (2017) diversification is common in enterprises, which are situated in adverse natural conditions and it is particularly activities related to tourism, where the enterprises profit from their location and quality of the environment. On the other hand, processing of agricultural products and contract work is typical of regions, which concentrate more on agricultural production. From the point of view of legal form it is legal persons that more diversify their production. The most successful entities when it comes to submitting projects were the entities with the legal form of a limited liability company (Fig. 4). Legal persons are mainly in

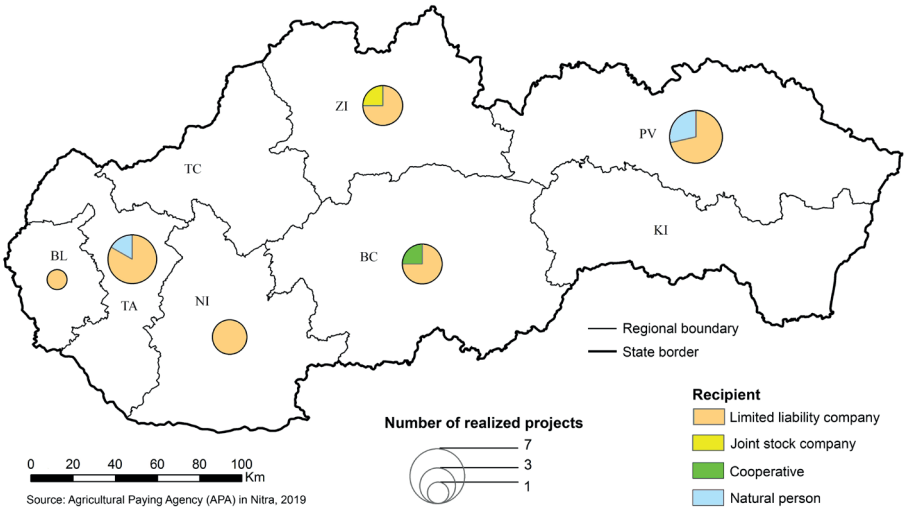

Figure 4
Structure of entities according to legal form with an implemented project within the RDP 2014-2020 by regions of Slovakia
Source: *APA Regional Office and the National Rural Development Network Nitra*

the production-orientated regions of Slovakia characterized by a higher degree of the adopted diversification measures, which correlates with the fact that they are economically more powerful (Buchta, 2018). Diversification, which is effectively exploited by an agricultural entity, will facilitate the allocation of the available financial resources and their utilization for agricultural production. The diversification strategy will help farmers find alternative ways of using their resources more efficiently in order to obtain higher economic return and better opportunities for selling their products.

CONCLUSIONS

At present agriculture plays an important role in the development of rural areas. The agriculture of today compared to the agriculture of the past fulfils apart from the production function a number of other functions, among which we classify the social, environmental and landscape forming functions. About the entities, which in addition to the traditional agricultural activities carry out other activities, we say that they diversify their production. Diversification supports the multifunctionality of agriculture. The Rural Development Policy as the second pillar of the EU Common Agricultural Policy contributes to the development of diversification activities, especially activities of non-agricultural character. Diversification supports employment in rural areas by maintaining the existing and creating new jobs. It further

contributes to increasing or maintaining the profit of an agricultural enterprise. As a result of successful diversification both the entity and the region become more competitive and the quality of life in rural areas improves as well. In the years 2007-2013 diversification in Slovakia was supported by the SR Rural Development Programme 2007-2013, specifically Measure 3. 1. Diversification into non-agricultural activities. This measure aided the development of activities related to recreation and agrotourism, renewable power resources and manufacturing and selling facilities for non-agricultural products. The most widespread beneficiaries of the non-repayable financial contribution in terms of legal form were limited liability companies. The highest project success rate according to the indicator average number of approved projects was seen in those districts of Slovakia, which are the most used for agricultural production - Nitra (27), Banská Bystrica (22) and Trnava (21). The aforementioned regions are characterized by the highest average value as to the number of completed projects (Nitra, Trnava - 10, Banská Bystrica - 6). Into these regions the highest financial contributions supporting diversification were allocated.

In the first two years of the Rural Development Programme of the Slovak Republic 2014-2020 Measure 3. 1. under the previous period was still going on, that's why this period saw a higher number of approved and completed projects. Support in form of investments in creating and developing non-agricultural activities was implemented under Submeasure 6. 4. , which primarily supported activities orientated at agrotourism and further processing of agricultural products. In terms of submitting projects the most successful entities were entities with the legal form ltd. The highest projects success rate over the entire monitored programming period from 2014 to 2020 according to the indicator average number of approved projects was seen in the Banská Bystrica (40), Nitra (32), Prešov (30), Žilina (27) and Trnava (25) Regions. According to the average number of completed projects the sequence of the regions is as follows: Nitra (16), Banská Bystrica (15), Trnava and Prešov (13). We expect that in the last years of the programming period 2019 - 2020 the agricultural entities will be more interested in projects dealing with diversification into non-agricultural activities.

If we search to improve the quality of life of the population in Slovak municipalities and reduce the unemployment rate it is vital to reinforce the tools, which promote entrepreneurial activities in municipalities, create jobs and suitable conditions for diversification into non-agricultural activities. This is why it is inevitable in specific entities in the individual regions of Slovakia to carry out empirical research focussing on the outcome of implementation of support measures targeting diversification under the rural development programmes.

REFERENCES

ARRU, B., FURESI, R., MADAU, F.A., PULINA, P. (2019). Recreational Services Provision and Farm Diversification: A Technical Efficiency Analysis on Italian Agritourism. *Agriculture-Basel*, 9, 2, 42.

BOHÁTOVÁ, Z. (2015). *Vplyv programu rozvoja vidieka na rozvoj multifunkčného poľnohospodárstva v Slovenskej republike.* Nitra: Slovenská poľnohospodárska univerzita.

BOLTIŽIAR, M., OLAH, B., GALLAY, I., GALLAYOVÁ, Z. (2016). Transformation of the Slovak cultural landscape and its recent trends. In *Landscape and landscape ecology : proceedings of the 17th International Symposium on Landscape Ecology. Proceedings*. Bratislava: Institute of Landscape Ecology SAS, pp. 57-67.

BONCINELLI, F., BARTOLINI, F., CASINI, L. (2018). Structural factors of labour allocation for farm diversification activities. *Land Use Policy*, 71, 204-212.

BUCHTA, S. (2018). *Veľký potenciál poľnohospodárstva.* Retrieved from: < https://www.noveslovo.sk/c/Velky_potencial_polnohospodarstva>. Accessed on 20 June 2019.

BUCHTA, S., FEDERIČOVÁ, Z. (2010). Diversification into non-agricultural activities under the conditions of Slovakia. *Agric. Econ. – Czech*. 56, 6, 284-291.

CZIMBALMOS, R., KOVÁCS, G., FEHÉR, A. (2013). Multifunctionality and farm concentration in Hungary. *Research Journal of Agricultural Science*, 45, 2, 52-60.

ERETOVÁ, V., JANČÁK, V. (2017). The past, present and future of diversification of agricultural holdings in Czechia. *AUC GEOGRAPHICA,* 52, 1, 27-37.

EUROPEAN COMMISSION. 2018. *Rural areas and the primary sector in the EU*. Retrieved from: https://ec.europa.eu/agriculture/sites/agriculture/files/statistics/facts-figures/eu-rural-areas-primary-sector.pdf. Accessed on 20 June 2019.

EUROPEAN PARLAMENT. 2016. Farm diversification in the EU. Retrieved from: pdf: < http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/581978/EPRS_BRI(2016) 581978_EN.pdf>. Accessed on 20 June 2019.

FELICIANO, D. (2019). A review on the contribution of crop diversification to Sustainable Development Goal 1 "No poverty" in different world regions. *Sustainable Development*, 27, 4, 795-808.

HRON, J., ŠTŮSEK, J., ARNOŠT, M., HUML, J., PLATILOVÁ-VORLIČKOVÁ, L. (2007). Diversification - Strategy of building the competitive advatage in agribusiness. *Agric. Econ. – Czech*, 53, 12, 580-584.

HRON, J., ŠTŮSEK, J., ARNOŠT, M., HUML, J. (2008). Diversification strategy in small and medium size agribusinesses in the Czech Republic – i mpulses for searching business opportunities. *Agric. Econ. – Czech*, 54, 11, 505-509. HUML, J.,

VOKAČOVA, L., KALA, Š. (2011). Implementation of diversifi cation strategy on farms in the Czech Republic. *Acta univ. agric. et silvic. Mendel. Brun*, LIX, 2, 109-114.

JADUĎOVÁ, P. (2019). *Diverzifikácia v poľnohospodárstve Slovenska*. Nitra: Univerzita Konštantína Filozofa.

KOŁODZIEJCZAK, A., KOSSOWSKI, T. (2011). Diversification of farming systems in Poland in the years 2006–2009. *Quaestiones Geographicae*, 30, 2, 49-56.

LANCASTER, N.A., TORRES, A.P. (2019). Investigating the Drivers of Farm Diversification Among US Fruit and Vegetable Operations. *Sustainability*, 11, 12, 3380.

MAYE, D., ILBERY, B., WATTS, D. (2009). Farm diversification, tenancy and CAP reform: Results from a survey of tenant farmers in England. *Journal of Rural Studies*, *25*, 3, 333-342.

MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT OF THE SLOVAK REPUBLIC, 2007. Program rozvoja vidieka SR 2007 - 2013. Retrieved from: < http://www.mpsr.sk/index.php?navID=47 & sID=43 & navID2=296>. Accessed on 1 June 2019.

MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT OF THE SLOVAK REPUBLIC, 2014. Program rozvoja vidieka SR 2014 - 2020. Retrieved from: < http://www.mpsr.sk/index.php?navID =47 & sID=43 & navID2=935>. Accessed on 1 June 2019.

OCIEPA-KUBICKA, A., PACHURA, P. (2015). Tourism as an Economic Activity form in Commune Olsztyn, Poland. *Folia geographica*, 57, 2, 5-15.

ROESCH-MCNALLY, G.E., ARBUCKLE, J.G., TYNDALL, J.C. (2018). Barriers to implementing climate resilient agricultural strategies: The case of crop diversification in the US Corn Belt. *GLOBAL ENVIRONMENTAL CHANGE-HUMAN AND POLICY DIMENSIONS*, 48, 206-215.

SCHÖPE, M. (2011). *Diversifizierung in der Landwirtschaft*. Retrieved from: < http://www.ifo.de/portal/pls/docs/1/1209164.pdf >. Accessed on 20 Januare 2019. roč. 25, s. 333 – 342.

ŠPIČKA J., PICKOVÁ A. (2007). Analysis of the diversification in the Czech agricultural enterprises within the EU-27 comparation. Praha: VÚZE.

TÓTHOVA, V., FIĽA, M. (2014). Hodnotenie diverzifikácie poľnohospodárskych subjektov v kontexte rozsahu obhospodarovanej pôdy. *Ekonomika poľnohospodárstva*, XIV, 3, 69-81.

VĚŽNÍK, A., KRÁL, M., SVOBODOVÁ, H. (2013). Agriculture of the Czech Republic in the 21st Century: From Productivism to Post-productivism. *Quaestiones Geographicae*, 32, 4, 7-14.

VILLA, G., ADENSO-DIAZ, B., LOZANO, S. (2019). An analysis of geographic and product diversification in crop planning strategy. *Agricultural Systems*, 174, 117-124.

WARD, N., JACKSON, P., RUSSELL, P., WILKINSON, K. (2008). Productivism, Post-Productivism and European Agricultural Reform: The Case of Sugar. *Sociologia Ruralis*, 48, 2, 118-132.

WOJEWODZKA-WIEWIORSKA, A. (2019). RDP 2007-2013 as an Instrument for Diversification the Rural Economy in Poland. In *17th International Scientific Conference on Hradec Economic Days,* Hradec Králove: Univerzita Hradec Králove, pp. 553-562.

ZVERKOVÁ, A., ZVERKOVÁ, M. (2013). Realizácia agroenvironmentálnych opatrení na poľnohospodárskej pôde v rámci regiónov SR. *Folia Geographica*, 21, 139-164.

FOLIA GEOGRAPHICA • ISSN 1336-6157 (hard copy) • ISSN 2454-1001 (online)

FIRST AND SECOND ORDER DISCONTINUITIES IN WORLD GEOGRAPHICAL THOUGHT AND THEIR PRIMARY RECEPTION IN SLOVAK GEOGRAPHY

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Received: January 26, 2020 | Revised: April 7, 2020 | Accepted: April 16, 2020
Paper No. 20-62/1-556

Abstract
In the introductory part of the paper, we outline the conceptual framework of research with an emphasis on the concept of discontinuity in scientific thought and its reception in geography. Subsequently, we define our understanding of discontinuity and define first-order discontinuities and second-order discontinuities in the world geographical thought. In the next part of the paper we will focus on the primary reception of these discontinuities in Slovakia. These are the first responses and applications of new paradigmatic approaches imported from the world geography into the geographical thought of Slovak geographers. This research effort is situated in the broader context of the research of convergent and divergent features of "domestic" discontinuities in confrontation with the discontinuities identified in the development of geographical thought in the world. The aim is to point out which discontinuities identified in world geographical thought have been reflected in Slovakia and which have not yet been reflected. Paper is focused on the primary reception of world geographical thought in the geographical literature of Slovak provenance.

Key words
Discontinuity, geographic thought, Kuhn´s model, paradigm, Slovak geography, scientific revolution.

The research of geographic thinking belongs to the main tasks of metageography. Lately, we have registered an increased interest of geographers in this issue (Wilczyński 2009). It is confirmed by the activities of the IGU Commission „*On The History Of Geography*" and other geographic scientific societies that organize special events in respect of this topic. The Slovak geographic community also deals with it with increased intensity (napr. Matlovič 2006, Paulov 2012, Matlovič, Matlovičová 2012, 2015, Korec, Rusnák 2018, Oťaheľ et al. 2019). The topic that has not been sufficiently discussed in the literature of Slovak provenience is the problem of reception of discontinuities in world geographic thought in Slovak geography.

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The introductory part of this paper outlines the conceptual framework of the research focused on the concept of discontinuity in scientific thought and its reception in geography. After that, our understanding of discontinuity will be outlined together with the outline of 1st order discontinuity and 2nd order discontinuity in world geographic thinking. The third part of the paper deals with the primary reception of these discontinuities in Slovakia. We aim to zoom in the first reactions and applications of new paradigmatic approaches imported from the world geographic environment into the environment of Slovak geographers. These exploration efforts are situated into a wider context of the research of convergent and divergent features of "domestic" discontinuities confronted with discontinuities identified within the development of geographic thought in the world. Our objective is to point out which discontinuities identified in world geographic thought were also reflected in Slovakia and which have not been reflected yet.

THE CONCEPT OF DISCONTINUITY IN THE DEVELOPMENT OF SCIENTIFIC THOUGHT

The idea of discontinuity in scientific thought broke through in connection with the refusal of positivistic historiography of science and its linear-cumulative model of history of science. Well known are Koyré's observations about the crucial difference between speculating about the nature and the possibilities of human knowledge in medieval and modern age science (Špelda 2009, s. 78). However, Cohen pointed out to the older roots of the application of the idea of discontinuity within researching of scientific thought in the form of scientific revolution concept in his survey study Cohen (1976).

Koyré (1939) was followed by T. S. Kuhn (1962/1970) Kuhn who conceptualized discontinuity as a scientific revolution in the form of paradigmatic shift. He understood it as a crucial qualitative transformation of ontological, methodological and axiological level of scientific discipline. Kuhn presented several interpretations of the key concept of a paradigm. Simply said, he understood it to be generally acknowledged scientific results shared by scientific community that in the given time of normal science present a model of problems and a model of their solution (Kuhn 1997, s. 10) for the relevant community of scientists. According to Kuhn, the development of a scientific discipline that reached a certain level of maturity, that is a paradigmatic stage, happens according to a 3-phases cyclic model: a period of normal science (dominance of a certain paradigm) – a period of scientific crisis – a period of scientific revolution – a period of new normal science (dominance of a new paradigm). The concept of scientific revolution is crucial from the point of the needs of our reasoning. It is the outcome of the crisis of the scientific discipline which occurs upon the increase of empiric anomalies to a critical level that is impossible to be solved by the existing paradigm and the modification of its

theories. Scientists are open to new ideas and create alternative theories. The scientific crisis terminates by choosing one of the alternatives whereby the old paradigm is supplemented by a new one and the new period of normal science (Kuhn 1997) begins. Kuhn interpreted the scientific revolution from the position of the sociology of science. Scientific revolutions appear to be revolutionary only to those, who the paradigms relate to. He did not explain the change of a paradigm only by determination of logical and empirical criteria and the reconstruction of objective standards of scientific activities, but also by the sociological and psychological analysis of conditions in scientific community. The driving force of choosing a new paradigm is not only rational criteria, but crucial is also the overall social context and namely a shared conviction of the scientific community of the adequateness of a new paradigm (Kuhn 1997, s. 187, Woleński 2014, s. 105). Another aspect of Kuhn's model is incommensurability of paradigms that is given by the fact that the empiric facts and the contents of the terms of competitive paradigms fail to mutually correspond. Kuhn considered his own model to be the suitable one for disciplines on the higher level of maturity, especially sciences. The disciplines that failed to reach the paradigm stage, namely the social sciences and humanities, are typical for competitiveness between various scientific schools in the privileged position in the field and so they miss the general agreement of the scientific community on one paradigm (Kuhn 1997, s. 177). Later, Kuhn reconsidered the designation of these sciences as pre-paradigmatic and admitted that they are multiparadigmatic sciences (Kuhn 1970b, s. 272). This way, Kuhn significantly relativized his initial conception.

Apart from Kuhn, the idea of discontinuity in scientific thought was worked up by other authors. Interesting contribution is I.G. Cohen's (1987) work, especially from methodological point of view. He preferred historical analysis to logical analysis when identifying scientific revolutions. He presented four tests that are universally applicable to identify scientific revolutions in the last four centuries. According to him, it is possible to rely on the statements of the scientists and other evidence of that time as well on the reflections of scientific revolutions in scientific literature published after the revolution in question, opinions and findings of professional historians and philosophers of the science and the general consensus of the scientists working in the relevant sphere of knowledge (Cohen 1987, s. 41-42). Thus, Cohen's approach implicitly presumes the existence of an objective and subjective dimension of research of discontinuities in scientific thinking.

Kuhn's work raised an intensive critical discussion in the community of philosophers. Lakatos (1970) presented an alternative concept of scientific research programmes in relation to a paradigm. He separated a hard core of theories resistant to refutation from a protective belt of adaptable theories. Discontinuity in a revolutionary type occurs when changing the hard core of a programme,

which is a rare event in the development of science. L. Laudan (1984) disputed a totally discontinuous character of a paradigmatic change in the form of a 3-level of science hierarchic model – an ontological, a methodological and an axiological one. Kuhn's model presumes that a revolutionary change on the ontological level is necessarily connected with the changes on the methodological and axiological levels. Laudan presented an alternative network model that presumes a mutual dependence between the levels, but refuses their hierarchy. Thus, this model interprets a paradigmatic shift as a progressive one and not necessarily requiring any changes on all the levels at the same time (Laudan 1984). Other author M. Foucault, instead of a paradigm, worked with the concept of epistemé in the meaning of the demarcation of the space and the organization of the way of cognition, thinking and speaking about things and events. His main argument became the interconnection between knowledge, truth and power. So, the truth is a relative concept, dependent on power relations in society that produces them. According to Foucault, the transition between epistémé does not lie in necessary continuity based on causal principles or a different type of mutual dependence, but it is the result of a historical coincidence or a power triumph of a certain type of thinking (Foucault 2000 in Ježková 2013, s. 114).

The analogy of reasoning about discontinuities can be also found in other spheres. As an example can be mentioned the Schumpeter's concept of creative destruction in economy or a sphere of innovations in industrial products that are characterised by the Abernathy-Utterback's model of discontinuous innovation. The analogy of paradigmatic shift can be seen in its transition phase in which the transition of dominant designs (Utterback 1994) occur. When retrospectively assessing the Kuhn's model, Cohen M. Cohen (2015, s. 181) marked the term *paradigmatic shift* as a certain type of intellectual virus that was spread out from sciences to social sciences and humanities and in the end to a daily political discourse.

THE RECEPTION OF THE DISCONTINUITY CONCEPT BY GEOGRAPHERS

In geographical literature the idea of discontinuity in scientific thought appeared in connection with the reflection of formation of quantitative and theoretical geography in 1950' and 1960'. In this connection, the work by Burton (1963) becomes relevant because it was published almost at the same time as the Kuhn's book. Burton did not reflect Kuhn then, but he used the term *quantitative revolution* to describe the mentioned changes in geographic thought. Burton's concept of discontinuity is an intellectual revolution whose revolutionary ideas become a part of conventional knowledge (Burton 1963, s. 153) after it ends.

Kuhn's model caused an intensive reaction in geographical community. Its inventory and classification was made by Mair (1986). He identified two basic applications of Kuhn's model in geography. The first application had a normative

character and was based on using the model as a recipe to increase the scientific status and reputation of geography. So, it was about searching and suggesting new paradigms for geography. P. Haggett a R. Chorley (1967) promoted a paradigm of geography based on modelling (model-based paradigm), R. Chorley a B.A. Kennedy (1971) a paradigm based on a system analysis, B. Berry (1973) a paradigm of localisation and environmental decision-making in complex systems. D. Harvey (1972) assumed an individual position in these efforts. He criticized the idealistic nature of Kuhn's model and conceptualized a revolutionary theory and contra revolutionary theory. While the first one presents an interesting progress of thought with a potential to generate a social change, the purpose of the second one is to prevent it. This overview of prescriptive applications of Kuhn's model may be concluded by the work of Hard (1973, s. 24) according to whom geographers should accept the new paradigm with enthusiasm.

The second group of works according to Mair (1986) is created by studies that endeavoured to apply the Kuhn's model as an analytical tool in the research of the history of geographic thought (for instance Johnston 1978, 1979, Graves 1981, Harvey a Holly 1981, Holt Jensen 1982, Paulov 2012). In this group, there already appear critical views that dispute the suitability of Kuhn's model for geography (Chisholm 1975, Johnston 1979, Graves 1981). According to them, the problem lay in the requirement for monoparadigmatic nature of the normal science period and for a revolutionary character of changes of paradigms with the attendance of a notable part of geographers.

According to Mair (1986) the geographers failed to fully appreciate the potential of Kuhn's model and made many inaccuracies and misinterpretations. According to him, they were frequently only superficial comparisons of Kuhn's model with the development of geographic thought. The geographers were unable to agree on the designated paradigms of geography despite Kuhn's opinion that if paradigms existed, then they should be easily identifiable (Mair 1986, s. 359). One of the causes could be that many authors worked with secondary resources (Mair 1986, s. 346) only and did not pay sufficient attention to a critical discussion about the Kuhn's model in the philosophy of science (Stoddart 1977/1981 in Wheeler 1982, s. 1). Based on its reflection, Kuhn was later more specific about his model and the concept of a paradigm. Agnew a Duncan (1981, s. 42) pronounced in general that geographers tend to underestimate the philosophical compatibility of ideas that they often uncritically borrow from other scientific disciplines. However, Johnston and Sidaway (2004, s. 11) warn about the problem of unobvious determination of the paradigm concept by Kuhn himself, and refer to M. Masterman (1970, s. 61) who identified three levels of the definition of a paradigm from more than 20 different ways of handling with the term, as follows: a metaparadigm, a sociological paradigm and a construction paradigm. Kuhn later partially accepted the classifica-

tion, and concentrated on being more specific about the second and the third level of definition of a paradigm. In their analysis of geographic thought development, Johnston and Sidaway (2004) work with all three hierarchic levels of a paradigm definition, more concretely the paradigm as the world view, the paradigm as disciplinary matrix and the paradigm as an exemplar. These definitions may be viewed as the hierarchic concept of scientific communities sharing similar values, namely from the level of all the scientists to small scientific communities sharing a paradigm as an exemplar.

An important contribution to the discussion is the work by D. Livingston (1992) who refused the concept of a paradigm because it is too simplifying. Instead, he offers a summary of main "conversations" or discourses that appeared in the course of the development of geographic tradition. He sees the term *geographic tradition* as one of a rather subjective, flexible and context-dependent character. On one hand, geographic thought is influenced by the status of studied reality and, on the other hand, by employed philosophical basis. According to him, the social context also contributes to the formation of geographic thought and emphasises the situation of geography in contemporary social and spatial contexts (Spedding 2008, s. 157).

From the methodological point, the contribution of Keighren et al. (2012a) are inspirational. When looking into the changes of geographic thought, they think the important role is to research geographical texts from which we learn about geographers' notions about the past, the present and the future of the scientific discipline they cultivate. They separated the classical texts from canonical ones (Keighren et al. 2012a, s. 299). The classical texts are the ones that played an important role when forming geographic thought and remained intellectually and pedagogically relevant, they depict the state of the discipline precisely in the context of that time and at the same time contain a prediction of its future development, so they carry a message that goes beyond modern intellectual trends. Canonical works are the ones that played a crucial role in forming geographic thinking in the past, however, now they do not continue. They have lost their dialogic function and potential. Classical texts carry their aura of immortality, but the canonical ones are considered to be a memento of the past times we do not necessarily wish to return (Keighren et. al. 2012a, s. 299). Agnew (2012) formed his sceptical opinion in relation to canons. He does not see the contribution of their conceptualization as important in relation to understanding of current development of geographic thought. According to him, a canon does not exist in geography and cannot exist despite it would be necessary. "Fanons" are typical for geography. They characterize the tendency of digressing from one intellectual modern tradition to another without thinking about what was there before. This tendency is also partially stimulated by current academic policy that is obsessed with preferring innovations, so

it does not take "the old one" into account (Agnew 2012 s. 322-323). As a reaction to this Agnew's comment, Keighren et al. (2012b) admits that there was no canon in geography at all and what more, not even in the first phase of initial academic institutionalization despite the fact that some texts also reached the status. The main reason is the fact that geography was too robust and diversified to be exhaustively defined by one text product (Keigren 2012b, s. 342). This opinion is supported by argumentation in favour of multiparadigmatic form of geography.

In general, it is possible to state that geographers in their reflections notably focused on the concept of a paradigm and the period of a normal science. To the lower extent they had a nuance discussion about the concept of scientific revolution. Mostly, they limited themselves to its relativization with reference to the evolutionary character of some movements in geographic thought – e.g. Johnston (1979) in connection with the behavioural paradigm – or coming out of Popper's critical rationalism; they urged the interpretation of geography as a science in the mode of permanent revolution (Bird 1975). Only rarely we can see the efforts to explicitly determine scientific revolutions or the paradigmatic progress in geographic literature (napr. Malik 2014). Johnston and Sidaway (2004, s. 405) characterize geography as a science in a multiparadigmatic situation on the highest metaparadigmatic level of the world view and there is a competition between the paradigms as disciplinary matrixes in two paradigms of the world view and many microparadigms as the examplars. This situation is caused by many human geographers who do not have an unequivocal affiliation to one disciplinary matrix, not even to one microparadigm because there are various ways to practice geography as a scientific discipline. Some geographers have gone through a paradigmatic shift on the metaparadigmatic level (Johnston, Sidaway 2004, s. 406) in their scientific career.

DISCONTINUITIES IN WORLD GEOGRAPHIC THOUGHT

When determining discontinuities in world geographic thought we follow the hierarchic conception of paradigms as interpreted by Johnston and Sidaway (2004, s. 11) based on the Masterman's (1970) classification. Similar thinking can be found in Peet (1998), who demarcated five levels of abstraction when classifying the streams of geographic thought. Discontinuity is understood as a new stream discovered in geographic thought that has specific and by a part of scientific community shared features relating mainly metaphilosophical and philosophical rooting, the philosophical basis, theoretical and methodological approaches, research methods and techniques, the thematic orientation of interests and problem-solving and the key text products. In our reasoning, we are to focus on two levels of discontinuities. In general features, first order discontinuities correspond to the highest hierarchical level of paradigm as the world view within the interpretation framework of John-

ston's and Sidaway's (2004) approach and the intersection of metaphilosophical and philosophical level of abstraction by R. Peet (1998). In general features, second order discontinuities correspond to the second hierarchical level of paradigm as a disciplinary matrix within the interpretation framework of Johnston's and Sidaway's (2004) approach and the intersection of philosophical and social-theoretical level of abstraction by R. Peet (1998).

Based on our classification of the stages and streams in geographic thought (Matlovič, Matlovičová 2015, s. 33-34) it is possible to think about 4 first order discontinuities and 16 second order discontinuities (tab 1). We do not pay attention to third order discontinuities in this study.

The first order discontinuity of the Enlightenment period represents the transition from pre-modern exploration geography to modern exploration geography. The Enlightenment period as an intellectual movement developed fully in the 18th century. However, it followed the impulses from the previous centuries. Rationalism, empiricism, critical and free thinking and definitive detachment of science from theology got to the front. The birth of modern geography dates back to this period. According to Stoddart (1986, s. 33) the decisive moment of its constitution was Cook's first exploration voyage in 1769 to the Pacific that had explicit scientific aims using three scientific methods – observing, classification and comparison (Stoddart 1986, s. 29). The important contributions to establish modern exploration geography were works by I. Kant, mainly his conception of time and space and the epistemological conception. The highlight of the period of forming modern geography was the first half of the 19th century and the work by German geographers Alexander von Humboldt and Carl Ritter. Thanks to them, geography was established and institutionalized as an individual academic discipline. Their conception was holistic; they saw unity in diversity in the world (Matlovič, Matlovičová 2015, s. 56).

The positivistic first order discontinuity is represented by the transition from modern exploration geography to modern positivistic geography. Due to it, the exploration tradition in geography ended because its heuristic potential was extinguished in the first half of the 19th century thanks to mapping the last blank places in the world map. Positivism became the determining philosophical basis and geography was forced to find its theoretical framework that would provide it with scientific status in this new situation. It found it in evolutionism that integrated the natural and the social world into one explanatory platform (Livingstone 1992 s. 210). These efforts showed themselves most significantly in geomorphology (W.M. Davis), geopolitics and in the conception of environmental determinism (F. Ratzel) that were stroke by this evolutionistic and deterministic discontinuity. Harvey and Holly (1981) considered „*Antropogeographie*" by F. Ratzel, which was published in 1882-1891, to be the key text in respect of this discontinuity. An alternative

Table 1 First and second order discontinuities in world geographical thought

Discontinuity	Time definition in the world	Time definition of response in Slovak geography
I. Enlightenment discontinuity	18th century and 1st half of 19th century	-
II. Positivist discontinuity	last quarter of the 19th century	-
Evolutionary and deterministic discontinuity	last quarter of the 19th century	-
Anarchist discontinuity	turn of the 19th and 20th century	-
Regionalist discontinuity - French possibilism - Berkeley School of Cultural Geography - Landschaft school - Chorology	early 20th century	1930s
Quantitative discontinuity	1950s	2nd half of 1960s
Behavioral discontinuity	turn of the 1950s and 1960s	1980s
III. Postpositivist discontinuity	late 1960s	2nd half of 1960s
Systemic and complex discontinuity - systems theory - synergetics and complexity theory	1950s, (1990s)	2nd half of 1960s
Humanistic discontinuity	first half of 1970s	1980s
Structuralist discontinuity	turn of the 1960s and 1970s	2010s
Structuration discontinuity	first half of 1980s	-
Critical-realistic discontinuity	first half of 1980s	beginning of the 21st century
New regionalist discontinuity	first half of 1980s	beginning of the 21st century
Feminist discontinuity	first half of 1980s	2006
New cultural discontinuity	first half of 1980s	-
IV. Postmodern discontinuity	1980s	1997
Poststructuralist relational discontinuity	1990s	2010s
Postcolonial discontinuity	1990s	-
Posthumanist discontinuity	beginning of the 21st century	-

Source: *own processing*

approach was brought by anarchistic discontinuity, mainly thanks to P. Kropotkin and E. Reclus. The key text is Kropotkin's „*Mutual Aid: A Factor of Evolution*", which was published in 1902. Regionalism (Hubbard et al. 2002, s. 25) became the main stream of geographic thought in the first half of the 20th century. Regionalistic discontinuity is connected with the French school that brought a possibilistic alternative for Ratzel's environmental determinism. Harvey and Holly (1981) consider „*Tableau de la Géographie de la France*" by P. Vidal de la Blache, published in 1903 to be the key text for this discontinuity. Regional discontinuity caused the formation of other modifications of this style of holistic thinking while two of them considered landscape to be the central concept. It was the Berkeley school of cultural geography with the key work by C. Sauer „*The Morphology of Landscape*" published in 1925 and the Landschaft/Landscape school developed by German and Russian/Soviet geographers. The key works are those by Passarge's 3-volume „*Die Grundlagen der Landschaftskunde*", which were published in 1919 and 1920. A very influential flow became the chorological conception of geography by A. Hettner and R. Hartshorne. Harvey and Holly (1981) consider Hartshorne's „*The Nature of Geography*" published in 1939, to be the key text of this conception.

The crisis of the chorological conception of geography brought significant 2nd order discontinuity which was quantitative discontinuity (revolution) in the 1950'. Harvey and Holly (1981) consider the key text to be the Schaefer's paper „*Exceptionalism in Geography*" published in 1953. This discontinuity caused the establishment of a paradigm of geography as a spatial science that maintained its strong influence by the end of 1960'. In the second half of 1960' geographic thought was enriched by another stream of thought thanks to behavioural discontinuity, despite Johnston (1979) saw in it not only the evolutionary progress of the paradigm of geography as a spatial science. The key text of behavioural discontinuity is Wolpert's paper „*The Decision Process in Spatial Context*" from 1964.

Post-positivistic 1st order discontinuity is represented by the transition from modern positivistic geography to modern post-positivistic geography. This discontinuity was the result of dissatisfaction with the paradigm of geography as a spatial science and with logical positivism as its philosophical basis. This critic caused the formation of two dominant streams of geographic thought. From the first stream, that pointed out to the inability of the spatial science to contribute to the solution of socially relevant problems (social injustice), was created critical geography that found its philosophical basis in structuralism and Marxism. It was a product of structuralistic discontinuity whose key representative was D. Harvey with his works „*Social Justice and the City*" from 1973 and „*The Limits to Capital*" from 1982. The second stream that pointed out to a very narrow look of spatial science at a human and the ignorance of human subjectivity formed humanistic geography whose philosophical base was in phenomenology, hermeneutics and existentialism (Daněk 2013). Humanistic discontinuity is represented by the key works by

A. Buttimer *„Values in Geography"* published in 1974 and Yi Fu Tuan's *„Topophilia: a Study of Environmental Perception Attitudes and Values"* published in 1974. The third stream of thought formed in this time was the paradigm of the theory of systems and the theory of complexity whose philosophical rooting lay in critical rationalism (Matlovič, Matlovičová 2015). System and complex discontinuity was initiated by the paper by A. Strahler *„Dynamic Basis of Geomorphology"* published in 1952, while the canonical text became "*Physical Geography. A System Theory Approach*" by R. Chorley and B. Kennedy, which was published in 1971. In human geography the system approach was extended mainly thanks to the key text by P. Haggett *„Locational Analysis in Human Geography"* from 1965. Later, thinking was enriched by the concepts of the theory of complexity and synergetics that resulted in the study of non-linear dynamics of complex systems. One of exemplary key works representing this stream of thought is Allen's monography *„Cities and Regions as a Self-Organizing Systems"*, which was published in 1997.

Another feature of post-positivistic discontinuity was the transition from the substantial to constructivist way of thinking (Osman 2014, s. 37). An ongoing debate of humanistic and structuralistic geographers about the importance of structure and agency when forming social life (structure-agency debate; Cresswell 2013, s. 197) resulted in the attempts to create conceptions spanning this dichotomy. An example can be structuration discontinuity that drew inspiration from the Giddens theory of structuration. Its establishment was supported by D. Gregory, A. Pred and B. Werlen. Another example is scientific-realistic discontinuity represented by the key work by A. Sayer *„Method in Social Science: a Realist Approach"*, published in 1984. New regionalistic discontinuity brought reconstructed (new) regional geography. An exemplary key text is the one by Paasi *„The Institutionalisation of Regions: a Theoretical Framework for Understanding the Emergence of Regions and the Constitution of Regional Identity"*, published in 1986. Feminist discontinuity brought an accent to the diversity of people and unequal relations between them. This discontinuity is represented by the key collective work titled *„Geography and Gender: An Introduction to Feminist Geography"*, which was published in 1984. A new cultural discontinuity brought new cultural geography as a stream of thought that is characterised in the key works by D. Cosgrove *„Social Formation and Symbolic Landscape"* from 1984 and P. Jackson *„Maps of Meaning"*, which was published in 1989.

Postmodern 1st order discontinuity is represented by the shift from modern post-positivistic geography to post-modern post-structuralist geography. It was mainly about the refusal of epistemological program of the Enlightenment period and its fundamental presumptions. It is characterized by resistance and scepticism against metanarrative stories, covered essences and distrust in relation to the possibility to find the universal truth and representation of the world. The

world is understood as a continuously changing social construct that is created by a common language. Through language we create our own world and so there are as many different worlds as there are world-creating languages. Post-modern world is only an arena of "fight of interpretations", an arena of language games (Matlovič, Matlovičová 2015). Post-structuralist reversal resulted in three 2nd order discontinuities. Post-structuralist relational discontinuity caused the formation of relational geography as a stream of thought that emphasize the topic of relations. The interest of geography does not focus on individual places and spaces as such, but on the ways that interconnect the relations. The key works of this discontinuity is Doel's „*Poststructuralist Geographies: The Diabolical Art of Spatial Science*" published in 1999, Murdoch's „*Post-structuralist Geography: A Guide to Relational Space*" published in 2006, Massey's „*For Space*" published in 2005, Soja's „*Third-space: Journeys to Los Angeles and Other Real-and-Imagined Places*" published in 1996 and Thrift's „*Non-Representational Theory*" published in 2007. Another one was post-colonial discontinuity that was conditioned by post-structuralist critic of Marxism and humanism and brought an accent to the agenda of difference. It comes out of post-colonial theory of E. Said. This reversal in geographic thought is represented by the key papers such as Gregory's „*The Colonial Present: Afghanistan. Palestine. Iraq*" published in 2004. Post-humanistic discontinuity draws inspiration from post-humanism and transhumanism that have a close relation to philosophies accentuating the embodied, material and vital nature of human life. Post-humanistic geography shows an increased interest in hybrid formations. It shows the ways of how the human and non-human or the perceiving and non-perceiving aspects of the world can be interconnected with the bridging of dualism between physical and human geography. The key text of this discontinuity is Whatmore's monography „*Hybrid Geographies: Natures, Cultures, Spaces*" published in 2002.

THE PRIMARY RECEPTION OF DISCONTINUITIES IN WORLD GEOGRAPHIC THOUGHT IN SLOVAK GEOGRAPHY

When analysing the primary reception of discontinuities in world geographic thought in Slovak geography it is important to take its late establishment caused by political and social-cultural factors (Matlovič 2018, Matlovič, Matlovičová 2018) into account. For this reason it makes no sense to look for the reception of 1st order discontinuity in the Enlightenment period and 1st order positivist discontinuity and evolutionary and determinist discontinuity and 2nd order anarchist discontinuity.

The beginnings of modern Slovak geography formation reach back to the interwar period, which is the period after the 2nd order regionalistic discontinuity. The first academic geographic workplace at the Comenius University in Bratislava started its activities in 1922. With regard had to the lack of educated Slovak geographers, it was substituted by professors from Prague. Certain faculty stabilisation

occurred in 1930' when the head persons became J. Král and J. Hromádka. Král considered himself to be an opponent of the German geographic school. He especially refused the genetic and the statistical approach. He regarded himself as a supporter of the French geographic school and he put a stress on researching the human influence on the formation of geographic environment (Král, Kondracki 1951). Hromádka devoted himself to geomorphology and regional geography. In 1931-1932 he spent study visit in Paris with A. Demangeon and E. de Martonne. He acquired the approaches and concepts (especially lifestyles/*genre de vie*) of the French school of regional geography school which he applied in his regional-geographic synthesis. A typical example is his book „*Všeobecný zemepis Slovenska*" ("*General Geography of Slovakia*") published in 1943. Hromádka worked in Bratislava until 1946 and educated the first generation of professional Slovak geographers (Matlovič 2018, Matlovič, Matlovičová 2019). A certain exemption was the student of J. Král., F. Bokes, who in the initial phase of his professional career devoted himself to geography and was the first director of the Geographical Institute of the Slovak Academy of Sciences and Arts in Bratislava. His book „*Slovenský životný priestor v minulosti a dnes*" ("*Slovak Living Space in the Past and Today*") from 1943 was written in a spirit of environmental determinism and used the German concept of the life space (Lebensraum), although defensively understood. However, Bokes does not explicitly reflect his affinity to environmental determinism in this book.

The character of Slovak geography started to change 1950'. In world geographic thought there was quantitative discontinuity. In Slovakia, the development was specific and conditioned by geopolitical and social-ideological influence. Slovakia, as a part of Czechoslovakia, fell under the influence of the Soviet Union after 1948. The monopoly of the power of the Communist Party manifested itself by ideological indoctrination of the science on the basis of dialectic and historic materialism. This Marxist discontinuity was represented by K. Ivanička who, at a theoretical conference in 1961, criticized geographical determinism for its connection with social Darwinism and its misuse to cover the political and economic expansion of the imperial powers. Ivanička also criticized geographical nihilism for complete underestimation of the influence of the geographical environment on the society. His criticism did not even spare the French geography school for its connections with positivism. He considered Marxism to be the only right world view, namely the study of forces and relations of production (Ivanička 1963). According to the resolution adopted at the mentioned conference organized by K. Ivanička, Slovak geography fought off geographical determinism as well as geographical possibilism together with the morphological tendency of anthropogeography and claimed allegiance to the dominant influence of Soviet geography. The resolution outlines the main tasks for physical, economic, historical geography, cartography and school geography. The tasks showed a tendency to complex approaches

(development of complex physical geography, study of territorial complexes in economic geography) and the need to draw up the methods and ways to process territorial regionalization (Ivanička 1963, s. 223-225). This paradigmatic doctrine was practically binding in Slovak human geography until 1989.

The first systematic reception of quantitative discontinuity in Slovak geography was the papers by Paulov (1966, 1968, 1969). They reflected Schaefer's criticism of the Hettner-Hartshorne's chorological conception. He paid significant attention to the reception of the book by W. Bunge „*Theoretical Geography*" from 1962 and pointed out to the cybernetization of geography and the application of system's theory in geography. Paulov's interest in the new paradigm of geography as a spatial science was influenced by the papers by Polish (Z. Chojnicki, R. Domański) and Russian geographers (J.V. Medvedkov). The key role was played by the monography of D. Harvey „*Explanation in Geography*" published in 1969, based on which J. Paulov prepared lectures in theoretical geography for students (Paulov 2009). Thanks to him, Slovak geography relatively early captured quantitative discontinuity in the world geography. Apart from Paulov, the paradigm of geography as a spatial science in Slovakia was firstly developed by A. Bezák, Š. Poláčik and J. Krcho (Matlovič, Matlovičová 2015). This paradigm became a sort of asylum for the part of geographers who had a moral problem to adapt to the requirements following from the ideological contamination of geography by dialectic and historical materialism. The Communist regime tolerated their activities because in mathematical modelling and the use of quantitative method the Communists saw no ideological threat for their interests in power. Despite this fact many key profile monographies representing this stream of geographic thought were published just after the social changes in 1989 – such as Paulov's monography „*Entropia v urbánnej a regionálnej analýze*" ("*Entropy in Urban and Regional Analysis"*) and Bezák's monography „*Problémy a metódy regionálnej taxonómie*" ("*Problems and Methods of Regional Taxonomy*"), both published in 1993. The reflection of quantitative discontinuity did not remain only as the inventory of the new approaches, but resulted in many applications and key papers that had already been inventoried in other papers (Bezák 2008, Paulov 2009).

As a follow up to the reception of quantitative discontinuity, Slovak geography relatively early reflected to the system and complex discontinuity. The system approach in the geomorphological research of slides and slope modelling was developed by Urbánek (1968). Slovak geography experienced a creative interconnection between the new approaches and the traditional Landschaft school developing as long as from the first decades of the 20th century. M. Lukniš (1963) pointed out to the application of the Landschaft approach and J. Drdoš (1965) brought theoretical knowledge of this school of thinking in Slovak geography. The landscape concept became the domain of physical geographer's research and

in it is possible to identify the influence of the conceptions of Soviet geographer Isačenko and German geographer Haase. J. Krcho (1968, 1974) connected the approaches of the Landschaft school with the system approach. He applied the system approach in the study and modelling of the landscape as a spatially organized system. He elaborated a complex digital model of relief. One of the most important is his monography *„Morphometric Analysis of Relief on the Basis of Geometric Aspect of Field Theory"*, which was published in 1973. The geosystem approach and inspirations form the approaches in the work of British geographer P. Haggett *„Geography a Modern Synthesis"* from 1972 were applied when making a conception of the landscape synthesis (Mazúr, Drdoš, Urbánek 1983). On the initiative of Slovak geography a Commission IGU (International Geographical Union) *„Landscape Synthesis – Geoecological Foundations of the Complex Landscape Management"* started in 1980 and operated until 1988. Within IALE (International Association of Landscape Ecology) there was a working group *„Landscape Synthesis – in Environmental Management"*. Complex discontinuity caused a less significant reaction in Slovak geography. Its theoretical bases were discussed by K. Ivanička (1988). Another author who implicitly discussed the relation of the theory of complexity and geography was J. Paulov (2002). In the concrete research we later meet the application of the theory of complexity, more concretely in the evolutionary analysis of the landscape system (Lehotský, Novotný, Grešková (2008). Only recently, Slovak geography discussed the concept of complexity in the context of economic geography (Rusnák 2012).

Behavioural discontinuity caused the first responses in Slovak geographic community in the second half of 1970'. It was thanks to V. Ira (1984), whose first papers in this field were focused on the evaluation of environmental quality in Bratislava via the study of evolutionary-preferential aspects of its perception (Ira, Paulov 1976, Bašovský, Paulov, Ira 1981) and on the reflection of the Lund school of time geography (Ira 1989, 2001). The study of the designation-structural aspects of perception in the research of the image of a city was reflected in Slovakia by Radváni (1983, 1985). However, this stream of geographic thinking could not be fully developed earlier than after the social changes in 1989. Work by Kollár (1992, 1994) and Matlovič (1992) are the examples of it.

Post-positivistic discontinuity initiated the first reflection in the paper of J. Paulov *„Spory o pozitivizmus v súčasnej západnej geografii"* (*"Controversies about Positivism in Current Western Geography"*), which was published in 1986. The response to post-positivistic 1st order discontinuity in Slovak geography was connected with the reflection of humanist 2nd order discontinuity. However, it was relatively modest. The application of humanist approaches in their pure form absents and no Slovak researcher can be marked as a humanistic geographer par excellence. A certain reflection or at least a marginal reference was received by humanistic geography in some mostly extensive works about the philosophical

issues of geographic thought or, a humanistic-geographical interpretation and a reinterpretation of traditional geographical concepts (Paulov 1986, Kasala 1994, Matlovič 2007). A certain intersection of humanistic geography is evident mainly in Slovak discussions about the constitution of reconstructed or new regional geography (Kasala 2005, Lauko, Kasala 2009). From the methodological point of view, the discussions about the application of the concept of understanding in regional-geographical (Kasala 2003) research and the use of qualitative methods in humanistic-geographical research (Rochovská et al. 2007) are relevant.

From the beginning, structuralistic discontinuity did not cause any reflection in Slovak geography. It was because of the fact that during the Communist regime dialectic and historic materialism was the dominant and binding ideology in its vulgarized Marx-Lenin version. University education, scientific education and social-scientific research were indoctrinated by it. It was precisely characterized by J. Demek (1987, p. 13), according to whom thanks to the cooperation with Soviet and Polish geographers we have developed the Czechoslovak Marxist geography school with several differences in individual schools, the Bratislava one, the Prague one etc. After the important social and political changes in 1989 the Marx-Lenin ideological doctrine was discredited whereby we can explain a relatively long period of Slovak geographers' unwillingness to reflect the western Marxist and Neomarxist ideas. The situation has become to change not earlier than in the recent years when some participants of the youngest generation make their efforts to encompass some topics in the way that they take into account at least a partial perspective of critical geography inspired by Marxism and neomarxism (these include works by Šuška, 2014 and Michalko, 2012, 2013, 2014). Smith and Rochovská (2006) used the perspective of critical geography when researching poverty and social-economic inequalities.

So far, scientific-realistic discontinuity has not caused any notable reaction in Slovak geography. It is mentioned in several theoretically oriented review articles. M. Lehotský (2003), M. Lehotský and J. Novotný (2006) pointed out to the use of the conceptions of transcendental realism in fluvial geomorphology.

New regionalist discontinuity was reflected in theoretical discussions relating the development of geographic thinking or the theory and methodology of regional geography -J. Paulov (1996), V. Lauko (2000), V. Lauko, K. Kasala (2009), R. Matlovič (2006, 2009). In empirical research the approaches of new regional geography started to be applied mainly in the researches of local and regional identity - S. Bucher (2012), K. Kasala (2005, 2012), K. Kasala et. al. (2009, R. Nikischer (2013) and P. Šuška (2010) a territorial marketing and place branding - K. Matlovičová (2007, 2015).

Feminist discontinuity was reflected only marginally in Slovak geographical literature. The summary of theoretical-methodological problems of feminist geography was brought by the monography of Blažek and Rochovská „*Feministické*

geografie" ("*Feminist geographies*") published in 2006. A. Rochovská partially relied on the feministic perspective in a widely designed research of poverty in which she pointed out to women as a vulnerable group that is more endangered by poverty (Rochovská 2005). New cultural discontinuity has not been reflected in Slovak literature yet.

Post-modern 1st order discontinuity was reflected in the review articles by Paulov (1997) and Matlovič (1999) by the end of 1990'. Post-structuralistic relation discontinuity, post-colonial discontinuity and post-humanistic discontinuity were informatively discussed in the book by Matlovič and Matlovičová (2015). The concrete applications of relational geography approaches can be found in the papers by Némethyová (2012) and Blažek, Šuška (2017). Generally, the potential of post-modern post-structuralist geography remains only minimally used in Slovak geography.

CONCLUSIONS

Summarizing the found facts it is possible to state that in Slovak geography two of four 1st order discontinuities of world geographic thought were reflected as well as 10 of 16 2nd order discontinuities of world geographic thought.

Our analysis shows that, as a result of its late institutionalization, Slovak geography could join the reflection of world geographic thought not earlier than after regionalist 2nd order, and so after 1st order positivistic discontinuity. This was the reason why the first two 1st order discontinuities of world geographic thought (the one of Enlightenment period and the positivistic one) and first two 2nd order discontinuities (evolutionistic-deterministic and anarchistic) could not have been directly reflected by Slovak geography.

The beginnings of Slovak geographic thought are mainly linked with the French school of regional geography the concepts of which were applied by J. Hromádka in his regional geography synthesis. Slovak geography diverted from this paradigm in 1950' due to the transition to the paradigm of dialectic and historic materialism. It was the result of power-motivated forced sovietisation of Slovak education and research practice. Despite the fact that this paradigm was binding until social-political changes in 1989, Slovak geographers managed to reflect almost all relevant discontinuities of the period.

Quantitative discontinuity was reflected a decade after its establishment in western geography. Its reflection showed itself not only as an inventory of the new approaches, but resulted in many applications and key works. Following the reception of quantitative discontinuity, Slovak geography relatively early also reflected system and complex discontinuity. Its creative interconnection with the Landschaft school brought many precious results and the creation of the separate Bratislava school of landscape synthesis, the results of which were appreciated by the institu-

tionalization of this research agenda in the structures of IGU and IALE. Behavioural discontinuity produced first responses in the Slovak geography community in the second half of 1970'.

Post-positivistic 1st order discontinuity was associated with the reflection of humanistic 2nd order discontinuity. Initially, structuralistic discontinuity did not cause any reflection in Slovak geography. It was caused by discredited Marx-Lenin ideological doctrine in the period after the end of the Communist regime and Slovak geographers' unwillingness caused by it to reflect the western Marxist and Neomarxist ideas. Scientific-realistic, new regionalist and feminist discontinuity caused a relatively modest reaction. Structuration discontinuity and cultural discontinuity and the concepts of new cultural geography have not been discussed in Slovak geography yet.

Post-modern 1st order discontinuity was reflected in summary studies and in Slovak geographical literature we can also find the first applications of the concepts as the result of post-structuralistic relational discontinuity. Post-colonial and post-humanistic discontinuities have been only informatively discussed in a wider reviews of geographic thought. In general, the potential of post-modern post-structuralistic geography remains only minimally used in Slovak geography.

Acknowledgement

The paper was elaborated within the VEGA Program No. 1/0049/18 „Discontinuities in the Development of Slovak Geographic Thinking in the 20th and 21st Century: Objective and Subjective Dimension".

REFERENCES

AGNEW, J., 2012. Of canons and fanons. In *Dialogues in Human Geography*, roč. 2, č. 3, s. 321-323. ISSN 2043-8206.

AGNEW, J., DUNCAN, J.S., 1981. The Transfer of Ideas into Anglo-American Human Geography. *Progress in Human Geography*, 5, 42-57.

BAŠOVSKÝ, O., PAULOV, J., IRA, V., 1981. Ekonomický rozvoj Bratislavy a problémy životného prostredia. In *Acta Facultatis Rerum Naturalium Universitatis Comenianae, Formatio et Protectio Naturae*, č. 6, s. 1-21.

BERRY. B. J., 1973. A paradigm for modern geography. In Chorley, R. J., ed., *Directions in Geography*. London: Methuen., pp. 3-12.

BEZÁK, A., 2008. Quo vadis kvantitatívna geografia? In *Acta Geographica Universitatis Comenianae*, roč. 50, s. 79-94.

BILLINGE, M., GREGORY, D., MARTIN, R.L., eds., 1984. *Recollections of a Revolution: Geography as Spatial Science*. London: Macmillan.

BIRD, J., 1975. Methodological implications for geography from the philosophy of K. R. Popper. *Scottish Geographical Magazine*, 91, pp. 153–63.

BLAŽEK, M., ŠUŠKA, P., 2017. Towards dialogic post-socialism: Relational geographies of Europe and the notion of community in urban activism in Bratislava. In *Political Geography*, vol. 61, p. 46-56.

BUCHER, S., 2012. Samosprávne kraje na Slovensku - formovanie identity a inštitucionali-zácia v kontexte integrácie do Európy regiónov: dizertačná práca. Školiteľ: R. Matlovič. Prešov: Prešovská univerzita, Fakulta humanitných a prírodných vied. 225 s.

BURTON, I., 1963. The Quantitative Revolution and Theoretical Geography. *Canadian Geographer*, 7, 4, 151-162.

COHEN, I.B., 1976. The Eighteenth-Century Origins of the Concept of Scientific Revolution. *Journal of the History of Ideas*, 37, 2, 257-288.

COHEN, I.B. 1987. *Revolution in Science*. Cambridge: Harvard University Press. 711 p.

COHEN, M. 2015. *Paradigm Shift: How Expert Opinions Keep Changing on Life, the Universe and Everything*. Exeter: Imprint Academic.

DANĚK, P., 2013. *Geografické myšlení: úvod do teoretických přístupů*. 1. vyd. Brno: Masary-kova univerzita. 171 s. ISBN 978-80-210-6694-6.

DRDOŠ, J., 1965. O niektorých teoretických problémoch náuky o krajine. *Biologické práce*, 11/10, 41-82.

FOUCAULT, M., 2000. *Slová a veci. Archeológia humanitných vied*. Bratislava: Kalligram. 400 s. ISBN 80-7149-664-2.

GRAVES, N.J., 1981. Can geographical studies be subsumed under one paradigm or are a plurality of paradigms inevitable? In *Terra*, roč. 93, č. 3, s. 85-90. ISSN 0040-3741.

HARD, G., 1973. *Die Geographie. Eine wissenchaftstheoretische Einführung*. Berlin: De Gruyter.

HARVEY, D., 1972. Revolutionary and counter-revolutionary theory in geography and the problem of ghetto formation. In *Antipode*, roč. 6, č. 2, s. 1-13.

HARVEY, M.E., HOLLY, B.P., 1981. Paradigm, philosophy and geographical thought. In Harvey, M.E., Holly, B.P., eds. *Themes in geographic thought*. New York: St Martin's Press, s. 11-37. ISBN 0-7099-01887.

HOLT-JENSEN, A. 1982: *Geography: its history and concepts: a student's guide*. Totowa, New Jersey: Barnes and Noble

HOLT-JENSEN, A., 2018. *Geography. History & Concepts*. 5. vyd. London: SAGE.

HUBBARD, Ph., KITCHIN, R., BARTLEY, B., FULLER,D., 2002. *Thinking Geographically*. 1. Vyd. New York: Continuum. 275 s. ISBN 0-8264-7771-2.

CHISHOLM, M. 1975. *Human geography: evolution or revolution?* Harmondsworth: Penguin

CHORLEY, R. J., HAGGETT, P., eds., 1967, *Models in Geography*. London: Methuen.

CHORLEY, R.J., KENNEDY, B.A., 1971. *Physical Geography: a System Approach*. London: Prentice-Hall. 370 s.

IRA,V., 1984. Priestorový a ekonomický rozvoj Bratislavy a problémy jej životného prostredia. Kandidátska dizertačná práca, GU SAV Bratislava, 149 s.

IRA,V., 1989. Niektoré otázky časovo - priestorových výskumov v sociálnej geografii. In: Bezák, A. (ed.): *Nové trendy v geografii*. SGS Bratislava, s. 39-42.

IRA, V., 2001. Geografia času: prístup, základné koncepty a aplikácie. In *Geografický časopis*, roč. 53, č. 3, s. 231-246.

IRA, V., PAULOV, J., 1976. Die Bewertung der Umweltkvalität von Bratislava mittels Ex-pertschätzung. In Sborník IV. medzinárodného sympózia o problémoch ekologického výskumu krajiny. Bratislava: Ústav experimentálnej biológie a ekológie. s. 263-267.

IVANIČKA, K., 1963. Ekonomická geografia. In Ivanička, K., ed. *Teoretické problémy geografie*. Acta Geologica et Geographica Universitatis Comenianae, Geographica, č. 3, Bratislava: SPN, s. 11-27.

IVANIČKA, K., 1988. *Synergetika a civilizácia*. 1. vyd. Bratislava: Alfa. 350 s.

JEŽKOVÁ, V., 2013. Genealogie diagnostiky Michel Foucault a zrození kliniky. In *Studia Philosophic*a, roč. 60, č. 3, s. 113-128.

JOHNSTON, R.J., 1978. Paradigms and revolutions or evolution? Observations on human geography since the second world war. In *Progres in Human Geography*, č. 2, s. 189-206.

JOHNSTON, R.J., 1979. *Geography and geographers: Anglo-American Human Geography since 1945*. London: Edward Arnold.

JOHNSTON, R.J., SIDAWAY, J.D., 2004. *Geography & Geographers. Anglo-American Human Geography since 1945*. 6. vyd. London: Arnold. 527 s. ISBN 0-340-80860-8.

JOHNSTON, R.J., 2006. The politics of changing human geography's agenda: textbooks and the representation of of increasing diversity. In *Transactions of the Institute of British Geographers*, roč. 31, č. 3, s. 286-303. ISSN 00202754.

KASALA, K., 1994. Philosophy of the Relation Between Man and Nature. In *Acta Facultatis Rerum Naturalium Universitatis Comenianae, Geographica*, č. 34, s. 190-201.

KASALA, K., 2003. Porozumenie ako cieľ regionálnogeografického prístupu. In *Acta Facultatis Rerum Naturalium Universitatis Comenianae*, Geographica, č. 42, s. 41-51.

KASALA, K., 2005. Regionálna geografia – zmeny paradigmy v 20. storočí a nová paradigma. *Acta Facultatis Rerum Naturalium Universitatis Comenianae, Geographica*, Suppl. č. 3, s. 247-253.

KASALA, K., 2008. Teoreticko-metodologické východiská výskumu identity lokality. In *Acta Geographica Universitatis Comenianae*, č. 50, s. 155-168.

KASALA, K., 2012. Meniaca sa identita lokalít Slovenska. In *Geographia Cassoviensis*, roč. 6, č. 1, s. 33-36.

KASALA, K. a kol., 2009. *Ekonomická, kultúrna a sociálna transformácia vybraných lokalít Slovenska*. Teoreticko-metodologická báza a aplikácie. 1. vyd. Bratislava: Kartprint. 194 s. ISBN 978-80-88870-79-1.

KEIGHREN, I., ABRAHAMSSON, Ch., della DORA, V., 2012a. On canonical geographies. In *Dialogues in Human Geography*, roč. 2, č. 3, s. 296-312. ISSN 2043-8206.

KEIGHREN, I., ABRAHAMSSON, Ch., della DORA, V., 2012b. We have never been canonical. In *Dialogues in Human Geography*, roč. 2, č. 3, s. 341-345. ISSN 2043-8206.

KOLLÁR, D., 1992. Sociálna geografia a problematika výskumu priestorového správania človeka. In *Geografický časopis*, roč. 44, s. 149-161.

KOLLÁR, D., 1994. Importance of perception and evaluation of environment in spatial behaviour of man. *In Geografický časopis*, roč. 46, s. 205-218

KOREC, P., RUSNÁK, J., 2018. *Prístupy humánnej geografie – filozofia, teória a kontext*. Bratislava: Univerzita Komenského. 239 s. ISBN 978-80-223-4625-2.

KOYRÉ, A., 1939. *Etudes galiléennes*. Paris: Hermann.

KRÁL, J., KONDRACKI J., 1951. West Slav Geographers. In Taylor, G., ed. *Geography in the Twentieth Century*. Methuen: London, pp. 116–127.

KRCHO, J., 1968. Prírodná časť geosféry ako kybernetický systém a jeho vyjadrenie v mape. In *Geografický časopis*, roč. 20, č. 2, s. 115-139.

KRCHO, J., 1974. Štruktúra a priestorová diferenciácia fyzicko-geografickej sféry ako kybernetického systému. *Geografický časopis*, 26, 132-162.

KUHN, T. S., 1962/1970a. *The Structure of Scientific Revolutions*. Chicago: University of Chicago Press.

KUHN, T.S., 1970b. Reflections on my critics. In Lakatos, I., Musgrave, A., eds., *Criticism and the growth of knowledge*. London: Cambridge University Press, pp. 231-278.

KUHN, T.S., 1997. *Struktura vědeckých revolucí*. Praha: Oikoymenh.

LAKATOS, I., 1970. Falsification and the Methodology of Scientific Research Programmes. In: Lakatos, I., Musgrave, A., eds., *Criticism and the Growth of Knowledge*. Cambridge: Cambridge University Press, pp. 91-196.

LAUDAN, L., 1984. Dissecting the Holist Picture of Scientific Change. In: Laudan, L.: *Science and Values: The Aims of Science and Their Role in Scientific Debate*. Berkeley and Los Angeles: University of California Press, pp. 67-102.

LAUKO, V., KASALA, K., 2009. *Teória a metodológia regionálnej geografie*. 1. Vyd. Bratislava: Kartprint. 95 s. ISBN 978-80-88870-80-7.

LEHOTSKÝ, M., 2003. Postmoderna a epistemológia krajinného priestoru s akcentom na fluviálne geosystémy. In Herber, V. ed. Fyzickogeografický zborník 1. *Fyzická geografia – vzdelávanie, výskum, aplikácie*. Brno: Přírodovedecká fakulta MU, s. 146-151.

LEHOTSKÝ, M., NOVOTNÝ, J., 2006. Metodológia konceptuálneho modelu vývoja morfológie rieky. In Smolová, I. ed. *Geomorfologické výzkumy v roce 2006*. Olomouc: Vydavatelství UP, s. 154-159.

LEHOTSKÝ, M., NOVOTNÝ, J. GREŠKOVÁ, A., 2008. Complexity and landscape. In *Geografický časopis*, roč. 60, č. 2, s. 95-112.

LIVINGSTONE, D. 1992. *The Geographical Tradition*. 1. vyd. London: Wiley-Blackwell Publishing, 1992. 444 s. ISBN 0-631-18535-6.

LUKNIŠ, M., 1963. Zemepisné krajiny Krymu. *Geografický časopis*, 15, 272-302.

MAIR, A., 1986. Thomas Kuhn and understanding geography. *Progress in Human Geography*, ISSN 0309-1325, roč. 10, č. 3, s. 345-369.

MALIK, A., 2014. Thomas Kuhn and Changing Paradigm in Geography: Critical Review. In *Asian Journal of Multidisciplinary Studies*, ISSN 2348-7186, roč. 2, č. 4, s. 41-46.

MATLOVIČ, R., 1992. Behaviorálna geografia, geografia percepcie a výskum vnútornej štruktúry mesta (na príklade Prešova). In Drgoňa, V. (ed.): *Regionálne systémy životného prostredia*, SGS Nitra - Wien, 1992, s. 139-143.

MATLOVIČ, R., 1999. Postmodernistické reflexie v urbánnej geografii. In *Folia Geographica*, 3, s. 45-53. ISSN 1336-6157.

MATLOVIČ, R., 2006. Geografia – hľadanie tmelu (k otázke autonómie a jednoty geogra-fie, jej externej pozície a inštitucionálneho začlenenia so zreteľom na slovenskú situáciu). In *Folia Geographica*, roč. 44, č. 9, s. 6-43. ISSN 1336-6157

MATLOVIČ, R., 2007. Hybridná idiograficko-nomotetická povaha geografie a koncept miesta s dôrazom na humánnu geografiu. In *Geografický časopis*. ISSN 0016-7193, 2007, roč. 59, č. 1, s. 3-23.

MATLOVIČ, R., 2018. Początki akademickiej geografii i jej przedstawiciele na Słowacji w 2. połowie XIX i 1. połowie XX w. In Jackowski, A., ed. *Rola geografii w utrwalaniu niepodległej Polski i w jej rozwoju*, IGiGP UJ, Kraków, 2018, s. 155-184. ISBN 978-83-64089-49-7

MATLOVIČ, R., MATLOVIČOVÁ, K., 2012. Spoločenská relevancia a budovanie značky geografie. In *Geografie – The Czech Journal of Geography*, ISSN 1212-0014, roč. 117, č. 1, s. 33-51.

MATLOVIČ, R., MATLOVIČOVÁ, K., 2015. *Geografické myslenie*. Prešov: Prešovská univerzita, Fakulta humanitných a prírodných vied. 321 s. ISBN 978-80-555-1416-1.

MATLOVIČ, R., MATLOVIČOVÁ. K., 2018. Etablovanie geografie na Univerzite Komenského a úsilie o posilnenie jej vplyvu v kontexte militarizácie pred druhou svetovou vojnou. *Geografické informácie*, 22, 1, 2018, 274-287.

MATLOVIČ, R., MATLOVIČOVÁ, K., 2019. Geography Education at the Comenius University in Bratislava in the years of 1922-1938: Institutionalization, actors and study cources. *Folia Geographica*, 61, 2, 2019, 71-85.

MATLOVIČOVÁ, K., 2007. Place as overlap between the Interest of Regional Geography and Marketing. In *Revija za geografijo*, roč. 2, č. 2, s. 53-62. ISSN 54-665X.

MATLOVIČOVÁ, K., 2015. *Značka územia*. 1. vyd. Prešov: Vydavateľstvo Prešovskej univerzity.

MASTERMAN, M., 1970. The Nature of a Paradigm. In Lakatos, I., Musgrave, A., eds. *Criticism and the Growth of Knowledge*. London: Cambridge University Press, pp. 59-90.

MAZÚR, E., DRDOŠ, J., URBÁNEK, J., 1983. Krajinné syntézy – ich východiská a smerovanie. *Geografický časopis*, 35, 3-19.

MICHALKO, M., 2012. Priestor ako hlavný koncept výskumu geografie. Smerom ku kritickému konceptu priestoru. *Folia Geographica*, roč. 54, 19, 196-209.

MICHALKO, M. 2013. Kritická regionálna politika. Hľadanie pozície geografa. *Folia Geographica*, roč. 55, č. 21, s. 67-83. ISSN 1336-6157.

MICHALKO, M., 2014. Diskurz a neoliberalizmus v regióne. Kriticko-geografický prístup. *Folia Geographica*, roč. 56, č. 2, s. 41-55. ISSN 1336-6157

MICHALKO, M., ČERMÁKOVÁ,L., 2010. Význam kritickej geografie v 21. storočí. *Geographia Cassoviensis*, 2, 2, 125-130.

NÉMETHYOVÁ, B., 2012. Analýza inovačného rozvoja v konceptuálnom rámci teórie aktér-sieť: teoretická báza a empirická aplikácia. : dizertačná práca. Školiteľ: R. Matlovič. Prešov: Prešovská univerzita, Fakulta humanitných a prírodných vied

NIKISCHER, R., 2013. Teritoriálna identita obyvateľov Česka a Slovenska. In *Geografie*, roč. 118, č. 3, s. 243-264.

OSMAN, R., 2014. Sociální prostor. In Matoušek, R., Osman, R., eds. *Prostor(y) geografie*. 1. vyd. Praha: Karolinum. s. 33-58. ISBN 978-80-246-2733-5.

OŤAHEĽ, J., MATLOVIČ, R., MATLOVIČOVÁ, K., MICHAELI, E., VILČEK, J., 2019. Critical approaches, integration of research and relevance of geography. *Geografický časopis*, 71, 4, 341-361.

PAULOV, J., 1966. Niektoré problémy a aspekty exaktizačného procesu v geografii. In *Geografický časopis*, roč. 17, č. 4, s. 252-268.

PAULOV, J., 1968. Snahy o premenu teoreticko-metodologického modelu geografie. In *Filozofia*, roč. 23, s. 55-68.

PAULOV, J., 1969. Syntetizačno-integračné úsilie v geografii a exaktné postupy. In Sborník *Československé společnosti zeměpisné*, roč. 74, s. 127-140.

PAULOV, J., 1986. Spory o pozitivizmus v súčasnej západnej geografii. In *Geografický časopis*, roč. 38, č. 1-2, s. 260-273.

PAULOV, J., 1996. Situation in Regional Geography: Some Open Questions. In *Acta Facultatis Rerum Naturalium Universitatis Comenianae*, Geographica, č. 38, s. 9-16.

PAULOV, J., 1997. Postmodern Geography: A Brief Characterization. In *Acta Universitatis Carolinae, Geographica*, č. XXXII., s. 45-50.

PAULOV, J., 2002. Komplexita a geografia. In *Geografický časopis*, roč. 54, č. 4, s. 393-398.

PAULOV, J., 2009. Theoretical and quantitative geography in Slovakia: a brief account. In Ira, V., Lacika, J., eds. *Slovak Geography at the Beginning of the 21st Century*. Geographia Slovaca, č. 26, s. 7-16. ISSN 1210-3519.

PAULOV, J. 2012. Základné paradigmy v rozvoji geografie ako vedy: pokus o stručnú identifikáciu. *Geografický časopis,* 64, 2, 111-120.

PEET, R., 1998. *Modern Geographical Thought*. 1. Vyd. Oxford: Blackwell. 342 s. ISBN 1-55786-206-0.

RADVÁNI,P., 1983. Mesto a jeho obraz. *Geografický časopis*, 35, 4, 395-408.

RADVÁNI,P., 1985. Vybrané aspekty obrazu podmalokarpatských miest. *Geografický časopis*, 37, 1, 46-60.

ROCHOVSKÁ, A., 2005. Vybrané aspekty chudoby na Slovensku s bližším zreteľom na ženy. Dizeračná práca. Bratislava: Prírodovedecká fakulta Univerzity Komenského.

ROCHOVSKÁ, A., BLAŽEK, M., SOKOL, M., 2007. Ako zlepšiť kvalitu geografie: o dôležitosti kvalitatívneho výskumu v humánnej geografii. In *Geografický časopis*, roč. 59, č. 4, s. 323-358.

RUSNÁK, J., 2012. Komplexita a ekonomická geografia. *Geografický časopis*, 64, 2, s. 181-198.

SMITH, A., ROCHOVSKÁ, A. 2006. Neo-liberalism and post-socialist urban transformations: Poverty, inequality and the city. *Acta Geographica Universitatis Comenianae*, No. 48, pp. 43-54.

SPEDDING, N., 2008. The geographical tradition (1992): David Livingstone. In Hubbard, Ph., Kitchin, R., Valentine G., eds. *Key Texts in Human Geography*. 1. vyd. London: SAGE, s. 153-161. ISBN 978-1-4129-2261-6.

STODDART, D.R., 1981. [1977] The paradigm concept and the history of geography. In Stoddart, D.R., ed. *Geography, ideology and social concern*. Oxford: Blackwell, s. 70-80. ISBN 0-38920207-X.

STODDART, D.R., 1986. *On Geography and its History*. 1. vyd. Oxford: Blackwell. 335 s. ISBN 0-6311-3488-3.

ŠUŠKA, P., 2010. Constructing Identity and Place. In Klusáková, L., ed., *Crossing Frontiers Resisting Identities*. Pisa : Plus - Pisa University Press, 2010, s. 93-100

ŠUŠKA, P., 2014. Aktívne občianstvo a politika premien mestského prostredia v postsocialistickej Bratislave. In *Geographia Slovaca*, č. 29. Bratislava: GÚ SAV. 145 s. ISBN 978-80-89580-09-5.

URBÁNEK, J., 1968. Zosuny a teória systémov. In *Geografický časopis*, roč. 20, č. 1, s. 18-33.

UTTERBACK, J. M. 1994. *Mastering the dynamics of innovation*. Boston, MA: Harvard Business School Press.

WILCZYŃSKI, W., 2009. On the Necessity of the History of Geographical Thought. *Bulletin of Geography. Socio-economic Series*, 11, 11, 5-14.

WHEELER, P.B., 1982. Revolutions, Research Programmes and Human Geography. *Area*, 14, 1, 1-6.

WOLEŃSKI, J., 2014. Filozofia nauki i historia nauki. *Prace Komisji Historii Nauki PAU*, Tom XXIII., s. 100-115.

YOUNG, R.W., 1979. Paradigms in Geography: implications of Kuhn's interpretation of scientific inquiry. *Australian Geographical Studies*, 17, 2, 204-209.

FOLIA GEOGRAPHICA • ISSN 1336-6157 (hard copy) • ISSN 2454-1001 (online)

HOLISTIC AND SUSTAINABLE QUALITY OF LIFE
Conceptualization and Application

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Received: January 14, 2020 | Revised: February 24, 2020 | Accepted: March 1, 2020
Paper No. 20-62/1-550

Abstract
In the article we focused on incorporating sustainability into the concept of quality of life in response to the current accelerating environmental problems. Quality of life is understood holistically as a link between the personal or subjective dimension with a geographic dimension or objective, expressed in terms of quality of place. Two goals were formulated in the article. The first is to analyze the possibility of including sustainability in the concept of holistic quality of life. It includes an answer to the question of which lifestyle - hedonistic or eudaimonic is sustainable. The second goal, closely related to the first, is to explore the spatial differentiation of holistic quality of life in districts of the Czech Republic. In the theoretical part of article, we explore quality of life, holistic quality of life and sustainable quality of life. In the empirical part we measure both dimensions of holistic quality of life in the form of satisfaction with life and satisfaction with the place in districts of the Czech Republic. The data were obtained by face-to-face interviews so that all districts were proportionally represented in terms of population. The informative value of such measurements, based on correlations, is high, much higher than the measurement of place quality in the form of set indicators. The value of the correlation between life satisfaction and place satisfaction according to the verbal evaluation of the correlation values is medium high.

Key words
Quality of life, holistic quality of life, quality of place, sustainable of quality of life, districts of the Czech Republic.

INTRODUCTION

Over the last period, in the study of quality of life, interest in the holistic approach to the quality of life has been increasing, usually expressed by its conceptualization (Veenhoven 2000, 2016; Phillips, 2006; Murgaš, 2016). At the same time, over the past few months, we have witnessed a paradigmatic change in terms of climate change, or in a broader sense, on environmental issues. These problems have moved from the academic sphere to the public sphere. Comprehensive warnings about the impacts of climate change on contemporary life are being formulated.

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In relation to quality of life, the outlined development raises sustainability as a primary requirement.

Improving the quality of life in developed countries, linked to a long period of economic growth, is coming to an end, and the effort to improve quality of life is likely to be replaced by an effort to maintain the current quality of life. In the article we focused on incorporating sustainability into the concept of quality of life and applying measurement of such a holistic quality of life in districts of the Czech Republic.

Vedou, ktorá je zameraná na explore ako kvalita života vzniká, resp. čo ju nasycuje je psychológia. V psychológii as with all new concepts, there is terminological inconsistency in this new field on the border of psychology and sustainability. Therefore, in addition to the term 'psychology of sustainability' we can also come across the term 'environmental psychology' (Pol et al. 2017).Attention is paid to the relationship between sustainability and quality of life or similar phenomena of well-being, happiness etc. (Chiras, Corson 1997; Moser 2009), some authors associate them into one term "quality and sustainability of life" (Mederly et al. 2003; Vonk 2011). One of the main sustainability factors is land use (Boltižiar et al. 2016; Izakovičová, 2000; Jedlička et al. 2019; Karlík et al. 2018; Kubinský et al. 2015; Lieskovský et al. 2018; Muchová, 2019; Olah 2003; Olah, Žigrai 2004; Petrovič, Muchová 2013; Slámová, Belčáková 2019; Tárniková, Muchová 2018).

We have two goals in the article. The first is to verify the possibility of including sustainability in the concept of holistic quality of life, including answering to the question of which way of life - hedonistic resp. eudaimonic is sustainable. The second goal, closely related to the first, is to explore the spatial differentiation of holistic quality of life in districts of the Czech Republic. Based on the above statements, we hypothesize: Sustainability can be a part of the concept of the quality of life.

This article has two parts. In the first, theoretical part, we outline the key concepts focused on quality of life, holistic quality of life and quality of place. In the second, empirical part, we will measure the quality of life at the geographical level in the districts of the Czech Republic, describing data, methods and findings. In discussion we explore the validity or invalidity of the hypothesis and whether we met objectives.

THEORETICAL FRAMEWORK

Quality of life

Exploring the quality of life (or the phenomena with which it is identified, such as well-being, life satisfaction or happiness) has gained prominence in the social sciences in recent decades (Kroll, 2008). The interest in exploring the quality of life has been and is accompanied by an effort to bring knowledge applicable to 'policy and practice in the field' (Hughes et al., 1995). In this period, the quality of

life entered the public sphere and became part of government programs in many countries as well as programs of international organizations such as the UN or the European Union. The consequence of these processes is that the quality of life has become a vague term meaning anything. A large part of the population of developed countries lives in prosperity, and therefore researchers identify the quality of life with the life satisfaction that is called well-being. This identification was supported by a paradigmatic change in psychology in the form of the emergence and rapid spread of positive psychology. In addition to satisfaction with life, there is dissatisfaction called ill-being. Moreover, none of us lives in a vacuum but in a specific geographical environment. This affects life satisfaction through its facilities, the level of social pathology, the quality of the environment and aesthetic values. It should also be emphasised that the researchers' interest to explore quality of life was primarily in a quantitative form with the development of its epistemology lagging behind. One of the consequences of this development is the terminological chaos, so the quality of life is identified not only with well-being, satisfaction with life or happiness, but also with their various modifications, such as economic well-being, material well-being, mental well-being, objective well-being, physical well-being, psychological well-being, personal well-being, subjective well-being, well-being of nations, economy of happiness, objective happiness, or welfare. The solution to the problem of terminological chaos is to define the key terms.

In the sense of quality of life, we consider the cognitive assessment of how good an individual's life is. When one expresses himself on the quality of his life, he evaluates it. Assessment can be verbal or numerical, on a prescribed scale expressing the degree of satisfaction with life. Satisfaction with life that has achieved above-average value is referred to as wellbeing, life satisfaction, which reached below-average values (in other words, dissatisfaction) becomes ill-being (Murgaš, 2019). Satisfaction with life is a synonym for quality of life, not happiness. The reason for this finding is that happiness is an emotion, expressing affective evaluation of satisfaction with life. Happiness is a short-term emotional state of joy. From the fact that happiness is an emotion comes the knowledge that happiness forms an effective part of the quality of life. We define it as the highest achievable well-being. An individual has a quality of life all his life, happiness is his just an occasional part.

Most people in developed countries are happy with their lives, in the United States, according to Gallup, 86% of Americans are content with their lives (McCarthy, 2019). Scientists that explore quality of life respond to this by identifying well-being with quality of life. This is a simplification, as well-being is only one part of the subjective dimension of quality of life, the other is ill-being. Dichotomy well-being - ill-being is one of many dichotomies of quality of life. Another is the fact that on the one hand the quality of life is a complex multidimensional complex,

on the other it is the answer to a simple question: How are you? The answer can be verbal on the Likert scale or numerical on the Cantril scale.

The multidimensionality and complexity of the quality of life cannot be expressed by one indicator, but there is no consensus about optimum number or the way of their measurement. The optimal solution is to identify the smallest number of indicators with the greatest possible informative value. The effort to express the complexity of quality of life leads to its conceptualization, which is formulated especially by authors focused on healthy related quality of life (Cella 1994; Schalock 2004; Kaplan, Ries 2007) but also by authors dealing with quality of life generally (Veenhoven 2000, 2016; Phillips 2006; Jakubcová et al. 2016; Murgaš, Klobučník 2018; Murgaš 2019). Geographically, the quality of life is conceptualized and an overview of the authors dealing with it is presented by Murgaš (2016). From conceptualizations there is a general consensus on knowing the existence of two dimensions of quality of life, subjective, referred to as well-being and objective, referred to as quality of place. Complex quality of life is described by researchers as holistic quality of life. The article is focused on that.

The introduction of the concept of quality of life into the public space was due to politicians. In the 1960s US President Johnson announced the Great Society program with aim to improve the lives of Americans (Rapley, 2008). In Europe, German Chancellor Brandt in the early 1970s included improving the quality of life of German residents on his party's agenda (Murgaš, 2012). The interest in the quality of life in terms of the offer of its improvement has become part of the agenda of political parties in developed countries. Quality of life has thus become part of government programs in many countries, as well as programs of international organizations such as the UN or the European Union. Researchers responded to this demand by bringing knowledge applicable in policy and practice in the field (Hughes et al. 1995). The current achieved high level of satisfaction with life is not sustainable in the future, this is explicitly stated by the third Sustainability monitor of the Netherlands (2015), which urgently states the need for the formulation of sustainability of quality of life.

Holistic quality of life

The quality of life was described in previous text. Why is it necessary to deal with holistic quality of life? The need lies in the recognition that if researchers have the ambition to bring valid knowledge to the public and politicians in terms of decision-making information, this is then necessary. The difference between quality of life, respectively for what is being declared as such - most often well-being - and the holistic quality of life is that holistic means two-dimensional quality of life. The Quality of Life Research Unit, which is a part of the University of Toronto, came up with the 'Being, Belonging, becoming' quality of life model known as the Raphael

et al. In this model there are three dimensions to quality of life, each of which consists of three domains. According to the authors „The model is multidimensional and assumes that quality of life is holistic in nature" (Quality of Life Research Unit, on line). The influence of both dimensions on the holistic quality of life is not the same; Lyubomirsky et al. (2005) analyzed it from the psychological point of view, Murgaš and Klobučník (2016b) explored it from the spatial point of view. Although the influence of the place in which one lives does not seem great at first sight, it is not negligible either.

System analysis and evaluation of quality of life factors affecting Faceted action system theory within metatheory framework can be considered as part of the creation of epistemology of quality of life (Shye, 2014a). Based on this meta-theory Shye (2014b) formulated The Systematic Quality of Life (SQOL) Model as a matrix of four subsystems: Personality, Physical, Social, and Cultural, and four modes: Expressive, Adaptive, Integrative, and Conservative. The SQOL model, as well as the familiar models of Allardt, Raphael et al., or Veenhoven, which is described by Murgaš (2019) are models of a holistic, two-dimensional quality of life. A holistic approach to quality of life is common in the written works that are focused on healthy related quality of life (Dossa 1989, Ventegodt et al. 2006, Kelley-Gillespie 2009, Bower et al. 2010, Carrieri et al. 2018, Werneburg et al. 2018). Therefore, it is surprising that a holistic approach to quality of life has not become significantly represented in the general quality of life.

Sustainability of quality of life

As we have already mentioned, the interest of researchers focused on quality of life in sustainability is obvious, as well as the interest of sustainability researchers in quality of life. In the last two decades, quality of life has begun to be classified within sustainable development as its fourth pillar. According to Ira and Huba (2007: 197) "Sustainable development has been redefined as a holistic concept of quality of life". The natural consequence of this is the unification of approaches to the use of the term "quality and sustainability of life". For the sake of completeness, it should be noted that only the eudaimonic quality of life in the sense of Aristotle is sustainable. Hedonic quality of life is not sustainable.

When we talk about the quality and sustainability of life, do we mean every life? Are all forms of contemporary human life sustainable? Aristotle divided the experience of human life into two basic types: hedonic and eudaimonic. This division is naturally simplistic, there are several transitional types, but we can accept it. At present, the level of life satisfaction is high in developed countries, especially in countries with a high quality of public policy. This is evidenced by almost all measurements by researchers, international organizations such as the UN or OECD and other entities such as The Economist or The Legatum Prosperity Institute.

The present high level of satisfaction with life has many hedonistic features. Is it sustainable in the future? It is not (Pol et al. 2017), even the third Sustainability monitor of the Netherlands (2015) states this explicitly. This implies the need to formulate sustainability of quality of life. In one of many definitions of sustainability, this is defined in relation to quality of life:

In one of many definitions of sustainability, this is defined in relation to quality of life: "Sustainability is a dynamic process which enables all people to realise their potential and improve quality of life in ways that simultaneously protect and enhance the Earth's life support system" (Forum for the Future, on line). *In the article, the sustainable quality of life is considered to be a quality of life that is not at the expense of future generations.* This implies that sustainability is not an indicator of (environmental or other) quality of life and therefore cannot be measured as an indicator. Sustainability is the goal of a quality of life and at the same time the path to this goal.

Quality of place

In the previous part of the article we focused on the need for a holistic approach to quality of life, meaning inclusion of its objective spatial dimension. The need for a geographical approach to quality of life is based on the recognition that quality of life always has a spatial dimension (Murgaš 2016). In this approach, the irreplaceable position of the ecological domain, respective ecological indicator when measuring quality of life, is accepted.

The characteristics of the physical environment in which people live their lives affect their quality of life (Pacione 1982), the same can be said about the social environment in which people live. Each individual has emotional ties to the physical environment, in which social relations are manifested but also our personal identity is rooted in (Kyle 2014). Raison d'être dealing with the quality of life by a geographer lies in focusing geography on a physical space that in reality takes the form of a place. The place is related to the phenomenon of good place (McCann 2004; Kyle 2014), which is a place of different hierarchical levels ranging from settlements to states. A place is good if it allows you to live a *good life* (Veenhoven 2014). An objective dimension focused on space some authors call the *quality of the place* (Trip 2007; Burton 2014; Murgaš and Klobučník 2016a). It can be defined as *"emotional and cognitive assessment of external, spatially differentiated material and immaterial conditions for the experience of good life"* (Murgaš 2016: 311). In exploring the spatial dimension of quality of life, emphasis is placed on the quality of life in regions (Gonzáles et al. 2011; Murgaš and Klobučník 2016a) and in settlements (Ira, Andráško 2008; Biagi et al. 2018), while the quality of urban life is significantly superior to the quality of rural life (Murgaš 2016).

DATA AND METHODS

Satisfaction with life and quality of the place was evaluated in the Czech Republic, while the districts were considered as the place. The data was obtained by a personal questionnaire survey and survey via social networks (N = 1,356) from respondents over 18 years of age from all 77 districts of the Czech Republic so that it would meet the quota selection for the district quota (LAU 1). The investigation took place for period from June 2018 to March 2019. The number of respondents is based on the minimum number of respondents (N = 10) in each district and simultaneously on the minimum number of respondents in each region (N = 70). In districts with the smallest population, the number of respondents was higher than mathematically should be. For Prague with a population of 1.3 million, the number of questionnaires was arbitrarily set at 150.

In the questionnaire survey, respondents rated their satisfaction with life and the quality of the place on the Cantril's scale 0-10, where 0 represents the lowest value and 10 represents the highest value. Questions were formulated as follows:

- How satisfied are you with your life?
- How satisfied are you with the quality of the place you live in?

RESULTS AND DISCUSSION

The result of the questionnaire survey is the finding that the inhabitants of the Czech Republic are satisfied with their life on the Cantril's scale 0-10 at 7.38, with the place where they live, they are satisfied at 7. 08.

The degree of correlation between life satisfaction variables and place quality is 0.41, according to the verbal correlation evaluation (de Vaus 2002), this correlation is moderately high. The values of satisfaction with life correspond to the values (Table 1) found by the Centre for Public Opinion Research at the Institute of Sociology of the Academy of Sciences of the Czech Republic (Spurný 2019) in period between June 2018 and March 2019.

Table 1 Life satisfaction from June 2018 to March 2019 in the Czech Republic as a percentage

Scale	2018					2019			average
	june	sept.	oct.	nov.	dec.	jan.	feb.	march	
very satisfied	17	17	16	15	17	15	18	15	16
satisfied	51	52	53	50	52	51	50	53	52
satis./dissat.	22	21	22	23	22	23	24	23	22
dissatisfied	9	9	8	10	8	10	7	8	9
very dissatif.	1	1	1	2	1	1	1	1	1

Source: *authors according Spurný (2019)*

The following tables show the districts with the highest life satisfaction values (Table 2) and the lowest life satisfaction values (Table 3). The range between these values is 8.43 - 6. 30.

Table 2 Districts with the highest life satisfaction in the quantile

Rank.	Districts	Value
1.	Cheb	8,43
2.	Břeclav	8,23
3.	Praha – východ	8,20
4.	Rychnov nad Kněžnou	8,18
5. - 6.	Hradec Králové, Jičín	8,10
7.	Kladno	8,05

Table 3 District with the lowest life satisfaction in the quantile

Rank.	Districts	Value
75.	Rakovník	6,40
76.	Jindřichův Hradec	6,36
77.	Tachov	6,30

The spatial structure of satisfaction with life in districts is shown in picture 1, based on the division of districts into quantiles. The fundamental statement is that in all districts of the Czech Republic, satisfaction with life is above average, so it takes the form of well-being. However, it is not easy to derive some regularity from spatial differentiation. Only three districts are in the first quantile with the lowest values (but above average in the absolute value). On the other hand, in the fifth quantile with the highest values, there are close to border districts but also districts

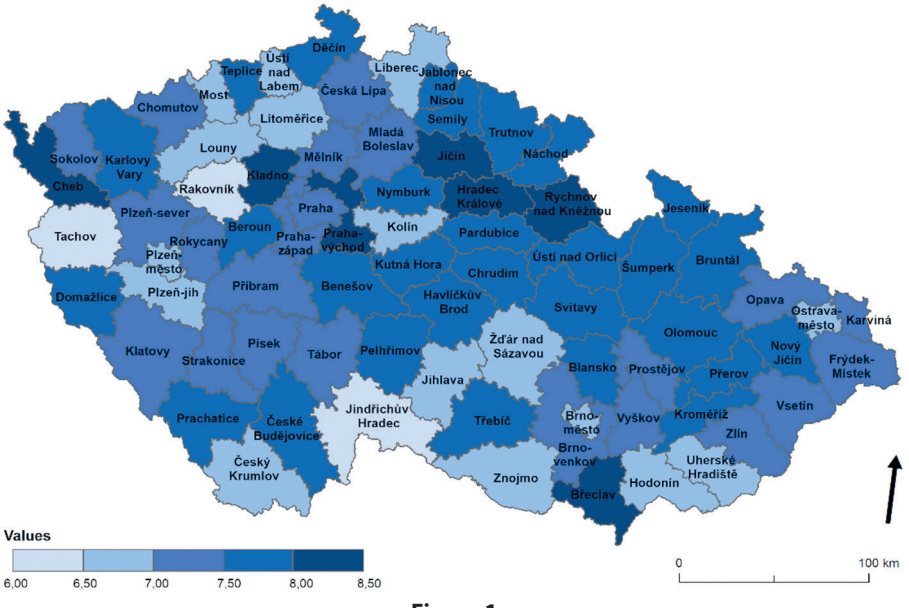

Figure 1
The average value of satisfaction with life in the districts of the Czech Republic

in the Prague agglomeration. There are no city districts in this quantile, and except from the Hradec Králové district, there are no districts with regional offices. The grouping of districts in this quantile in the form of an area can be talked about only in one case of the districts of Jičín, Hradec Králové and Rychnov nad Kněžnou.

The second component of holistic quality of life is the quality of the place. The following tables show the districts with the highest value of quality of place (Table 4) and the lowest value of quality of place (Table 5). The range between these values is 4.54 - 8.70, so it is larger, as it was the case with life satisfaction. Since there is only one district in the quantile with the highest value of quality of the place - Jičín, for better understanding of spatial differentiation I also mention the districts with the second highest values in the quantile.

Table 4 Districts in quantile with highest and second highest value of quality of place

Rank	Districts	Value
1.	Jičín	8,70
2.	Kroměříž	8,00
3.	Tábor	7,92
4.	Olomouc	7,85
5.	Praha	7,83

Table 5 Districts in quantile with the lowest and second lowest value of quality of place

Rank	Districts	Value
72.	Rakovník	6,00
73.	Jindřichův Hradec	5,91
74.	Tachov	5,70
75.	Česká Lípa	5,63
76.	Ústí nad Labem	5,13
77.	Most	4,54

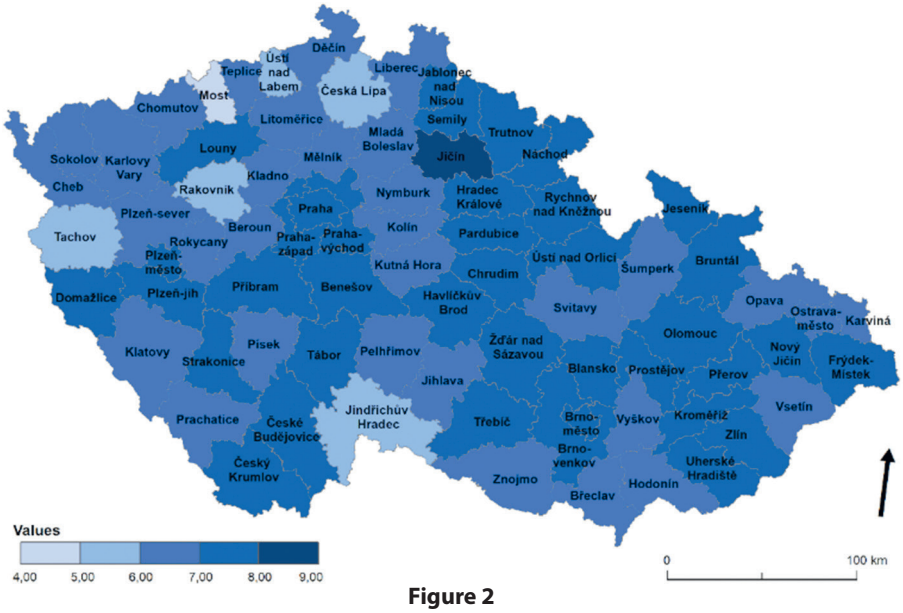

Figure 2
The average values of quality of place in the districts of Czech Republic (2019)

The comparison of the districts in quantiles with the highest and lowest values of satisfaction with life and quality of the place implies that in the case of districts with the highest values, the only district of Jičín is represented in both cases and in the case of the districts with the lowest only district of Jičín is represented in both cases and in the case of the districts with the lowest values, the district of Jindřichův Hradec is represented in both quantiles. Spatial differentiation of place quality in districts is shown in Fig. 2, also based on the division of districts into quantiles.

A holistic understanding of quality of life means evaluating both of its dimensions in one whole. Measuring holistic quality means adding up date from life satisfaction measurements and quality of place. Both dimension values were measured on a 0-10 scale, so theoretically, the holistic quality of life values could range from 0-20, in fact, the range was 11.3-16. 8. This means that the holistic quality of life in the districts of the Czech Republic is above average good (Fig. 3).

Table 6 Districts in quantile with the highest value of holistic quality of life

Rank.	Districts	Value
1.	Jičín	16,80
2.	Rychnov nad Kněžnou	16,00
3. - 4.	Kroměříž	15,85
3. - 4.	Olomouc	15,85

Table 7 Districts in quantile with the lowest holistic quality of life

Rank.	Districts	Value
75.	Tachov	12,00
76.	Ústí nad Labem	11,73
77.	Most	11,31

In Table 6 we show the districts in quantile with the highest value of holistic quality of life. The Jičín District ranked first in quantiles with the highest value of life satisfaction (Table 2) and the quality of the place (Table 4).

The districts with the lowest holistic quality of life in quantile are in Table 7. Their location, especially in the districts of Ústí nad Labem and Most, was decided by very low values in the quality of the place.

When there are two dimensions of quality of life, it is natural to deal with their relationship.

It is not equal, life satisfaction is generally considered more important than the quality of the place (Rapley 2003), according to other opinions, the relationship of both domains is relatively independent (Allison et al. 1997). In the article, the weight was not given the dimensions, they are understood as equal. When both variables have the same weight, one would expect that the resulting holistic quality of life is equally influenced, but it is not. Pearson's correlation coefficient of life satisfaction and holistic quality of life is.77, the correlation of place quality and holistic quality of life is.88, meaning that quality of place affects the holistic quality of life more as life satisfaction.

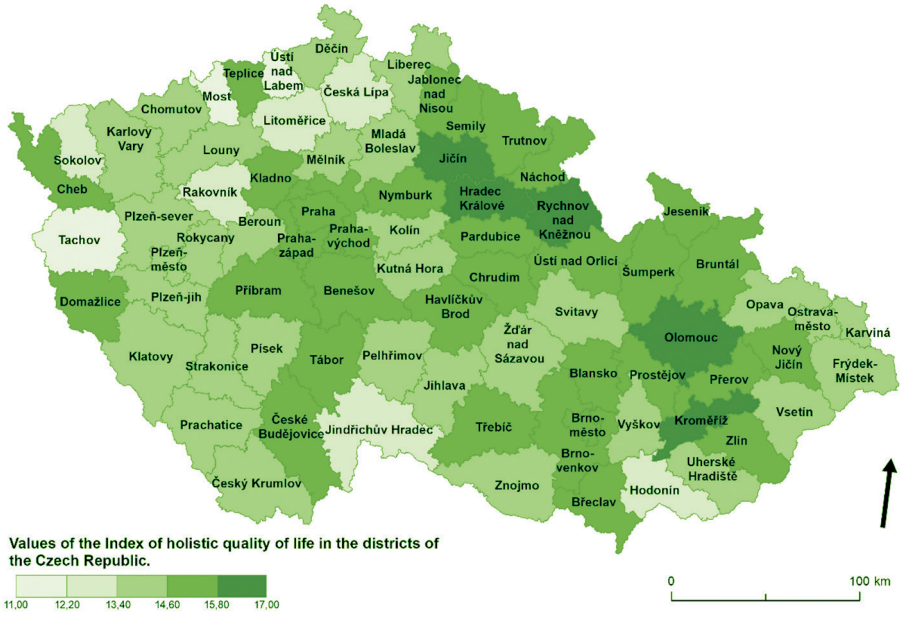

Figure 3

The Average values of the Index of holistic quality of life in districts of the Czech Republic

The following important conclusions come from the measurements:

(i) life satisfaction and the quality of a place have different measured values, so life satisfaction cannot be identified with the quality of life,

(ii) the level of satisfaction with the life of the Czech Republic population on the Cantril scale of 0-10 is high (7.38), the level of satisfaction with the place they live in is also high (7.08), only slightly lower than the level of life satisfaction,

(iii) correlation coefficient between variables of life satisfaction and place quality is 0.41, according to the verbal correlation (de Vaus 2002), correlation is moderately high,

(iv) from the analysis of spatial differentiation of holistic quality of life (Picture 3) shows that there is no regularity. There are five districts in quantile with the highest values, they are not urban districts, two out of five are districts with regional towns (Hradec Králové, Pardubice). The districts in quantile with the lowest values are three, the district of Tachov is a sparsely populated district with a small district town (less than 13,000 inhabitants), while the district of Ústí nad Labem is the district with a regional town with a population of 93,000 inhabitants.

(v) Thus, the values of holistic quality of life do not correlate with the population or the meaning of the district city. The peculiarity that future research could focus on is the relatively large difference between the values of two neighboring districts in Eastern Moravia - Kroměříž (15.85) and Hodonín (13.04).

DISCUSSION

In the previous part of the article the holistic quality of life in an example of districts of the Czech Republic was described, the data for life satisfaction and quality of place was obtained by questionnaire survey. In the case of an objective dimension, this means satisfaction with the quality of the place. As we have already mentioned, Murgaš and Klobučník (2016a) dealt with municipalities and regions of the Czech Republic as good places to live. They used the values of 10 indicators as data, obtained from statistical sources and constituting „golden standard quality of life ". According to the authors „the essence of the golden standard of quality of life are quantifiable manifestations of the age-old archetypal human desire common to all people in human history: desire to live long in health, in family, surrounded by children and later grandchildren, to be educated, to have a meaningful job which is fulfilling and to be considered a good person, respectively to have a good reputation. The desire to live, to be healthy, to live in a functional family and have a job is expressed by indicators of their absence. Suicide is the final phase of the lack of will to live, mortality is the final phase of the absence of health, divorce is breaking of a family functioning, and unemployment is the absence of job" (Murgaš, Klobučník 2016a: 555). A similar procedure when the quality of a place is a sum of variables obtained from statistical sources was used in the creation of the World Happiness Report (Helliwell et al. 2019). An approach where scientists or politicians tell people what life is good can be described as the 'top down' approach. Its essence is the belief that a high-quality place must match a high-quality life in special units (districts or states). Murgaš a Klobučník (2016b) dealt with the influence of the quality of place on the life satisfaction in districts of the Czech Republic. The quality of the place was measured by a set of ten indicators of the golden standard of quality of life whose values were obtained from statistical sources. The result of a comparison of life satisfaction and place quality is the Pearson correlation coefficient of -0.1183, which represents the low to very low correlation interface. In a particular form in 15 districts out of 77, life satisfaction was lower than the quality of the place, in 2 districts both values were the same, and in 60 districts, life satisfaction was higher than the quality of the place. It turned out that the assumption of " at a good quality place a life is of a good quality" does not apply in 78% of the districts of the Czech Republic. It is remarkable that people "were better off than they should" in the district of Most and other districts of the Ústí nad Labem and Karlovy Vary regions. At the same time, it was true that people were "the worse off than they should have" in the city district of Brno, where the quality of the place is the tenth best of all 6251 residences in the Czech Republic.

The article uses a bottom-up approach, in other words, the quality of a place is good when people consider it good. Numerically, the two approaches do not differ in the districts of the Czech Republic: in 17 districts the quality of the place

was higher than the satisfaction with life, in one district they were the same and in 59 districts the quality of the place was lower than the satisfaction with life. What is important, however, is that the Pearson correlation coefficient of life satisfaction and place quality in terms of satisfaction with it is 0.41, which is a medium-high correlation.

CONCLUSION

In the article we formulated two objectives.

The first concerned verifying the possibility of including sustainability in the concept of holistic quality of life, including the answer to the question of which way of life - hedonistic resp. eudaimonic is sustainable. We discovered that sustainability can be included in a holistically understood quality of life. However, sustainability is not an indicator and therefore cannot be measured. When asked if the quality of life is sustainable, the unequivocal answer is that sustainable is just a life lived eudaimonically. Today's hedonistic life is not sustainable. The second goal, closely related to the first, is to explore the spatial differentiation of holistic quality of life in districts of the Czech Republic. From the spatial analysis of holistically described quality of life the following important implications arise:

- Valid information necessary for both the public and the academic world will bring only holistic understanding of the quality of life, containing both its dimensions, satisfaction with life and the quality of the place.
- The acceptance of the claim that improving the quality of life is the primary objective of public policy is related to the need to approach the improvement of the quality of the place from the "bottom up" in the form of satisfaction with the quality of the individual population.

In this way, the quality of the place is correlated with life satisfaction.

- The quality of the place in terms of satisfaction with it correlates with the holistic quality of life more like satisfaction with life, this emphasizes the position of the quality of the place as the primary goal of public policy.

The analysis of the geographical approach to quality of life brings the following important findings:

- the need for a geographic approach to quality of life is essential because the quality of life always has a spatial dimension,
- geographic approach allows exploring the quality of life at all spatial size levels.
- The physical space that geographers are focused on can have a form of place in reality. A good place phenomenon is related to the place (McCann 2004; Kyle 2014). The place is good when its characteristics enable a good life experience (Veenhoven 2014).

In the next research, it would be appropriate to focus on two lines of enquiries. The first is repetition of the described procedure and thereby confirmation or refutation of its conclusions. In the event of confirmation of the conclusions, the next step should be the identification of indicators that contribute to the assessment of satisfaction with the place. The second line should be to create a minimum time series. Murgaš (2019) dealt with the development of quality of life in the years 2003-2015 in the regions of the Czech Republic based on data from the Centre for Public Opinion Research at the Institute of Sociology of the Academy of Sciences of the Czech Republic. He states that satisfaction with life in the period under review stagnated. The explanation of this fact the author sees in the validity of Easterlin's paradox and the influence of cultural-geographical characteristics of Czech society. Creating a time series at district level will enrich the exploration of the holistic quality of life and enhance its application character.

Acknowledgement

The authors thank two anonymous reviewers who have made a significant contribution to the quality of the article and support by project VEGA 1/0706/20.

REFERENCES

ALLISON, P. J., LOCKER, D., FEINE, J. S. (1997). Quality of life: a dynamic construct. *Social Science and Medicine*, 45, 2, 221-230.

BIAGI, B., LADU, M. G., MELEDDU, M. (2018). Urban Quality of Life and Capabilities: An Experimental Study. *Ecological Economics*, 150, 137-152. https://doi.org/10.1016/j.ecolecon.201 8. 04. 011.

BOLTIŽIAR, M. et al. (2016). Transformation of the Slovak cultural landscape and its recent trends. In Halada, Ľ., Bača, A., Boltižiar, M. eds. Landscape and landscape ecology: proceedings of the 17th International Symposium on Landscape Ecology. Proceedings. Bratislava (Institute of Landscape Ecology SAS), 57-67.

BOWER, W. F., VLANTIS, A. C., CHUNG, T. M. L, VAN HASSELT, C. A., (2010). Mode of Treatment affect quality of life in head and neck cancer survivors: implications for holistic care. *Acta Oto-Laryngologica*, 130, 10, 1185-1192. DOI 10.3109/00016481003667366.

BURTON, M. (2014). Quality of place. In A. C. Michalos (Ed.), *Encyclopaedia of quality of life and well-being research* (pp. 5212–5315). Dordrecht: Springer.

CARRIERI, D., PECCATORI, F. A., BONIOLO, G. (2018). Supporting Supportive Care in Cancer: The ethical importance of promoting a holistic conception of quality of life. Critical Reviews in Oncology Hematology, 131, 90-95. DOI 10.1016/jcritrevonc.2018. 09. 002.

CELLA. D. F. (1994). Quality of life: Concepts and definition. *Journal of Pain and Symptom Management*, 9, 3, 186-192. https://doi.org/10.1016/0885-3924 (94)90129-5.

CHIRAS, D. D., H. CORSON, W. H. (1997). Indicators of sustainability and quality of life: Translating vision into reality, Journal of Environmental Science & Health Part C, 15:1, 61-82, DOI: 10.1080/10590509709373490

De VAUS, D. (2002). *Surveys in social research*. 5th edition. London: Routledge.

DOSSA, P. A. (1989). Quality of life: individualism or holism? A critical review of the literature. *International Journal of Rehabilitation Research*, 12, 2, 121-136.

FORUM FOR THE FUTURE (online). What is sustainability? Available for https:// www.forumforthefuture.org/faqs/what-is-sustainability

GONZÁLES, E., CÁRCABA, A., VENTURA, J. (2011). The importance of geographic level of analysis in the assessment of the quality-of-life: The case of Spain. Social Indicators Research 102, 2, 209-228. DOI: 10.1007/s11205-010-9674-8.

HELLIWELL, J., LAYARD, R., SACHS, J. (2019). World Happiness Report 2019, New York: Sustainable Development Solutions Network.

HUGHES, C., HWANG B., KIM J. H, EISENMAN L. T., KILLIAN D. J. (1995). Quality of life in applied research: a review and analysis of empirical measures. *American Journal on mental Retardation*, 99, 6, 623-641.

IRA, V., ANDRÁŠKO, I., (2008). Quality of life in the urban environment of Bratislava: two time-spatial perspectives. Geografický časopis/Geographical Journal, 60, 2, 149-178.

IRA, V., HUBA, M. (2007). Udržateľnosť a kvalita života: niekoľko poznámok k teórii a konceptom výskumu In: Nováček, P., (ed) Udržitelný rozvoj: Nové trendy a výzvy (Sustainable Development: New Trends and Challenges. In Czech). Olomouc: Univerzita Palackého. (Sustainability and quality of life: some remarks on the theory and concepts of research. In Slovak).

IZAKOVIČOVÁ, Z. (2000). Evaluation of the stress factors in the landscape. Ekológia Bratislava, 19, 1, pp. 92-103.

JAKUBCOVÁ, A. et al. (2016). Impacts of flooding on the Quality of Life in Rural Regions of Southern Slovakia. Applied Research in Quality of Life, 11, 1, pp. 221-237.

JEDLIČKA, J. et al. (2019). Assessing relationship between land use changes and the development of a road network in the Hodonín region (Czech Republic). Quaestiones Geographicae, 38, 1, pp. 145-159.

KAPLAN, R. M., RIES, A. L. (2007). Quality of Life: Concept and Definition. *Journal of Chronic Obstructive Pulmonary Disease*, DOI 10.1080/15412550701480356.

KARLÍK, L. et al. (2018). Vineyard zonation based on natural terroir factors using multivariate statistics - Case study Burgenland (Austria). OENO ONE, 52, 2, DOI: 10.20870/oeno-one.2018. 52. 2.1907

KELLEY-GILLESPIE, N. (2009). An Integrated Conceptual Model of Quality of Life for Older Adults Based on a Synthesis of the Literature. *Applied Research in Quality of Life,* 4, 3, 259-282. DOI 10.1007/s11482-009-9075-9.

KROL, Ch. (2008). Social capital and the Happiness of Nations. The Importance of Trust and Networks for Life Satisfaction in a Cross-National Perspective. Bruxelles/Frankfurt a. M./New York/Oxford: Peter Lang Publishing.

KUBINSKÝ, D et al. (2015) Open Geosciences. Changes in retention characteristics of 9 historical artificial water reservoirs near Banská Štiavnica, Slovakia. 7, 1, pp. 880-887.

KYLE, G. (2014). Place-Related Measures. In Michalos A.C. (eds) Encyclopedia of Quality of Life and Well-Being Research, pp. 48164819. Springer, Dordrecht.

LIESKOVSKÝ, J. et al. (2018). Historical land use dataset of the Carpathian region (1819-1980). Journal of Maps, 14, 2, pp. 644-651.

LYUBOMIRSKY, S., SHELDON, K. M., SCHKADE, D. (2005). Pursuing happiness: The architecture of sustainable change. *Review of General Psychology*, 9, 111–131.

McCANN, J. E. (2004). 'Best Places': Interurban competition, quality of life and popular media discourse. *Urban Studies*,41(10), 1909–1929. doi: 10.1080/0042098042000256314.

McCARTHY, J. (2019). Six in Seven Americans Satisfied with Their Personal Lives. Gallup Poll. https://news.gallup.com/poll/246326/six-seven-americans-satisfied-personal-lives.asp x. 9. 5. 2019.

MEDERLY, P., NOVÁČEK, P. TOPERCER, J. (2003). Sustainable development assessment: Quality and sustainability of life indicators at global, national and regional level. Foresight, 5(5):42-49, DOI:10.1108/14636680310507307.

MOSER, G. (2009). Quality of life and sustainability: Toward person–environment congruity. Journal of Environmental Psychology. 29, 3, 351-357. https://doi.org/10.1016/j.jenvp.2009. 02. 002.

MUCHOVÁ, Z. (2019). Assessment of land ownership fragmentation by multiple criteria. Survey Review, 51, 336, pp. 265-272.

MURGAŠ, F. (2012). Prostorová dimenze kvality života. (Space dimension of quality of life. In Czech). Liberec: Technická univerzita v Liberci.

MURGAŠ, F. (2016). Geographical Conceptualization of Quality of Life. *Ekológia (Bratislava)* 35, 4, 309-319.

MURGAŠ F. (2019). Can Easterlin's paradox be applied to the development of satisfaction with life or does the explanation lie in cultural geographical characteristics?. *Geografický časopis*. 71, 1, 3-14. DOI: https://doi.org/10.31577/geogrcas.2019. 71. 1. 01.

MURGAŠ F., KLOBUČNÍK M. (2016a). Municipalities and Regions as Good Places to Live: Index of Quality of Life in the Czech Republic. *Applied Research in Quality Life*, 2016, 11, 2, 553–570. DOI: 10.1007/s1148 2-014-9381-8.

MURGAŠ F., KLOBUČNÍK M. (2016b). Does quality of place affect well-being? Ekológia (Bratislava), 35, 3, 224–239, 2016. DOI:10.1515/eko-2016-0018.

MURGAŠ F., KLOBUČNIK M. (2018). Quality of life in the city, quality of urban life or well-being in the city: Conceptualization and case study. Ekologia (Bratislava), 37, 2, 183–200, DOI :10.2478/eko-2018-0016.

PACIONE, M. (1982). The Use of Objective and Subjective Measures of Life Quality in Human Geography. Progress in Human Geography. 6 4, 495-514. https://doi.org/10.117 7/030 913258200600402

PHILLIPS, D. (2006). Quality of Life: Concept, Policy and Practice. London: Routledge.

PETROVIČ, F., MUCHOVÁ, Z. (2013). The potential of the landscape with dispersed settlement (case study Čadca town). Conference: Conference on Public Recreation and Landscape Protection - with Man Hand in Hand Location: Mendel Univ, Fac Forestry & Wood Technol, Dept Landscape Management, Brno, Czech Republic, p. 199

OLAH, B. (2003). Potential for the sustainable land use of the cultural landscape based on its historical use (a model study of the transition zone of the Poľana Biosphere Reserve). Ekologia (Bratislava), 22, Supplement 2, 79–91

OLAH, B., ŽIGRAI, F. (2004). The meaning of the time-spatial transformation of the landscape for its sustainable use (a case study of the transition zone of the Poľana Biosphere Reserve). Ekologia (Bratislava), 23, Supplement 1, 231–243

POL E., CASTRECHINI A., CARRUS G. (2017). Quality of Life and Sustainability: The End of Quality at Any Price. In: Fleury-Bahi G., Pol E., Navarro O. (eds) Handbook of Environmental Psychology and Quality of Life Research. International Handbooks of Quality-of-Life. Cham: Springer, https://doi.org/10.1007/978-3-319-31416-7_2. QUALITY OF LIFE RESEARCH UNIT (online) The Quality of Life Model. Toronto: University of Toronto.

RAPLEY, M. (2008). *Quality of Life Research. A Critical Introduction*. London: SAGE.

SCHALOCK, R. L. (2004). The Concept of Quality of Life: What We Know and Do Not Know. Journal of Intellectual Disability Research 48, 3, 203-216. DOI: 10.1111/j.1365-2788.200 3. 00558.x

SHYE S. (2014a). Faceted Action System Theory (FAST). In: Michalos A.C. (eds) Encyclopedia of Quality of Life and Well-Being Research, pp. 2119-2125. Springer, Dordrecht.

SHYE S. (2014b). Systemic Quality of Life Model (SQOL). In: Michalos A.C. (eds) Encyclopedia of Quality of Life and Well-Being Research, pp. 6569-6575. Springer, Dordrecht.

SLÁMOVÁ, M., BELČÁKOVÁ, I. (2019). The Role of Small Farm Activities for the Sustainable Management of Agricultural Landscapes: Case Studies from Europe. Sustainability, 11, 21, DOI: 10.3390/su11215966

SPURNÝ, M. (2019). *Spokojenost se životem – březen 2019*. Tisková zpráva. (Satisfaction with life-March 2019. Press release. In Czech). Praha: Centrum pro výzkum veřejného mínění při Sociologickém ústavu AV ČR v.v.i. Available at https://cvvm.soc.cas.cz/media/comform2c ontent/documents/c2/a4907/f9/ov190418.pdf. SUSTAINABILITY MONITOR OF THE NETHERLANDS, third edition (2015). The Hague: Statistics Netherlands.

TÁRNIKOVÁ, M., MUCHOVÁ, Z. (2018). Lands cover change and its influence on the assessment of the ecological stability. Applied Ecology and Environmnetal Research, 16, 3, pp-2169-2182.

TRIP, J. J. (2007). Assessing quality of place: a comparative analysis of Amsterdam and Rotterdam. *Journal of Urban Affairs*, 29(5), 501–517. DOI: 10.1111/j.1467-9906.2007.003 62.x.

VEENHOVEN, R. (2000). The four qualities of life. Ordering concepts and measures of the good life. *Journal of Happiness Studies*, 1, 1-39.

VEENHOVEN, R. (2014). Quality of life (QOL), an overview. In A. C. Michalos (Ed.), *Encyclopaedia of quality of life and well-being research* (pp. 5265–5268). Dordrecht: Springer.

VEENHOVEN, R. (2016). Quality of life and happiness: concepts and measures. In: Bruni, L., Porta, P. L. (eds). Handbook of Research Methods and Applications in Happiness and Quality of Life, pp. 309-333. Cheltenham, UK, Northampton, MA, USA: Edward Elgar.

VENTEGODT, S., KANDEL, I., MERRICK, J. (2006). Principles of Holistic Medicine: Quality of Life and Health. New York: Hippocrates Scientific Publications.

VONK, M. (2011). Sustainability and Quality of Life. A study on the religious worldviews, values and environmental impact of Amish, Hutterite, Franciscan and Benedictine communities. Amsterdam: Vrije Universiteit.

WERNEBURG, G. T., KONGNYUY, M. HALPERN D. M., SALCEDO, J. M., KOSINSKI, K. E. HAS, J. A., SCHIFF, J. T. CORCORAN, A. T., KATZ, A. E. (2018). Patient –reported quality of life progression in men with prostate cancer following primary cryotherapy, cyberknife, or active holistic surveillance. Prostate Cancer and prostatic Diseases, 21, 3, 355-363. DOI 10.1038/s41391-017-0004-y.

FOLIA GEOGRAPHICA • ISSN 1336-6157 (hard copy) • ISSN 2454-1001 (online)

CITY CENTRE RESIDENTS' OPINION ON INNER QUARTER RENEWAL: A CENTRAL EUROPEAN CASE STUDY

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Received: January 6, 2020 | Revised: February 23, 2020 | Accepted: May 4, 2020
Paper No. 20-62/1-549

Abstract
Since the political change of regime in 1990, tendencies previously characteristic of Western European urban areas, such as city centre regeneration, revitalization, gained momentum in post-communist cities as well. The ruined city centres' renewal aimed at the creation of liveable surroundings. The goal of this article is to explore how residents of Debrecen, East Hungary, viewed the regeneration of the city centre, what this process meant to them and what kind of positive and negative results could be observed in relation to the surroundings' alteration.

Key words
Cities in post-communist countries, Debrecen, Urban renewal, Questionnaire survey, residents' opinion.

INTRODUCTION

Local governments have striven for the regeneration of post-communist city centres since the beginning of the 1990s. In this process, the revitalization of city centres ruined during the decades of socialism played a vital role (Matlovič, 2014). The creation of more liveable cities was one of the most important objectives of such projects. On the one hand, residents were offered new physical, more comfortable surroundings. On the other hand, these changes also brought about unexpected reactions: some welcomed the changes, while others had doubts about them.

In the spirit of the above the aim of this article is to explore the various reactions of downtown Debrecen residents to city centre renewal and analyse the differences of opinions in view of the respondents' sex, age, education and type of housing.

THEORETICAL FRAMEWORK

During the last decades, different periods of downtown development were distinguished by researchers (Egedy and Kovács, 2005; Horváth, 2019). After World War II, during the 1940s and 1950s, one of the most important aims of urban reconstruction was clearing ruined quarters and building new ones. The new period of urban

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revitalization, which appeared in the 1960s and dominated the 1970s, focused on the restoration of buildings built before World War II. In the next decade, a new component emerged by the name of urban renewal. As a new element of these processes it could be witnessed that instead of projects financed by government resources, local governments and private capital appeared among the investors.

Since the 1990s the concept of sustainability has gained more terrain, and it generated the new approach called urban regeneration. There is no consensus on the exact meaning of this concept. Kazimierczak and Kosmowski define it as: 'Urban regeneration consists in the multifaceted revitalisation of urban areas deprived of their economic, social and technical livelihoods. Although it focuses on areas of diverse origin and functions, it always aims at improving the quality of space (landscape) and utility, including the housing function' (Kazimierczak and Kosmowski, 2018, p. 37). According to Hall, urban regeneration is a proactive set of interventions designed primarily to ameliorate against the negative consequences of urban decline (Hall, 2006, p. 57). Nevertheless, Robert's definition is the most widely embraced by researchers. In his view, 'urban regeneration is a comprehensive and integrated vision and action which leads to the resolution of urban problems and which seeks to bring about a lasting improvement in the economic, physical, social and environmental condition of an area that has been subject to change' (Roberts, 2010, p. 17.).

In the Central European region, the above tendencies appeared to varying extent. After World War II, demolition of the severely damaged inner quarters could be observed mainly in big cities (e.g. Warsaw, Berlin) (Horváth, 2019). It was followed by the construction of new residential buildings suited to the socialist architectural concept. After the change of regime – drawing on the first experiences in the 1980s – projects were launched in many countries (Keresztély and Scott, 2012; Matlovič et al., 2014; Hlavacek et al., 2016; Sykora, 2017; Stryjakiewicz et al., 2018; Nedučin et al., 2019).

The most essential component of the investigation is the analysis of the impact of the projects. It is carried out by the application of two methods. Firstly, the positive and the negative results of the alterations are demonstrated by statistical data and, secondly, the projects' impacts are examined through surveys studying mainly residents' opinion (Bucher et al., 2013). Research of the first type examines, for example, institutions which offer both leisure and entertainment activities and may be increasingly important in the cities' everyday life (Nedučin et al., 2019). Research may also indicate advantages offered by the renewed buildings, or the development in commercial or business life (Guimarães, 2017).

Some questionnaire surveys show that the increasing demand for parking place is a serious problem (Hlavacek et al., 2016), while others find a growing need for public recreation space and residential buildings (Kunc et al., 2014). Other surveys

discuss the improvement of public security and interpersonal relationships as important factors (Jalaludin et al., 2012). According to a survey carried out among businesses, residents, and customers, 'the improvements encourage private investment' as well (Kozma, 1998; Bromley et al., 2003).

Several questionnaire surveys examine the relationship between residents and the renewed quarters. A special group of these surveys deals with elderly people's satisfaction with improved surroundings (Temelová and Dvořáková, 2012), or the youngest generation's attitude to the regeneration projects and their needs (O'Brien et al., 2000).

Among other issues, Albertini and her co-authors call attention to the varying priorities of different parties involved in regeneration projects. They state that 'the residents and the public officials/stakeholders care about several aspects of urban regeneration and sustainability, and that in some cases their views are sharply different' (Albertini et al., 2006). Murzyn arrives at a similar conclusion when she states that 'the private, public and local interests and needs are often divergent and hard to reconcile'. In her view, 'the main problem involves the functioning of the quarter as an attractive leisure and entertainment area versus its residential function' (Murzyn, 2006).

Yet another essential issue is how the relationship between the city centre and the city's other parts may have changed in the last decades (Matlovič and Sedláková, 2007).

THE BACKGROUND

In the 20th century there was a lapse in the centuries-old organic development of Debrecen's historical city centre. The differences within the city centre are partly the result of the terrible destruction during World War II, and partly of the (socialist) reconstruction. Some inner quarters' rebuildings during the communist regime and the projects carried out with varying success after the change of regime also contributed to the area's uneven development. Due to the above mentioned factors, there are substantial differences in the built environment and the role and function of city centre quarters of Debrecen.

In spite of socialist development programs, by the time of the change of regime, the major part of the central area had become severely dilapidated therefore various city regeneration projects were recommended to be planned by experts (Süli-Zakar, 1994).

The different regeneration projects launched around the turn of the millennium have changed the historical city centre of Debrecen to a great extent. In particular, the main square (Kossuth Square) and its near surroundings have been radically altered. The city centre's changes (the importance of city regeneration in Debrecen and its effects) and the development of residential areas have been discussed by

the authors of the present article in several publications (Kecskés, 2015., 2018., Kozma, 2016). It should also be noted that these projects have had various effects on diverse parts of the city centre (e.g. residential areas developed differently), and we believe that some areas show greater changes than others.

Based on the findings of our questionnaire survey, this study shows how city centre residents view these regeneration projects. It is of vital importance to Debrecen's city centre's regeneration, because no similar studies have been conducted in the field.

DATA AND METHODS

This study is based on former social-geographical surveys conducted by the Department of Social Geography and Regional Development Planning and the Sociology and Social Policy Department of the University of Debrecen. The questionnaire charted by sociologist Csaba Béres and his co-workers was also used by the authors of this study (Béres, 1996).

The novelty of this study partly derives from its topic, city regeneration from residents' point of view, and from our contention that distinct housing types are a crucial component of residents' reception of regeneration projects. In comparison with former surveys, since the selection of respondents of this study was based on types of housing and surroundings, the research covered a much greater area than similar surveys had done. It included almost the entire historical city centre.

The basis of this survey are the results of questionnaires answered by city centre residents in summer 2019. The questionnaires provide information on residents' relationship with the regenerated, renewed city centre and how these changes have affected the respondents' neighbourhood.

A simple random sampling method was used during the interviews: respondents were visited by pollsters in their homes, and 160 questionnaires were answered. In addition to determining sampling criteria, it was also important that respondents come from diverse parts of the historical city centre, live in various types of dwellings, and are of different age, too.

Based on the questions on the types of residential buildings, four categories of dwellings within the historical city centre were found (Fig. 1):

1. Multi-storey block of flats built before 1945, mainly found in the main street or its close vicinity (1.).
2. Housing complex (groups of blocks of flats) in the historical city centre, built after World War II. They usually consist of four- or ten-storeyed brick or block buildings (2/a, 2/b, 2/c).
3. Multi-storey block of flats, built after the change of regime in diverse parts of the historical city centre (3.).

4. One-storied detached houses (or parts of a real estate), found in that part of the historical city centre that statistical publications call the "city's traditionally built residential area" (4/a, 4/b).

Survey results were recorded in an Excel file, and data was processed with IBM SPSS Statistics 23.

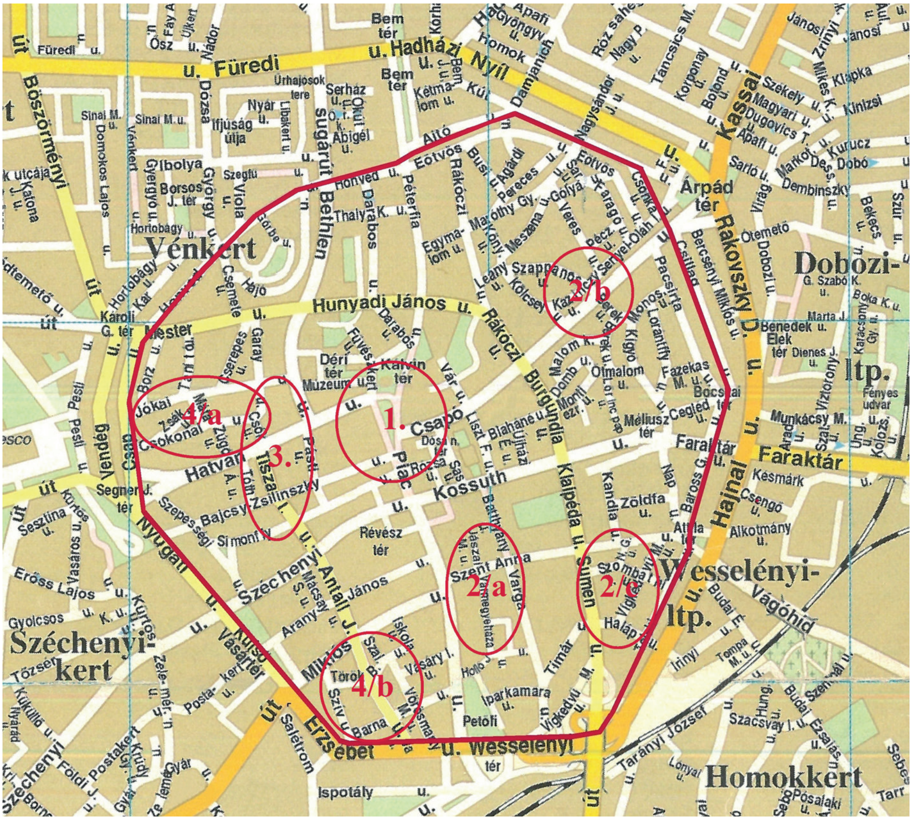

Figure 1
Debrecen's historical city centre – the area of research
Source: *own work*

RESULTS AND ANALYSIS

The first group of questions addressed residents' relationship to their quarters. The authors inquired what the respondents' positive and negative opinions about their surroundings were in each type of dwellings. Respondents had to rank positive and negative attributes from the most to the least attractive characteristics of their surroundings.

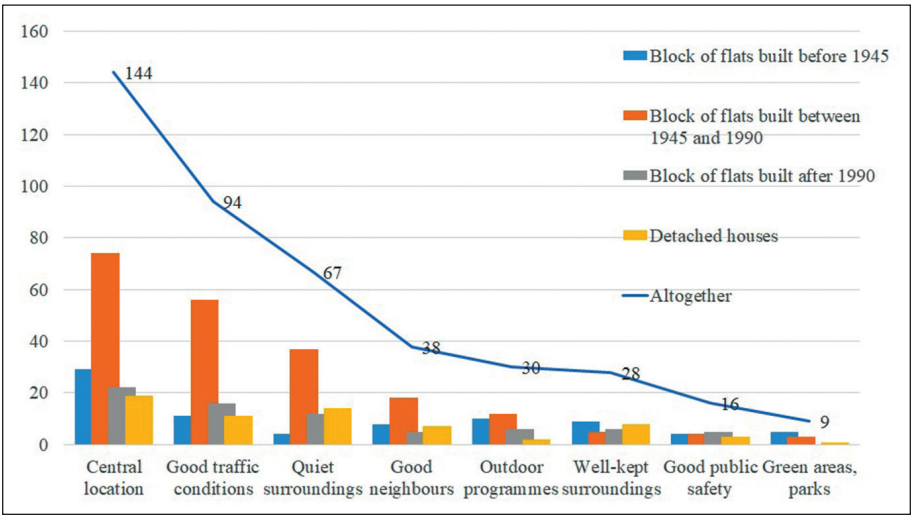

Figure 2
Benefits of the location
Source: *own survey*

Each group responded that the central location was the most important benefit. (Fig. 2).

Irrespective of types of housing, the most frequently cited advantages were the central location and, closely related to it, good traffic conditions. Three groups of respondents ranked the latter as second. As regards the order of benefits, quiet surroundings were generally the third. Although a lot of respondents said that their neighbourhood was quiet, the exact opposite was also stated by residents of the same street or even the same block of flats! Only residents of detached houses with a garden ranked the importance of 'quiet surroundings' second on the list of advantages. The explanation of this ranking lies in the fact that the majority of detached houses are located in Debrecen's historical city centre, far from crowded high streets, usually in the quieter side streets. Residents bought the properties in this part of the city centre because they wanted to live in a peaceful neighbourhood.

Among residents of multi-storey blocks of flats (except for those living in houses built before 1945), the quiet surroundings was the third most important positive factor. The importance of good neighbours and outdoor programmes were placed after the above mentioned points. The number of green areas, their condition (some of them were full of rubbish and untended), and the lack of public safety (primarily the presence of homeless people in the vicinity of residential buildings and in the stairways) were mentioned as the least positive characteristics. These were put at the end of the list because residents found them to be the most serious problems in their area.

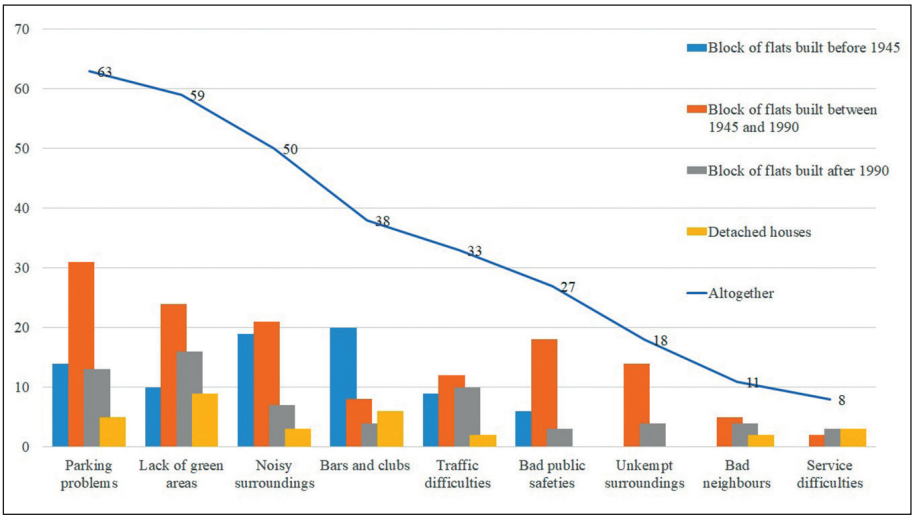

Figure 3
Disadvantages in the surroundings
Source: *own survey*

Unlike in the case of positive factors, responses on the negative features by residents of the four types of dwellings showed no consonance. But shortage of parking space and expensive parking fees were mentioned almost unanimously in the first place as the greatest problem for (almost) everybody (Fig. 3).

Parking problems in Debrecen originate from increasing motorisation and the relatively few car parks and underground garage, which cannot keep up with the demands. Another problem is that parking is not free, in fact, sometimes, rather pricy, almost everywhere in the historical city centre of Debrecen.

Only residents who live in blocks of flats built before 1945 said that the noise caused by outdoor programmes (concerts, festivals, etc.) is more disturbing than parking problems. A relatively large number of respondents living in the city centre's housing estates mentioned noise as a disturbing factor as well. They often complained about the noise of motor vehicles (this is a problem mostly in the busy Csapó Street), and the same respondents also complained of nightly disorderly behaviour of customers of places of entertainment. (The latter also troubled those respondents who live near the main square.) For this reason, some respondents think that public safety is lacking. The unwanted presence of the homeless who settled near residential buildings was mentioned among the problems as well. For respondents living in detached houses, the disturbing factors might not be related to the outdoor programmes organised on the main square or its surroundings. We found that instead of outdoor programmes, these residents may experience drunken patrons of nearby pubs and bars to be a threat to public safety.

A relatively large number of respondents marked the lack of parks and green areas among the negative factors, and even if there were some recreational areas near their housing, they were neglected and were usually heavily littered. The majority of respondents living in flats built after 1990 marked this factor as the greatest problem of their surroundings. (It is important to note that the lack of green areas and the regeneration of parks have resulted in the Green City Project of Debrecen. As a result, in the past few years, a lot of park renewal projects have been started (or were finished) in various parts of the city.)

Heavy traffic and the lack of public transportation services were also indicated as negative features by those who live farther from the city's main roads, mostly in the hard-to-reach side streets. For example, for residents of detached houses, the lack of transportation services may occur as a specific problem. The background of this problem may well be the greater distance from main roads, where a lot of shops and service facilities are located.

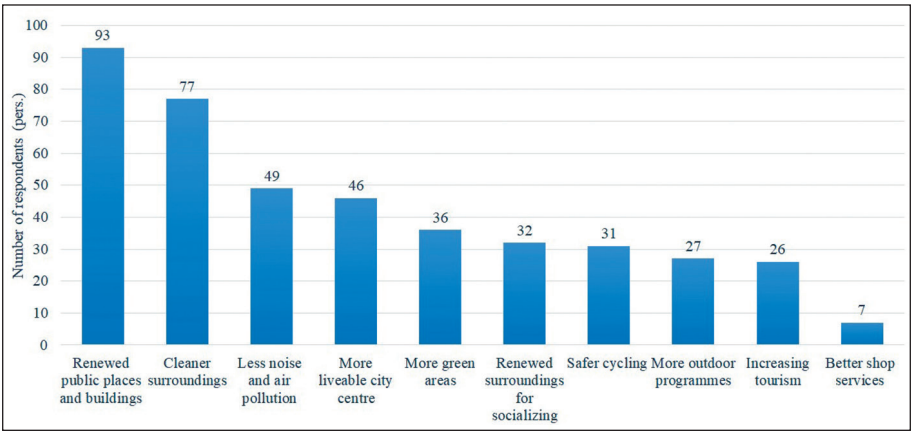

Figure 4
The importance of city centre regeneration for respondents
(respondents could mark three options)
Source: *own survey*

The second group of survey questions addressed the city centre's renewal. The authors wanted to collect data on why the city centre's regeneration is important for residents and what their opinion is about projects that have already been finished. Based on respondents' expectations, we conclude that besides renewed public places and buildings, respondents believe the neat and clean environment to be the most important factor (Fig. 4).

Residents also found the reduction in noise and air pollution important and it substantially contributed to the sense of more liveable surroundings. Respondents

thought that the formation and extension of green areas could secure the improvement of their quality of life. As regards importance, perhaps the low ranking of outdoor programmes in pedestrian zones is the most surprising. We propose two possible explanations. Firstly, the number of aged city centre residents is high, and their majority has not attended such events yet. Secondly, although it was not always unambiguous, these programmes, which often entail noise and littering, can be troublesome for residents.

In general, the development of the city centre was received positively: more than one third of respondents (36%) thought that the quarter's renewal had a positive effect on their surroundings (Fig. 5), and only one fifth of them (20%) said that the renewal had no effect on their surroundings. Considering the dimension of the alteration of the city centre, these data may be surprising. The changes mainly affected the sparsely populated and fancy inner part of the city centre, crowded with shops and offices, but the more populous and traditional sections of the centre behind the main street were left out, that is, the city's inner residential quarters are still waiting for major alteration. In general, 11% of respondents had a negative attitude towards the changes. Some factors, such as the above-mentioned noise, dirt and the presence of homeless people could contribute to it. 10% of respondents were indecisive on this question.

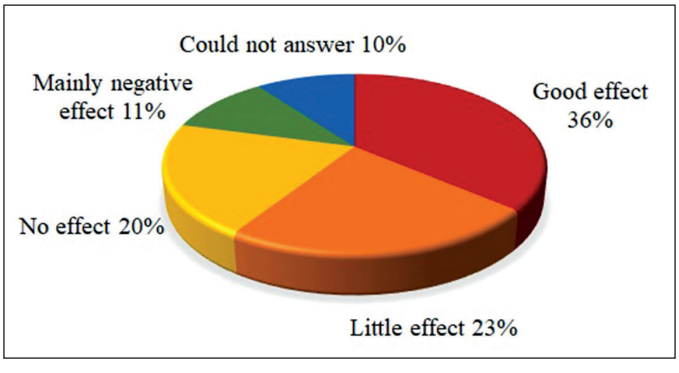

Figure 5
Renewed city centre's effect on respondents' surroundings
Source: *own survey*

In relation to accomplished projects, significant differences can be observed among the different dwelling categories (Table 1).

A large proportion of respondents living in blocks of flats built before 1945 thought that the regeneration of the city centre had a good effect on their surroundings. We can state that the people living near the city's main square profited the most from the city centre's renewal and modernisation. Nevertheless, it is in-

Table1 Renewed city centre's effect on the respondents' surroundings (%)

Renewal's effect	Block of flats			Detached houses
	Built before 1945	Built between 1945 and 1990	Built after 1990	
Good effect	50.0	28.0	26.1	57.1
Little effect	16.7	24.0	43.5	4.8
No effect	6.7	30.7	13.0	9.5
Mainly negative effect	20.0	5.3	13.0	14.3
No answer	6.7	12.0	4.3	14.3

Source: *own survey*

teresting to note that the proportion of ranking the changes mainly negative was the highest in this group. One of the reasons can be the annoying effect of some outdoor programmes organised in those public places that were altered into pedestrian zones in the last decades. The other reason can be the banning of motor vehicles from the public areas of the city centre resulting in residents experiencing restriction in movement and parking problems (parking restrictions, high parking fees, etc.).

Although divided on some aspects, the greatest proportion of people living in blocks of flats built between 1945 and 1990 thought that the renewal of the city centre did not have any effect on their surroundings. The explanation to such inconsistency may be that these flats are the most heterogeneous in terms of their condition and, in many cases, the spectacular investments of different city regeneration projects have avoided the surroundings of these buildings. We must note that people living in the middle section of the busy Csapó Street or in Vármegyeháza Street, that is, hidden behind Piac Street, which is as important as the main square in Debrecen, or farther from the city centre (e.g. residents of Wesselényi housing complex) could hardly experience the regeneration of inner quarters.

In comparison with the other three types, blocks of flats built after 1990 are spread throughout the city centre. They are located not only in the close neighbourhood of Kossuth Square and Piac Street, but at the edge of the historical city centre, along busy main roads and in quieter side streets as well. The majority of respondents in this type of housing thought that the regeneration and renewal of the city centre had only a little effect on their surroundings. This may indicate a cautious, but a fundamentally positive attitude towards the regeneration of the city centre.

As concerns the connection between the regeneration of the city centre and surroundings, answers by residents of detached houses were the most surprising.

Compared to other groups, the ratio of respondents who thought that the regeneration of the city centre positively affected their surroundings was the highest here (57%). It is remarkable because the majority of this kind of houses are usually located far from those parts of the city centre that were involved in the alteration. The reason may be that respondents are aware of the alteration and development of the city centre, too. On the other hand, the changes either did not have any negative effects at all or only to a small extent. These residents may visit programmes organised in the renewed public places, but they are not disturbed by the noise, their areas are not littered, and they do not have to face parking problems every day. On the whole, they belong to that group of Debrecen residents who mainly enjoy the advantages of the alteration of the city centre. As compared to all four groups, the ratio of those who could not answer what effect the regeneration of the city centre had on their surroundings was the highest here. They were, in part, the same respondents who took the longest time to answer this question and were uncertain about the regeneration's effects on their surroundings.

The examination of respondents' age and sex led to the following conclusions:

The interviews indicated that it is predominantly the elderly residents who welcomed the changes and their extent. It is most likely rooted in the fact that the elderly had seen the former condition of the city centre and they have a basis of comparison. On the other hand, respondents from younger age groups were born into these circumstances and, due to their age, cannot remember what the situation was two decades ago.

A comparison of answers by male and female respondents shows that the majority of both groups think that the various regeneration projects have contributed to the significant development of the city centre. Among female respondents, the highest ratio is of those who find the changes positive. The total percentage of women who marked "a lot of developments' or 'developments' is 86%. This ratio is 77% in the male group. In both the male and the female group, the ratio of respondents not satisfied with changes (those who do not recognize the development or mainly see the disadvantages of regeneration) was under 5% (Table 2).

In view of respondents' educational background, we can state that respondents with higher level of education (university or college degree) appreciate the alteration of the city centre more than those with less schooling (respondents with different secondary school qualifications). 89% of respondents with more education thought that a lot of developments helped the renewal of the city centre or these developments were sufficient. More than three quarters (76%) of respondents with lower qualification marked the advantages of the changes as well. Almost one quarter of them thought that the results achieved were not sufficient (Fig. 6-7).

Table 2 Men and women's opinion – in different age groups – about regeneration (%)

	Men				Women			
	18-39	40-59	60-x	Total	18-39	40-59	60-x	Total
Lots of developments	4.7	8.1	11.3	24.2	4.6	14.9	17.2	36.9
Developments	21.0	21.0	11.3	53.2	13.8	20.7	14.9	49.4
Few developments	6.5	11.3	0.0	17.8	4.6	2.3	1.1	8.0
No developments	0.0	1.6	0.0	1.6	0.0	0.0	0.0	0.0
Mostly negative effects	0.0	0.0	0.0	0,0	0.0	0.0	2.3	2.3
No answer	0.0	0.0	3.2	3.2	2.3	0.0	1.1	3.4
Total	32.2	41.0	25.8	100.0	25.3	37.9	36.8	100.0

Source: *own survey*

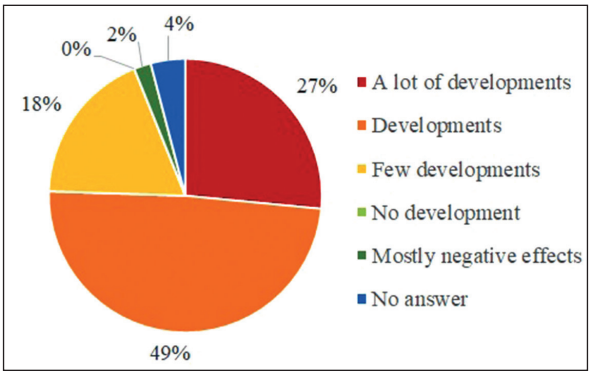

Figure 6
Opinion of respondents with secondary school certificate about regeneration
Source: *own survey*

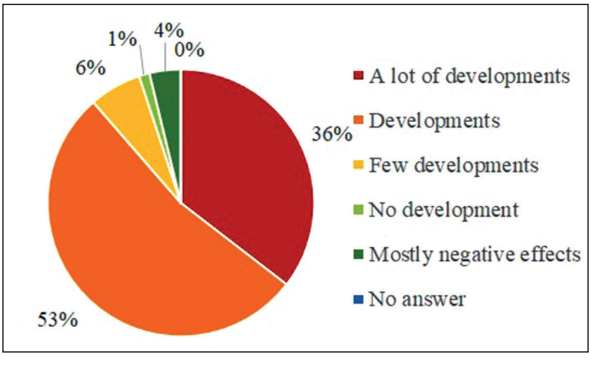

Figure 7
Opinion of respondents with university/college degree about regeneration
Source: *own survey*

The analysis of answers in view of respondents' sex or schooling indicates that, in spite of diverse problems, the regeneration of the city centre has a massive social support in Debrecen.

The third group of questions aimed at finding a connection between the regeneration of the centre and potential moving out. We established a direct relationship between the successful city regeneration and residents' intention to move. The intention to leave the area is influenced by the positive or negative relation to the city centre.

The most important finding is that city centre residents strongly hold onto their homes and their familiar surroundings (Fig. 8). Although it is true to all age-groups, the intent to move can be mainly seen among the youngest, and it might be natural. As Figure 8 shows, people over 60 do not want to move out from the city centre at all. Furthermore, many of them said that they did not want to leave their home at all! (This was also said by respondents living in blocks of flats that have not seen any renovation or modernisation for ages.)

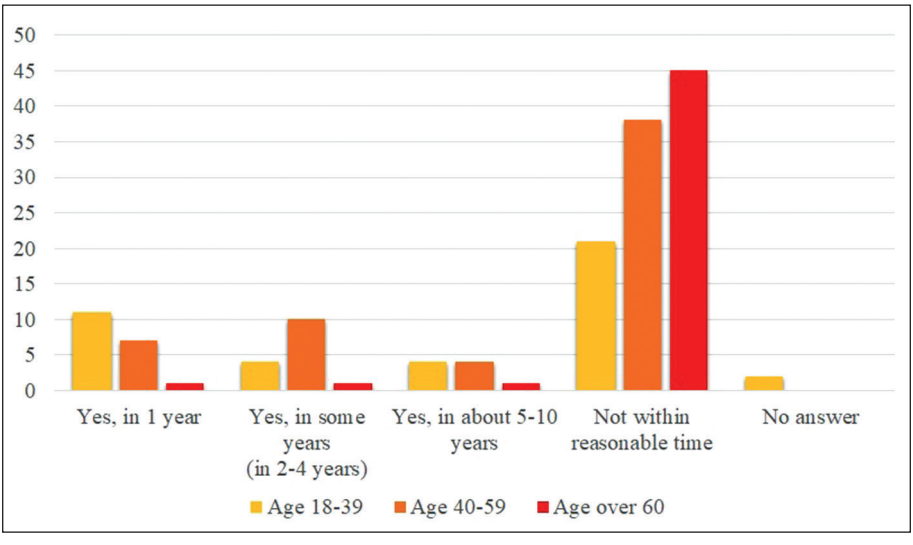

Figure 8
Respondents' potential moving intention and its predictable time
Source: *own survey*

Dissatisfaction with mainly the condition or size of flats was the first (38%) among the reasons for possible moving (Fig. 9). Primarily flat owners who live in older houses in need of modernisation were dissatisfied with conditions. The high rate of 'other reasons' (22%) needs some further explanation. Behind choosing this answer there might be some intention to move, but it is difficult to express

and sometimes it has not been seriously considered yet. It might be connected to family reasons or the difficulty of changing jobs, or some other issues in the background. 'Family reasons' were mentioned by many respondents as well (21%). In contrast, the surroundings as the reason for a possible move was only marked by 6% of respondents. The fact that people living in the inner quarters are fundamentally satisfied with both the condition of their surroundings and the renewal of the city centre may explain this finding.

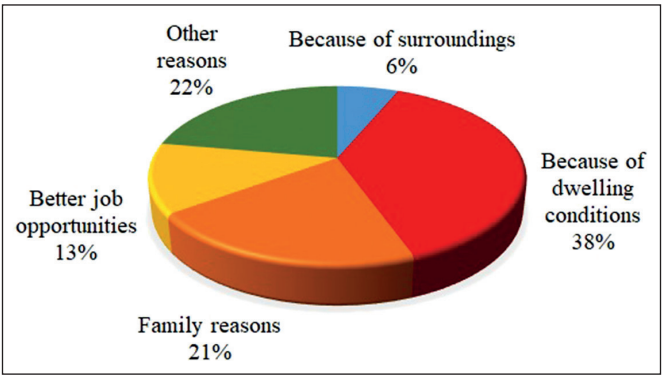

Figure 9
Respondents' reasons for moving out
Source: *own survey*

CONCLUSIONS

The aim of this questionnaire survey was to collect information about residents' opinion on the renewal of the city centre in Debrecen.

Respondents could choose from not only the positive but negative factors as well, and they ranked the sections of the city regeneration project in accordance with their personal experience. Beside similarities, respondents had varied opinion on areas to be developed and, in many cases, they also mentioned various positive and negative factors in connection with their surroundings.

The data collected for this study also confirms our hypothesis that the condition of the dwelling place and its surroundings play a vital role in residents' opinion on regeneration. We saw that people with diverse housing conditions in various surroundings experience the renewal of the city centre differently. In general, residents appreciated the developments and they also marked areas in need of development. Naturally, respondents' points of view on the necessity of development in different areas, sometimes even within the same household, may vary. We found that these differences sometimes originate in respondents' diverse demands.

During the survey we observed that age and schooling also influence the choice of areas to be developed. The survey also proved that men and women's opinion may differ on the effect of city regeneration.

Although respondents often had distinctive opinions on the effects of city centre regeneration, they all considered the changes fundamentally positive. We may conclude that the majority of respondents appreciate the development of the city centre of Debrecen and since they like living in this part of the city they do not want to move.

REFERENCES

ALBERTINI, A., ALBERTO L., PATRIZIA R. (2006). *Using Surveys to Compare the Public's and Decisionmakers' Preferences for Urban Regeneration: The Venice Arsena*-le. Fondazione Eni Enrico Mattei, November, 2006.

BÉRES, Cs. (1996). A debreceni belváros szociológiai problémái [The city centre's social problems in Debrecen]. In Süli-Zakar, I., ed., *Tanulmányok Debrecen városföl-drajzából II.* Debrecen: Kossuth Lajos Tudományegyetem Társadalomföldrajzi Tanszék, 71-88.

BROMLEY, R., MARTIN H., COLIN T. (2003). The impact of environmental improvements on town centre regeneration. The Town Planning Review, 74, 2, 143-164.

BUCHER S. L., MATLOVIČ, R., LUKÁČOVÁ, A., HARIZAL B., MATLOVIČOVÁ, K., et al. (2013). The Perception of Identity through urban toponyms in regional cities of Slovakia. *Anthropological Notebooks*, 19, 3, 23-40.

EGEDY, T., KOVÁCS Z. (2005). A városrehabilitáció néhány elméleti kérdése [City regeneration's some theoretical questions] In Egedy, T., ed., *Városrehabilitáció és társadalom*. Budapest: Magyar Tudományos Akadémia Földrajztudományi Ku-tatóintézet, Budapest, 9-20.

GUIMARÃES, P.P.C. (2017). An evaluation of urban regeneration: the effectiveness of a retail-led project in Lisbon. *Urban Research & Practice*, 10, 3, 350-366.

HALL, T. (2006). *Urban Geography*. Oxon: Routledge.

HLAVACEK, P., PAVEL R., MARTIN B. (2016). Regeneration projects in Central and EasternEuropean post-communist cities: Current trends and community needs. *Habitat International*, 56, 31-41.

HORVÁTH, D. (2019). *A városi diverzitás és a városrehabilitáció kapcsolatának társadalomföldrajzi vizsgálata Józsefvárosban* (Doktori PhD értekezés), [A human geographical analysis of the relationship between urban diversity and urban renewal in Józsefváros] Szeged, 2019.

JJALALUDIN, B., MICHELLE M., BASEMA S. et al. (2012). A pre-and-post study of an urban renewal program in a socially disadvantaged neighbourhood in Sydney, Austra-lia. BMC Public Health, 12, 1,

KAZIMIERCZAK, J., KOSMOWSKI, P. (2018). Post-industrial urban areas in the context of ruination, demolition and urban regeneration in a post-socialist city: Experiences of Łódź, Poland. *Finisterra-Revista Portuguesa de Geografia*, 109, 3551.

KECSKÉS, T. (2015). The regeneration of Debrecen city centre and its effect on the functional zones. In Kordel, Z. – Josan, I. – Wiskulski, T. eds., *Geography for Society. Editura Universităţii din Oradea*, 45-69.

KECSKÉS, T. (2018). The regeneration of a Hungarian city centre from the 1990s till nowadays *Analele Universităţii din Oradea, Seria Geografie*, 28, 1, 54-71.

KERESZTÉLY, K., SCOTT (2012). Urban Regeneration in the Post-Socialist Context: Budapest and the Search for a Social Dimension. *European Planning Studies*, 20, 7, 1111-1134.

KOZMA, G. (1998). A lakosság térbeli preferenciáinak vizsgálata Debrecenben [Spatial preferences of inhabitants in Debrecen]. Társadalomkutatás, 16, 1-2, 43-57.

KOZMA, G. (2016). A debreceni lakóterületek II. világháború utáni fejlődésének társadalomföldrajzi vizsgálata. Didakt Kiadó, Debrecen.

KUNC, J., NAVRÁTIL, J., TONEV, P. et al. (2014). Perception of urban renewal: Reflexions and coherences of socio-spatial patterns (Brno, Czech Republic). *Geographia Technica*, 9, 1, 66-77.

MATLOVIČ, R. (2014). Adaptative Transformation of the Intra-Urban Structures in Postsocialist Period: Ontological and Epistemological Considerations (Adaptačná transformácia intraurbánnych štruktúr v postsocialistickom období: ontologické a epistemologické úvahy). *Acta Facultatis Studiorum Humanitatis et Naturae Universitatis Presoviensis, Prírodné vedy, Folia Geographica*, 56, 2, 5-13.

MATLOVIČ, R., SEDLÁKOVÁ, A. (2007). Transformation processes of the urban space in post-communist cities. *Przemiany przestrzenne w duzych miastach Polski i Europy srodkowo-wschodniej*. – Krakow: Zaklad Wydawniczy NOMOS, 32-46.

MATLOVIČ, R., MATLOVIČOVÁ, K., KOLESÁROVÁ, (2014). Conceptualization of the historic mining towns in Slovakia in the institutional, urban-psysiological and urban-morphological context. In Radics, Pénzes, eds., *Enhancing competitiveness of V4 historic cities to develop tourism. Spatialeconomic cohesion & competitiveness in the context of tourism*. Didakt Kft., Debrecen, 165-193.

MELNYCHUK, A., GNATIUK, O. (2019). Public perception of urban identity in post-Sovietcity: the case of Vinnytsia, Ukraine. *Hungarian Geographical Bulletin*, 68, 1, 37-50.

MURZYN, M.A. (2006). 'Winners' and 'Losers' in the Game: The Social Dimension of Urban Regeneration in the Kazimierz Quarter in Krakow. In Enyedi, Gy., Kovács, Z., eds., *Social Changes and Social Sustainability in Historical Urban Centres – The Case of Central Europe*. Pécs: Centre for Regional Studies of Hungarian Academy of Science, Pécs, 81-106.

NEDUČIN, D., KRKLJEŠ, M., GAJIĆ, Z. (2019) Post-socialist context of culture-led ur-

ban regeneration – Case study of a street in Novi Sad, Serbia. *Cities*, 85, 72-82.

O'BRIEN, M., RUSTIN, M., GREENFIELD, J. (2000). *Childhood Urban Space and Citizenship: Child-sensitive Urban Regeneration*. London: University of North London Faculty of Environmental and Social Sciences.

ROBERTS, P. (2000). The evolution, definition and purpose of urban regeneration. In Roberts, P., Skyes, H., eds., *Urban Regeneration: A Handbook*. London: Sage Pub-lications, 9-36.

STRYJAKIEWICZ, T., ROBERT K., PRZEMYSŁAW C. et al. (2018). Urban regeneration in Poland's non-core regions. *European Planning Studies*, 26, 2, 316-341.

SÜLI-ZAKAR, I. (ed.) (1994). *Debrecen fejlesztési elképzelései*. Debreceni Regionális Gazdaságfejlesztési Alapítvány.

SÝKORA, L. (2017). Urban development, policy and planning in the Czech Republic and Prague. In Altrock, U., Güntner, S., eds., *Spatial Planning and Urban Development in the New EU Member States*, London: Routledge, 127-154.

TEMELOVÁ, J., DVOŘÁKOVÁ, N. (2012). Residential satisfaction of elderly in the city centre: The case of revitalizing neighbourhoods in Prague. *Cities*, 29, 310-317.

FOLIA GEOGRAPHICA • ISSN 1336-6157 (hard copy) • ISSN 2454-1001 (online)

SOLVING OF CLASSIFICATION PROBLEM IN SPATIAL ANALYSIS APPLYING THE TECHNOLOGY OF GRADIENT BOOSTING CATBOOST

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Received: January 19, 2019 | Revised: May 1, 2020 | Accepted: May 7, 2020
Paper No. 20-62/1-558

Abstract
In the paper two models of spatial analysis are considered. The models are dedicated for spatial analysis of ecological factors distribution, such as distribution of contaminant concentration on researched territory. The models are created using the method of machine learning – gradient boosting. In order to build the models we have used open source effective library CatBoost. Functions AUC and Accuracy were calculated for each model. MultiClass – integrated function of CatBoost library was used for loss minimization. For solving the problem, it was necessary to define affiliation of searched point from test dataset to one of four classes. This problem belongs to the type of classification, or rather multiclassification. As a result of the studies, an effective model was obtained that allows one to perform with sufficient accuracy the spatial forecast of the factor distribution at points and regions of the studied field with an unknown gradient value of this factor. This model works adequately with a training dataset of 0.5% of all analyzed information about the object.

Key words
Spatial analysis, gradient boosting, CatBoost, machine learning, neural networks, computer modeling, geoecological maps.

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INTRODUCTION

Geographical approaches to understanding origins of environmental problems are quite often used (Ilieş et al., 2017). Currently, an urgent problem in ecology is the study of the spatial distribution of various factors (Beketova et al., 2019; Gallego-álvarez et al., 2014; Glass et al., 1995; Jerrett et al., 2003; Ramazanova et al., 2019). These factors can be divided into groups:

1) natural factors (temperature, pressure, soil salinity, biodiversity, etc.);
2) technogenic factors (concentration of pollutants, soil degradation, drying out of water bodies, etc.);
3) factors associated with human life (the spread of diseases, mortality and fertility, population, etc.).

A huge amount of work has been devoted to studying the influence and distribution of these factors. (Azhayev et al., 2020; Berdenov et al., 2017; T. Z. Li et al., 2009; Matlovič and Matlovičová, 2012, 2020; Ribeiro et al., 2013; Safarov et al., 2019; Sexton et al., 2002; Vicente et al., 2014). The knowledge of the spatial distribution of such factors allows us to draw conclusions about the degree of influence, dynamics and directions of distribution, helps to identify the main trends in the change in the situation associated with the influence of the factor on the environment. In addition, these data allow us to make predictions of the situation over time. (Berrocal et al., 2010; Ilieş et al., 2019; Mihincău et al., 2019; Paci et al., 2013; Sahu et al., 2009).

When implementing spatial analysis, the problem of lack of data, or uneven distribution of data, often arises. For example, Meyer et al. (Meyer et al., 2019) presented a map of the location of weather stations in Antarctica (Figure 1). The figure shows that the weather stations are located unevenly on the mainland and there are not many data sources. When the question arises of obtaining extended data at other points located not near the stations, it is necessary to consider various approaches of spatial forecasting. The most common computer modeling methods are statistical methods of interpolation and extrapolation. Currently, computer models obtained through the application of machine learning approaches, in particular neural networks, are gaining more and more popularity (R. Li et al., 2020; Murtagh et al., 2000; Shoji and Kawakami, 2006).

The problem of spatial prediction of the distribution of factors is the significant non-linearity of the existed dependencies (Casati et al., 2004; Madadgar and Moradkhani, 2014). Non-linearity is due to the specificity of the task, the influence of the landscape, weather conditions, the mixed sources of the factor, etc. In such analytical problems as forecasting, including spatial forecasting, decisions are based on known available data and the more known data we have, the more detailed the forecast can be. But, often, as in the example of Antarctica, there is not much data. This is due to the technical complexity or cost of analysis, the inaccessibility of locations for sampling, lack of human resources to perform monitoring analytical work.

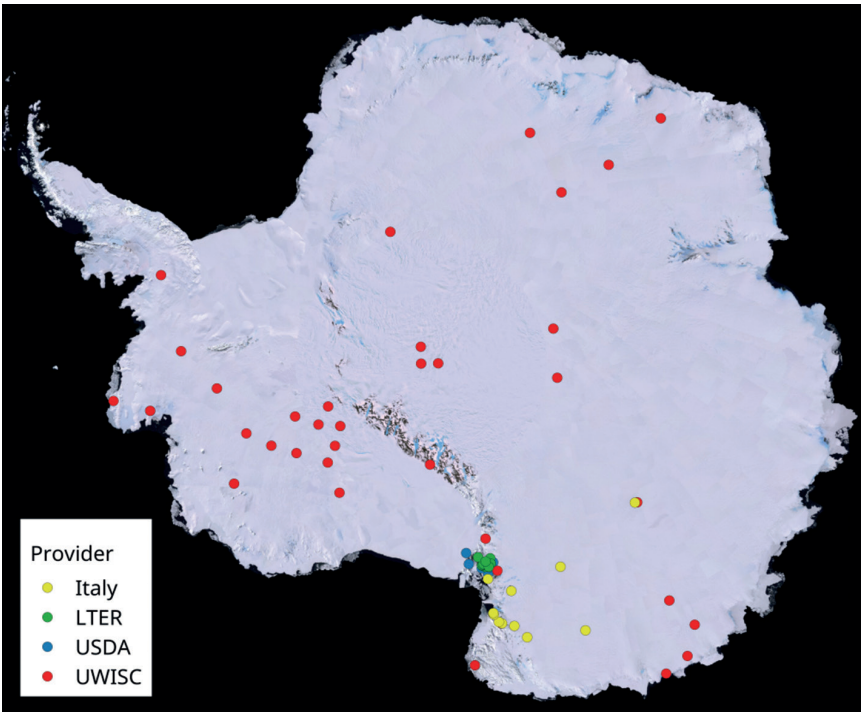

Figure 1
Location of weather stations in Antarctica (according to the Antarctic Meteo-Climatological Observatory of Italy, the Long Term Ecological Research (LTER) programme, the United States Department of Agriculture (USDA), the Antarctic Meteorological Research Center at the University of Wisconsin (UWISC))
Source: *Meyer et al., 2019*

Classical interpolation methods can be used to build good enough forecasts only if the set of known data is evenly distributed in space, in compliance with a certain mesh structure. In cases where this is not possible, it is recommended to use more complex computer models, for example, using neural network technologies or gradient boosting (GB) (Abadi et al., 2016; Yuan, 2015).

Along with neural networks, gradient boosting technology has confidently take the place in solving complex nonlinear problems. Gradient boosting is a class of algorithms that works best on heterogeneous data, that is, in cases where an object is described by a set of different data: temperature, height, weight, age, other information (Körner et al., 2018; Xiong et al., 2018). Therefore, gradient boosting is widely used to solve various problems in medicine, in the field of economics, in marketing, in industry, when creating artificial intelligence, when performing search queries, etc. Also, unlike neural networks, the use of gradient boosting is much simpler. Since for the successful use of a neural network it is necessary to be able to design

a network architecture that can effectively solve the problem. In the case of using gradient boosting, the task is simplified, since we feed the available data, and at the output we get a working model. In other words, gradient boosting works like a "black box", the model is automatically generated based on the algorithms embedded in the library (Natekin and Knoll, 2013; Prokhorenkova et al., 2018).

Gradient boost models work on the basis of the so-called "decision trees" (Figure 2). The model is built in parts. First, one decision tree is built, which may not produce very good quality. Then another decision tree is built, which improves the quality. This happens hundreds, thousands or tens of thousands of times, after which a large model is obtained that can already find complex patterns within the data (Natekin and Knoll, 2013).

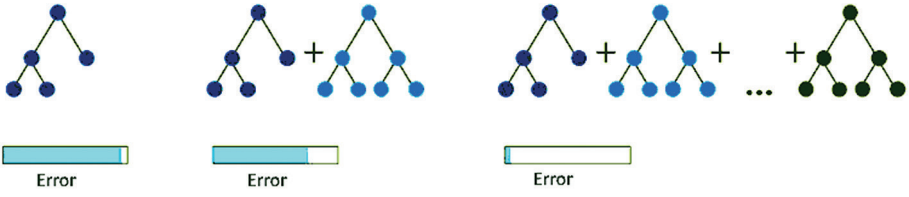

Figure 2
The principle of constructing a gradient boosting model based on decision trees

In this article, we present the results of a study of solving the problem of spatial forecasting of the distribution of a factor classified into several groups. For solving the problem, the machine learning method - gradient boosting was used. The proposed model can be applied, for example, to the study of the spatial distribution of the pollutant (for example, heavy metals in the soil), divided into hazard classes (I-IV hazard class) or into classes by relation the concentration of pollutant to MPC (class 1 - pollutant concentration below MPC, Grade 2 - at the MPC level, Grade 3 - above the MPC). There can be many approaches to classification; the type of classification is selected when solving an applied problem.

DATA AND METHODS

1. Object of study

As the object of study, we take an image (Figure 3), which rather well imitates the spatial distribution of the concentration factor, for example, the distribution of the concentration of the pollutant. The image is made in four gradients of gray. So, it is known that in computer graphics the gradation of gray (from white to black) lies in the range from 0 to 255. Four gradients are included in the given image: 0 - black, 85 - dark gray, 170 - light gray, 255 - white. Image dimensions 197x256 pixels, total pixels - 50432.

Figure 3
Model image taken as a data source for solving an analytical problem

2. Gradient boosting library

To solve this problem, we used the CatBoost library, an open source product from Yandex. The CatBoost library is distinguished by the fact that it has a wide functionality for studying the learning process, a wide range of functions for assessing the effectiveness of model training, and good tools for visualizing learning results (Prokhorenkova et al., 2018). In addition, since gradient boosting models can work with heterogeneous data, there is no need to implement procedures of normalization - renormalization data. The model works with its own input parameters "as is", showing adequate results.

3. Gradient boosting models

Models were developed in Python (ver. 3.7) in the Jupyter Notebook environment.

During the study, two models were built. In the first model (SpatialCB1), the coordinates X and Y were used as input parameters, and the gray gradient at X.Y point was obtained as the output parameter (Figure 4).

In the second model (SpatialCB2), in addition to the X, Y coordinate parameters, it was also supplied the data about the nearest point with known data from the training dataset. So, additional parameters were chosen: the distance to the nearest point, a gray gradient at the nearest point (Figure 5).

The prototype for this approach was the well-known interpolation method called the "k-nearest neighbor method". K-nearest neighbor method (k-nearest neighbors algorithm, k-NN) is a metric algorithm for automatic classification of objects or regression. In the case of using the method for classification, the object is assigned to the class that is the most common among k neighbors of this element,

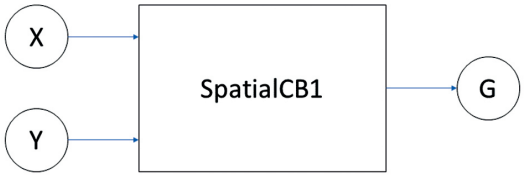

Figure 4
Scheme of the gradient boost model SpatialCB1.
X, Y – coordinates, G – the gradient of the desired point.

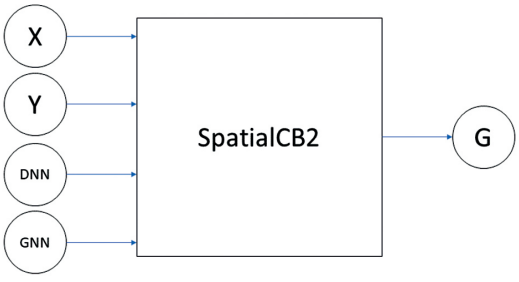

Figure 5
Scheme of the gradient boost model SpatialCB2.
X, Y – coordinates, DNN – distance to nearest neighbor point, GNN – gradient of nearest neighbor point, G – gradient of the desired point.

the classes of which are already known (Kung et al., 2012; Lee, 2017). In the case of using the method for regression, the object is assigned an average value over the k nearest objects to it, the values of which are already known. In a weighted way of implementing this method, not only the number of certain classes that fall into the region, but also their remoteness from the new value are considered (Biau et al., 2011). Figure 6 shows an example of k-nearest-neighbor classification. The test

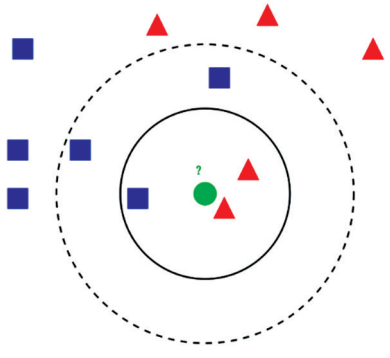

Figure 6
Example of classification by the method of k-nearest neighbors
Author: Antti Ajanki ("File:KnnClassification.svg - Wikimedia Commons," n.d.)

sample (green circle) must be classified as a blue square (class 1) or as a red triangle (class 2). If k = 3, then it is classified as 2nd class, because inside the smaller circle there are 2 triangles and only 1 square. If k = 5, then it will be classified as 1st class (3 squares against 2 triangles inside the larger circle).

For building the models CatBoostClassifier the class of the CatBoost module was used. Model parameters were set the same and have the following values: eval_metric = 'AUC' – evaluation metric, the metric by which the model's performance on a test set is calculated. AUC – one of the most popular quality assessment functions in classification problems – the area under the error curve or ROC curve (Cortes and Mohri, 2004). The error curve or ROC-curve is a graphical characteristic of the quality of the binary classifier, the dependence of the rate of true positive classifications on the rate of false positive classifications when varying the threshold of the decision rule (Hernández-Orallo, 2013). Figures 7 and 8 show examples of ROC curves. The graphs show that for the most accurately working model, the area under the error curve (AUC) will be 1.

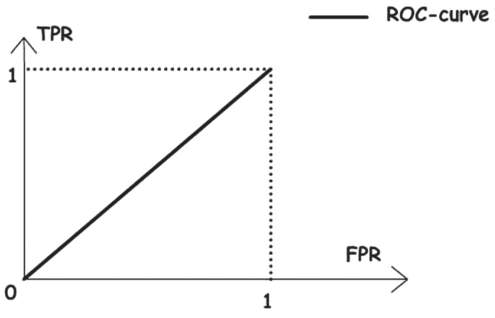

Figure 7
The shape of the ROC-curve in the case when the right or wrong decision is made as a result of „random fortune-telling"

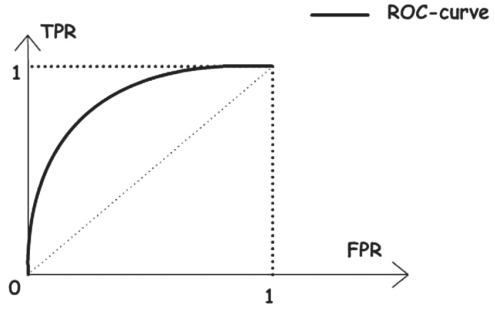

Figure 8
The shape of the ROC curve when using a fairly good model

iterations = 40 – iterations number. The number of repetitions of the model training procedure.
random_seed = 63 – the number used to generate random numbers when working with the built-in randomizer of the CatBoostClassifier class.
learning_rate = 0.01 – learning rate.
loss_function = 'MultiClass' – loss function. This function is used to reduce errors during model training. The 'MultiClass' function allows you to find the probability of each given class to be the right answer, while the total probability of all classes is 1.0 ("Multiclassification: objectives and metrics - CatBoost. Documentation," n.d.). Since in our problem the number of classes in the output is four, the type of the problem is multiclassification.
custom_loss = ['AUC', 'Accuracy'] – functions calculated during model training. Observation of these functions allows you to better understand how well the model is trained and how adequate results it can show on the test sample. 'Accuracy' function – proportion of correct algorithm responses (Jiang et al., 2018):

$$Accuracy = \frac{number\ of\ correct\ answers}{number\ of\ all\ answers}$$

early_stopping_rounds = 20. This parameter is responsible for the number of training iterations during which a decrease or increase in the loss function is observed. If the loss function does not decrease, the learning algorithm stops.

RESULTS AND DISCUSSION

Two gradient boosting models were tested with varying training dataset sizes from 50 to 10000 elements. The results of the models are shown in table 1.

Table 1 Spatial prediction results using gradient boosting models

Training dataset size	% of the training dataset from the total data	Model					
		SpatialCB1			SpatialCB2		
		AUC	Accuracy	Learning time	AUC	Accuracy	Learning time
50	0.099	0.28	0.2	132 ms	0.16	0.90	256 ms
100	0.198	0.19	0.6	94 ms	0.84	0.70	215 ms
250	0.496	0.62	0.52	141 ms	0.91	0.86	446 ms
500	0.991	0.62	0.62	185 ms	0.96	0.91	371 ms
1000	1.983	0.83	0.65	269 ms	0.98	0.95	548 ms
5000	9.914	0.95	0.77	7 s 437 ms	0.98	0.97	547 ms
10000	19.827	0.96	0.76	9 s 678 ms	0.99	0.98	847 ms

The study revealed that already with a training sample of 250 points (~ 0.5% of the total data), the SpatialCB2 model shows an efficiency similar to that achieved with the SpatialCB1 model with a training sample of 5000 points, which is almost 10% of the total data. In other words, in order to get adequate results on the SpatialCB1 model, we need to have 10% of the total amount of information, while in the case of the SpatialCB2 model, 0.5% of the known amount of data will be enough. Figures 9 and 10 show the results of the two models under consideration with different sizes of the training dataset. Figure 11 shows an approximate distribution of points of a training dataset of different volumes in order to visually see the required amount of information about the object under study.

Analyzing the visualized results of the models, it is clear that with a small sample size of 50 points, the SpatialCB1 model detects the most common gradient and gives a "dark gray" answer to any coordinate. In this case, all the points that fall into the area with the given color gradient are automatically determined as "correct",

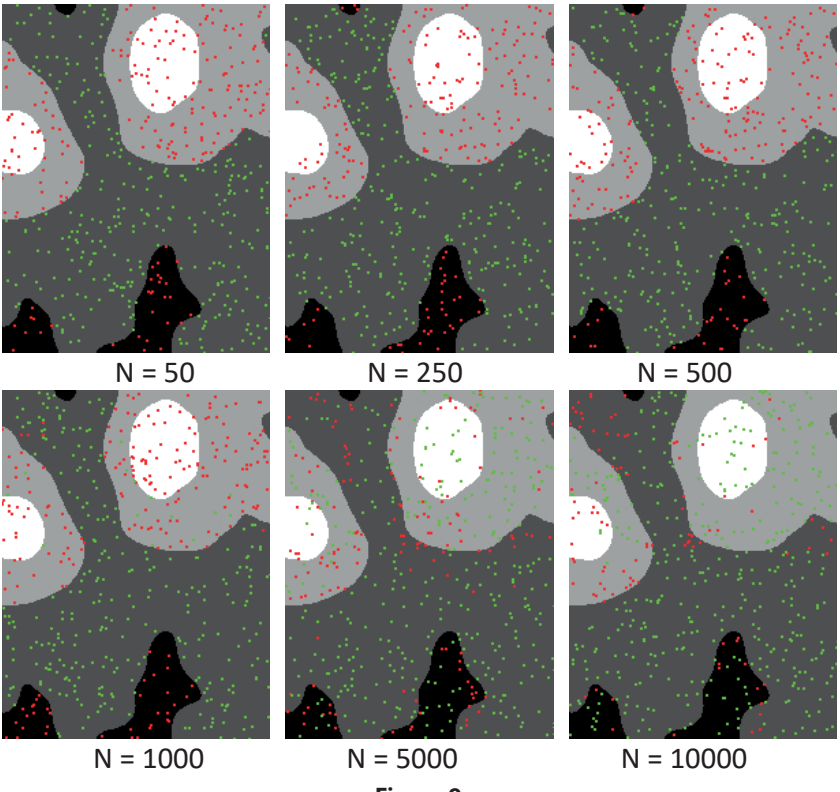

Figure 9
Visualization of the results of spatial forecasting using the SpatialCB1 model
(N - volume of the train dataset, green dots - correctly defined values,
red dots - incorrectly defined values)

and the points lying in the areas with other gradients are "incorrect". On the Spatial-CB1 model, this picture is repeated until the training sample reaches 1000 points, i.e., almost 2% of all points of the model image. In this case, several points lying on a light gray gradient are correctly determined. The smallest areas - white and black on this model begin to be determined only when using the training sample size of 5000 points (~ 10%). On this model, the efficiency does not exceed 76%.

On the SpatialCB2 model, with a small training sample of 50 points, points lying in areas with dark gray and light gray gradients are quite well defined. Plots with all four gradients begin to be determined at N = 250. This model is characterized by the presence of errors at the boundaries of the transition from one gradient to another. Thus, this model shows an efficiency 20 times higher.

Based on the data obtained, it is possible to visualize the sampling grid necessary to perform a spatial forecast using the developed models, provided that we have information from 50 locations on the study area (for example, sampling sites).

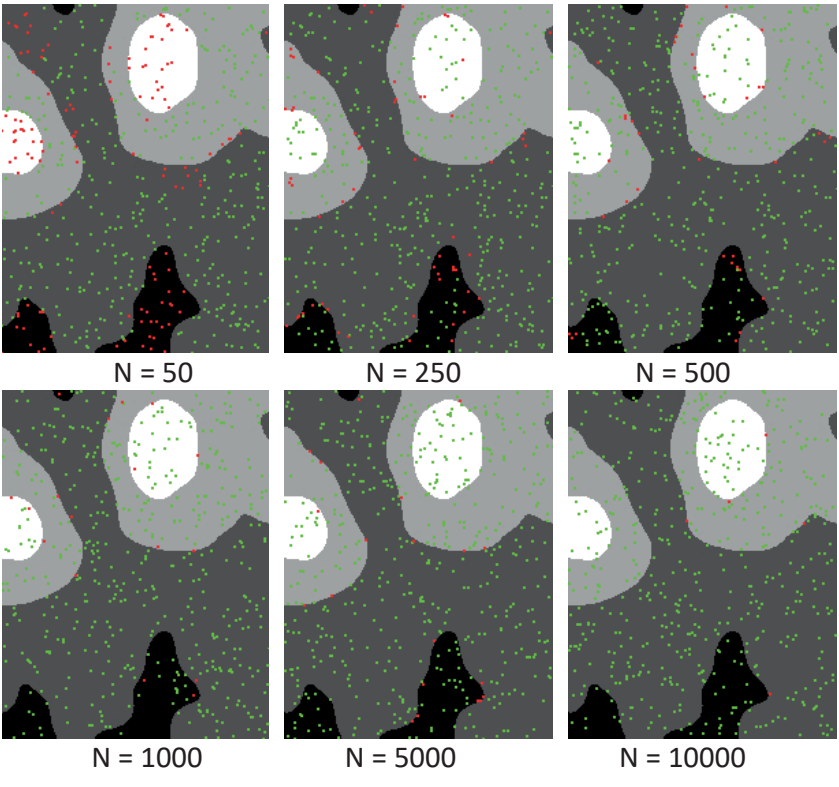

Figure 10
Visualization of the results of spatial forecasting using the SpatialCB2 model
(N - volume of the train dataset, green dots - correctly defined values,
red dots - incorrectly defined values)

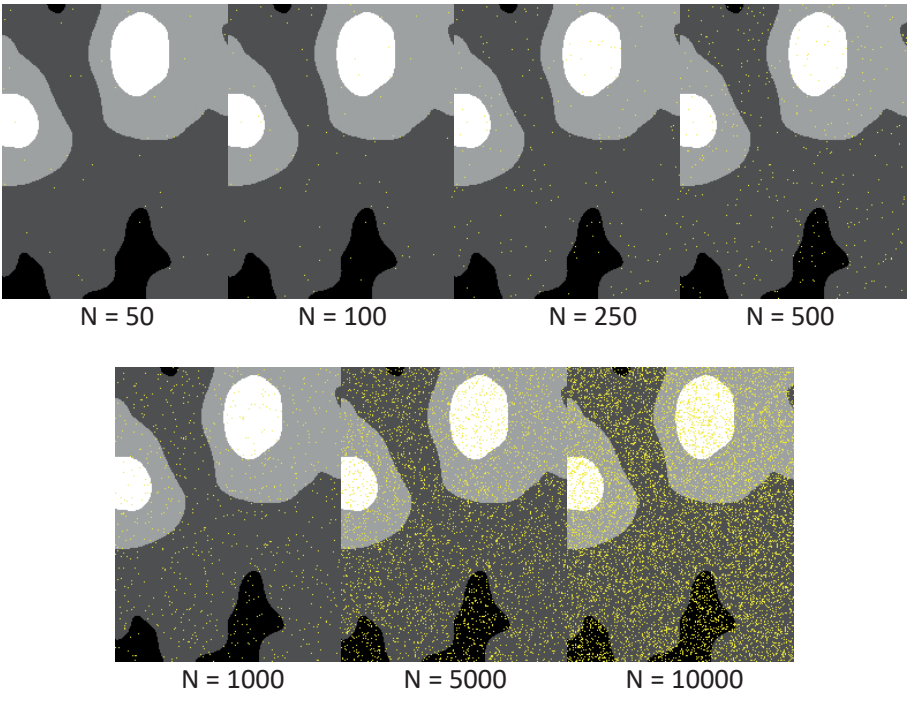

Figure 11
Visualization of train dataset (N - volume of the train dataset, yellow dots – place of certain point from dataset)

For the SpatialCB1 model, the minimum information for an adequate forecast is 10%. We take each sampling location as a square with a certain area. Then 50 squares is 10%, and 500 squares will be the entire investigated area. That is, for an adequate analysis, a grid of 500 cells can be superimposed on the study area. For the SpatialCB2 model, the minimum information for an adequate forecast is 0.5%. Then, for this model, 50 squares is 0.5%, and 10 000 squares will be the entire investigated area. That is, for an adequate analysis at 50 points studied, a grid of 10 000 cells can be superimposed on the study area. A visualized representation of such grids is shown in Figure 12. Figure 12 shows how a more detailed picture can be obtained using the SpatialCB2 model.

For an even more cleare understanding of the results, let us consider Pavlodar city (Kazakhstan) as an example. The area of the city is – 352.3 km^2. Then, in the case of the first model, each square under consideration will have an area equal to 0.7046 km^2 or 704 600 m^2. That is, if we take 50 samples to the entire territory of the city, then each sample will provide conditional information about an area of 704 600 m^2 (i.e., a square of 839 meters in length and 839 meters in width). In

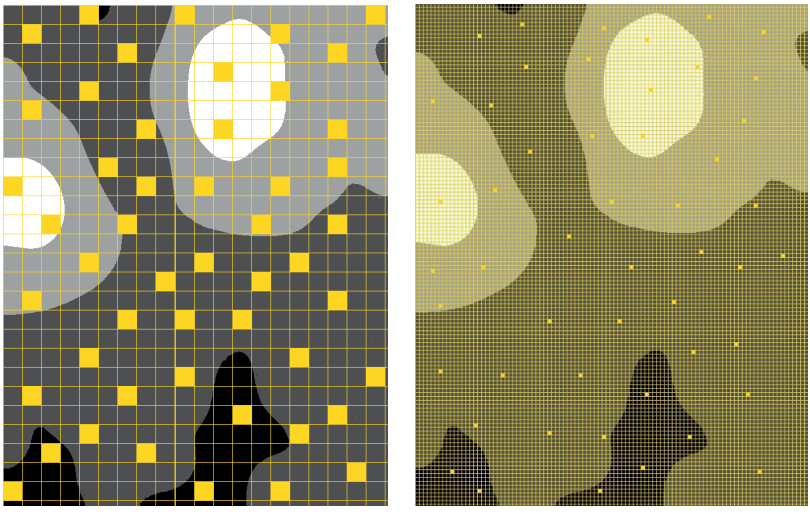

Figure 12
Visualization of spatial forecast detailing using SpatialCB1 (left) and SpatialCB2 (right) models

the case of the second model, the square area will be – 35 230 m^2 (i.e., a square of 188 m in length and 188 m in width), which is almost 20 times smaller than in the case of the first model. If, for example, we take 100 points to the city, then, using the SpatialCB2 model, one point will be a territory with an area of 17 615 m^2 (i.e., a square of 133 m in length and 133 m in width).

CONCLUSIONS

As a result of the studies, two gradient boosting models were obtained for spatial analysis of the distribution of various factors, in particular the distribution of the concentration of the pollutant. The SpatialCB2 model showed an efficiency 20 times higher than the SpatialCB1 model. This result was achieved due to the fact that in the second model, information about the nearest neighboring point (distance to the neighboring point and the gradient of the neighboring point) was additionally introduced as parameters by analogy with the k-nearest neighbor method. This model works adequately with a training sample of 0.5% of all analyzed information about the object. The analysis showed that for the study area of 352.3 km^2 with the available data for 100 grid elements, the analytical segment of the grid will occupy an area of 17 615 m^2, which is equivalent to a square of 133x133 m.

Thus, an effective version of the model was obtained for spatial analysis of the distribution of a certain factor using the technology of machine learning - gradient boosting. The model is based on the CatBoost library.

REFERENCES

ABADI, M., AGARWAL, A., BARHAM, P., et al. (2016). TensorFlow: Large-Scale Machine Learning on Heterogeneous Distributed Systems. Retrieved from http://arxiv.org/abs/1603.04467

AZHAYEV, G., ESIMOVA, D., SONKO, S. M., et al. (2020). Geoecological environmental evaluation of Pavlodar region of the republic of Kazakhstan as a factor of perspectives for touristic activity. *GeoJournal of Tourism and Geosites*, *28*(1), 104–113. https://doi.org/10.30892/gtg.28108-455

BEKETOVA, A., BERDENOV, Z. G., ATAEVA, G., et al. (2019). Geochemical monitoring of industrial center for development of recreational areas (on the example of Khromtau-don industrial hub, Kazakhstan). *GeoJournal of Tourism and Geosites*, *27*(4), 1449–1463. https://doi.org/10.30892/gtg.27428-447

BERDENOV, Z., MENDIBAEV, E., SALIHOV, T., et al. (2017). Geoecological analysis of industrial cities: on the example of Aktobe agglomeration. *Chemistry*, *26*(6), 890–902.

BERROCAL, V. J., GELFAND, A. E., HOLLAND, D. M. (2010). A bivariate space-time downscaler under space and time misalignment. *Annals of Applied Statistics*, *4*(4), 1942–1975. https://doi.org/10.1214/10-AOAS351

BIAU, G., CHAZAL, F., COHEN-STEINER, D., et al. (2011). A weighted k-nearest neighbor density estimate for geometric inference. *Electronic Journal of Statistics*, *5*, 204–237. https://doi.org/10.1214/11-EJS606

CASATI, B., ROSS, G., STEPHENSON, D. B. (2004). A new intensity-scale approach for the verification of spatial precipitation forecasts. *Meteorological Applications*, *11*(2), 141–154. https://doi.org/10.1017/S1350482704001239

File:KnnClassification.svg - Wikimedia Commons. (n.d.). Retrieved May 4, 2020, from https://commons.wikimedia.org/w/index.php?curid=2170282

GALLEGO-ÁLVAREZ, I., VICENTE-GALINDO, M. P., GALINDO-VILLARDÓN, M. P., et al. (2014). Environmental performance in countries worldwide: Determinant factors and multivariate analysis. *Sustainability (Switzerland)*, *6*(11), 7807–7832. https://doi.org/10.3390/su6117807

GLASS, G. E., SCHWARTZ, B. S., MORGAN, J. M., et al. (1995). Environmental risk factors for Lyme disease identified with geographic information systems. *American Journal of Public Health*, *85*(7), 944–948. https://doi.org/10.2105/AJPH.85. 7. 944

ILIEŞ, D. C., BAIAS, Ş., BUHAŞ, R., et al. (2017). Environmental education in protected areas. case study from Bihor County, Romania. *Geojournal of Tourism and Geosites*, *19*(1), 126–132.

ILIEŞ, D. C., ONEŢ, A., GRIGORE, H., et al. (2019). Exploring the indoor environment of heritage buildings and its role in the conservation of valuable objects. *Environmental Engineering and Management Journal*, *18*(12), 2579–2586. https://doi.org/10.30638/eemj.2019.243

JERRETT, M., BURNETT, R. T., GOLDBERG, M. S., et al. (2003, August 22). Spatial analysis for environmental health research: Concepts, methods, and examples. *Journal of Toxicology and Environmental Health - Part A*. https://doi.org/10.1080/15287390306446

KÖRNER, P., KRONENBERG, R., GENZEL, S., et al. (2018). Introducing Gradient Boosting as a universal gap filling tool for meteorological time series. *Meteorologische Zeitschrift*, *27*(5), 369–376. https://doi.org/10.1127/metz/2018/0908

KUNG, Y. H., LIN, P. S., KAO, C. H. (2012). An optimal k-nearest neighbor for density estimation. *Statistics and Probability Letters*, *82*(10), 1786–1791. https://doi.org/10.1016/j.spl.2012. 05. 017

LEE, J. M. (2017). Fast k-Nearest Neighbor Searching in Static Objects. *Wireless Personal Communications*, *93*(1), 147–160. https://doi.org/10.1007/s11277-016-3524-1

LI, R., ZHANG, X., LIU, L., et al. (2020). Application of neural network to building environmental prediction and control. *Building Services Engineering Research and Technology*, *41*(1), 25–45. https://doi.org/10.1177/0143624419838362

LI, T. Z., LIN, J. S., WU, M. T., et al. (2009). Concept and spatial analysis method of urban environmental traffic capacity. *Journal of Transportation Engineering*, *135*(11), 873–879. https://doi.org/10.1061/(ASCE)TE.1943-5436.0000061

MADADGAR, S., MORADKHANI, H. (2014). Spatio-temporal drought forecasting within Bayesian networks. *Journal of Hydrology*, *512*, 134–146. https://doi.org/10.1016/j.jhydrol.2014. 02. 039

MATLOVIČ, R., MATLOVIČOVÁ, K. (2012). The social relevance and branding of geography [Spoločenská Relevancia a Budovanie Značky Geografie]. *Geografie-Sbornik CGS*, *117*(1), 33–51.

MATLOVIČ, R., MATLOVIČOVÁ, K. (2020). First and second order discontinuities in world geographical thought and their primary reception in Slovak geography. *Folia Geographica*, *62*(1), (online first).

MEYER, H., KATURJI, M., DETSCH, F., et al. (2019). *AntAir: satellite-derived 1 km daily Antarctic air temperatures since 2003*. https://doi.org/10.5194/essd-2019-215

MIHINCĂU, D. C., ILIES, D. C., KOROLEVA, Y., et al. (2019). The study of indoor microclimate on wooden churches to be included among Oradea's representative sights. *Geojournal of Tourism and Geosites*, *26*(3), 737–750. https://doi.org/10.30892/gtg.26305-393

MURTAGH, F., ZHENG, G., CAMPBELL, J. G., et al. (2000). Neural network modelling for environmental prediction. *Neurocomputing*, *30*(1–4), 65–70. https://doi.org/10.1016/S0925-2312(99)00144-7

NATEKIN, A., KNOLL, A. (2013). Gradient boosting machines, a tutorial. *Frontiers in Neurorobotics*, *7*(DEC). https://doi.org/10.3389/fnbot.2013.00021

PACI, L., GELFAND, A. E., HOLLAND, D. M. (2013). Spatio-temporal modeling for real-time ozone forecasting. *Spatial Statistics*, *4*, 79–93. https://doi.org/10.1016/j.spasta.2013. 04. 003

PROKHORENKOVA, L., GUSEV, G., VOROBEV, A., et al. (2018). CatBoost: unbiased boosting with categorical features. In Bengio, S and Wallach, H and Larochelle, H and Grauman, K and CesaBianchi, N and Garnett, R (Ed.), *ADVANCES IN NEURAL INFORMATION PROCESSING SYSTEMS 31 (NIPS 2018)* (Vol. 31). 10010 NORTH TORREY PINES RD, LA JOLLA, CALIFORNIA 92037 USA: NEURAL INFORMATION PROCESSING SYSTEMS (NIPS).

RAMAZANOVA, N., BERDENOV, Z. G., RAMAZANOV, S., et al. (2019). Landscape-geochemical analysis of steppe zone basin Zhaiyk. *News of National Academy of Sciences of the Republic of Kazakhstan*, *4*(436), 33–41. https://doi.org/10.32014/2019.2518-170x.95

RIBEIRO, M. C., PINHO, P., LLOP, E., et al. (2013). Multivariate geostatistical methods for analysis of relationships between ecological indicators and environmental factors at multiple spatial scales. *Ecological Indicators*, *29*, 339–347. https://doi.org/10.1016/j.ecolind.2013. 01. 011

SAFAROV, R. Z., SHOMANOVA, Z. K., MUKANOVA, R. Z., et al. (2019). Design of neural network for forecast analysis of elements-contaminants distribution on studied territories (on example of Pavlodar city, Kazakhstan). *News of the National Academy of Sciences of the Republic of Kazakhstan, Series of Chemistry and Technology*, *438*(6), 86–98. https://doi.org/10.32014/2019.2518-1491.78

SAHU, S. K., YIP, S., HOLLAND, D. M. (2009). Improved space-time forecasting of next day ozone concentrations in the eastern US. *Atmospheric Environment*, *43*(3), 494–501. https://doi.org/10.1016/j.atmosenv.2008. 10. 028

SEXTON, K., WALLER, L. A., MCMASTER, R. B., et al. (2002). The importance of spatial effects for environmental health policy and research. In *Human and Ecological Risk Assessment* (Vol. 8, pp. 109–125). https://doi.org/10.1080/20028091056764

SHOJI, R., KAWAKAMI, M. (2006). Prediction of genotoxicity of various environmental pollutants by artificial neural network simulation. *Molecular Diversity*, *10*(2), 101–108. https://doi.org/10.1007/s11030-005-9005-1

VICENTE, J. R., GONÇALVES, J., HONRADO, J. P., et al. (2014). A framework for assessing the scale of influence of environmental factors on ecological patterns. *Ecological Complexity*, *20*, 151–156. https://doi.org/10.1016/j.ecocom.2014. 10. 005

XIONG, D., GUI, Q., HOU, W., et al. (2018). Gradient boosting for single image super-resolution. *Information Sciences*, *454–455*, 328–343. https://doi.org/10.1016/j.ins.2018. 04. 075

YUAN, S. (2015). Random gradient boosting for predicting conditional quantiles. *Journal of Statistical Computation and Simulation*, *85*(18), 3716–3726. https://doi.org/10.1080/00949655.2014.1002099

FOLIA GEOGRAPHICA • ISSN 1336-6157 (hard copy) • ISSN 2454-1001 (online)

STEM EDUCATION IN TEACHING GEOGRAPHY IN BOSNIA AND HERZEGOVINA

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Received: October 12, 2019 | Revised: November 30, 2019 | Accepted: December 2, 2019
Paper No. 20-62/1-546

Abstract
The aim of this paper is to support the change of STEM education in Bosnia and Herzegovina within the education programmes. Geography relates to STEM disciplines through the application of geography tools for problem solving. Geography strongly connects STEM (science, technology, engineering, and mathematics) disciplines using geographic technology/ tools that may offer better understanding of inter-disciplinary occurrences for solving important problems. With an aim to offer a holistic image of higher geographic education relating to STEM education in Bosnia and Herzegovina. The results of this research support the benefits to education based on the economics of knowledge of geography programmes, as well as other disciplines. This process could be modeled in countries that have chosen to participate in the development of STEM disciplines. Within the research, an overview of basic indicators and trends in STEM education was given, as well as an evaluation of quality of the education system in Bosnia and Herzegovina. In this paper, conduction of the primary research is planned and it will include questionnaires and semi-structured interviews with the population and persons responsible for scientific innovations in education.

Key words
STEM, geography major, science, geography, education.

INTRODUCTION

In the past several years, governments of developed countries throughout the world have put a special emphasis on improving quality of education in technology and geography areas (STEM). This sustains a critical important of STEM disciplines for a modern society. STEM represents an integration, interdisciplinary and trans-disciplinary approach – integration between subjects, a uniqueness of knowledge that produces coherence. Science and geography provide answers to foundational questions of nature and they enable us to get familiar with the world around us. Expertise in STEM disciplines should encourage our economic ambitions, support innovations and ensure foundations for future prosperity of youth in primary and secondary schools. Economies based on knowledge in Bosnia and Herzegovina are especially dependent on quality and quantity of STEM graduates. Bosnia and

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Herzegovina, for research and development, science and technology, emphasizes a critical importance of the excellence of STEM education in order to ensure a continuing development of economic activities and talents to support foreign direct investments and an active ecosystem for domestic companies. Preparation of this report was founded on expertise of many individuals and organizations in the USA and the European Union. Significant consultation with a wide spectrum of interested parties were included. Besides providing their expertise of members of the audit group, the members were asked to contribute to public, academic and education institutions, as well as, the professionals in the education sectors along with their representative bodies (Dweck, Walton, & Cohen, 2014; Sharples, 2000).

University of Prešov is the only one of the above universities to have fully implemented the new paradigm within tertiary Geography education. It is also the only one to have created a modular study programme. The whole process of implementation was divided into different stages. At the beginning there was lengthy discussion between course guarantors and key stakeholders working in the areas of tourism, regional development and land management from which it became clear that new study programmes should consider not just the new university education paradigm but also other factors. The aim was to increase application of geospatial collection technology, cartographical interpretation and visualization of geographical data (Matlovič, Rene; Matlovičová, Kvetoslava, 2016).

In 2017 in Bosnia and Herzegovina, a new programme has started, education and education of teachers in primary and secondary schools with support of a development agency USAID and organization Save the Children in Sarajevo. I would especially like to emphasize that the office of Save the Children in Sarajevo and the support of professors from the USA who were engaged in STEM education in Bosnia and Herzegovina. I am looking forward to seeing their and our efforts transformed into significant improvements of the STEM experience for students in schools of Bosnia and Herzegovina. Led by these studies, and aware of solicitude expressed from a series of sources regarding quality and quantity of education, STEM in Bosnia and Herzegovina has an aim to develop innovation and creativity in primary and secondary schools. Preparation of this research was founded on expertise of many individuals in education and organizations (Md Rajibul Al Mamun1, Trisha Jackson1 & George White, 2015).

For the uninterested ones from Bosnia and Herzegovina, STEM is science, technology, engineering and mathematics, geography, chemistry, physics and economics, and these are the areas that many academic and political leaders in Bosnia and Herzegovina have evaluated as important for current and future growth of our economic area and area in which our students do not excel. Strengthening education in the STEM field in relevant sectors of economy based on knowledge in Bosnia and Herzegovina in primary, secondary and higher education is the most important for our global competitiveness in key people in education and

politics, that is, principals and supervisors of the education system. As a result of that, financing on all levels is increased for STEM, often with the price of support of other disciplines. Surely, we may challenge why these certain disciples and ways of knowing the world are extracted and gain attention and financing (as well as many others, especially in humanities), however, due to this short column, we wish to focus on the majority of reality. Here, we are currently faced with developing knowledge through STEM education in primary, secondary and higher education institutions.

Geography status, comparing to STEM, is ambiguous due to two main reasons. First, no one has synchronized with the national definition of that which connects specific fields of study relating to STEM. The Department of national security includes geographical information science and cartography as a STEM discipline (it is important in a sense of international student employment), while the national foundation for science includes geography in its list of disciplines that fulfill conditions for STEM funding of most of their competitions in the field of undergraduate education. Second, geography is a broad interdisciplinary discipline, which was mentioned in the first column as a radically interdisciplinary one.

METODS AND DATA SOURCES

Case study methods are used for deeper understanding the answers made by stakeholders about STEM during the workshop. Various methods were used in order to collect rich information about new understanding of teachers about this approach and questions relating to its implementation in real school contexts (Merriam, 1988. Yin, 2003). Implementation of the Bologna process led to the increased subordination of the European universities and higher education institutions to neoliberal values *(Matlovič, René; Matlovičová, Kvetoslava, 2017)*.

Participants from 40 public education institutions in Bosnia and Herzegovina were offered a possibility to send two teachers from various disciplines for STEM professional education. Finally, 35 education institutions sent their representatives for STEM education, and those have agreed to participate. (Nurković, R., 2012) Teachers that have registered included teachers of geography, mathematics, physics, biology, information technologies and homeroom. From those, 35 have completed all five days of education in the STEM programme. Teachers that have not completed the programme have named many reasons why they have not finished, including illnesses, child care issues, other conferences they wanted to participate in, and the quantity of time need to participate in those sessions. The data was collected through a) observations of participants in activities and discussions during the workshop for professional development, b) focus group discussions at the end of the workshop (60 min), c) individual interviews with 12 participants (both improvised and formal, in the duration from 15 to 20 min), and d) feedback about workshops and evaluation forms.

Besides the named, a survey was used prior to the workshop in order to research the understanding of participants and any other experiences relating to learning and based on STEP discipline problems. Multiple methods of data collection used during workshops have helped to monitor the reaction of participants to the interdisciplinary approach, as well as, their perception of numerous system challenges in using this approach in their current practice. Data on quantitative surveys were collected through a survey conducted at the beginning of the workshop in order to include starting conceptions of participants about the STEM programme and their previous experience and application in class *(Fontichiaro, K., & Elkordy, A. 2015)*.

Analytical strategies for data analysis have included coding interviews, focus groups and observational data. In the starting data analysis, we have followed the inductive approach in order to enable those codes to arise from data. Further, we used the constant comparative method according to (Lincoln & Guba, 1985) to organize data of broader categories and topics according to our research questions (for example, starting perceptions of teachers about learning in STEM education, implementation of challenges, system obstacles, etc.). Besides that, multiple discussions between members of the study team have enabled a deeper data analysis from multiple angles and they have helped in answering questions of validity relating to our interpretation of findings (Patton, 1990; Strauss, 1987; Strauss & Corbin, 1998). For data analysis of surveys, we have used descriptive statistical techniques. These discussions about main topics that have been revealed by our analysis, and their implications on development and implementation of efficient programmes for development of teachers using the interdisciplinary approach of STEM education, were analyzed. Our analyses revealed some interesting changes in conceptions of teachers about STEM education of teachers of various disciplines (Rothwell, 2013). Besides that, broad topics that have occurred were related to the implementation of the STEM approach and possible outcomes of such implementation in Bosnia and Herzegovina.

RELEVANT SECTORS OF ECONOMY BASED ON KNOWLEDGE

Conceptualizing the importance of geography, we must understand that what makes science relevant is shaped by the social context in which science is represented, interpreted and used (Matlovič, René; Matlovičová, Kvetoslava ,2017). The complexity of today's world requires that all people are equipped with the new set of basic knowledge and skills for solving complex problems, collecting and validating evidence, and creating a sense for information they gather from diverse and growingly digital media.(Nurkovic,R.,2018): Teaching and working of STEM helps in development of these skills and prepares students for work force where their success depends on what they know, as well as, what they are able to do with that knowledge. Therefore, a strong STEM education becomes growingly recognizable

as the key starter of possibilities, and the data show the need for STEM knowledge in Bosnia and Herzegovina, as well as, skills that will grow and continue to be needed in the future. As with all other aspects of education, the whole community plays the key role in the demonstration of the relevance and value of STEM in everyday life and in the promotion of exposure and fair approach to high-quality STEM learning experiences. Engaging the whole series of stakeholders and community members in the improvement of STEM education in certain sectors may help in relieving the behavioral, structural and organization factors that impact teaching and learning of the STEM practice, where they play a role in engaging or converting of certain student groups outside of STEM (Handelsman & Sakraney, 2015). Academic culture is substituted by the culture of auditing. Financing systems of universities adapt to the model of multisource financing which involves decreasing support from the public budgets and the profuse participation of private resources. Performance, contract and project funding is enforced. Such an approach stimulates commercialisation and commodification both in the area of education (maximisation of numbers of students) and in the area of research (orientation to marketable results or those applicable in the political/economic practice) (Matlovič, René; Matlovičová, Kvetoslava, 2017).

Despite many challenges relating to transformation of STEM education in Bosnia and Herzegovina, priority is placed on STEM education, including the past several years, to include public, private and secondary schools (Sanders, M. 2009) Foundation for education and science, USAID and Save the Children in Bosnia and Herzegovina also financed larger research regional centers, through which they offer a wide spectrum of educational and field activities. It also directly manages national projects, such as STEM education. Geography in primary schools is a unique component of the tri-dimensional part of the curricula, social, ecological and science education, which is made up of three subjects: science, geography and history. The suggested changes in the post-primary education have resulted in a way that STEM subjects are more focused on a deeper understanding of basic concepts, as well as, on the application of knowledge and understanding. Such programmes might be developed on a successful model of blended education, education for geography teachers that are not in the field. To sustain a strong programme in geography and information technologies is important since it is the foundation for STEM education. Within this research, there is an overview of basic indicators and trends in STEM education and quality evaluation of the education system in Bosnia and Herzegovina. Process of learning and practicing STEM disciplines may be adopted by students through the passion for researching, discovering and stimulating skills, such as perseverance, teamwork and application of gained knowledge in new situations (Bailey et al., 2015; Betrus, 2015). (Table 1 and 2).

Table 1 Relevant sectors of economy based on knowledge in Bosnia and Herzegovina, 2019.

FIELD 1: EARTH IN SPACE AS LIVING SPACE			
Component 2: Structure and functional connection between natural and geographical environment			
Outcome: 1. analyses natural processes and occurrences and their interaction using geographical terminology			
Differentiates and determines specificities of natural-geographical and socio-geographical characteristics of a certain geographical space.	Relevant sectors KBE	Explanation how an indicator relates to KBE sector	Closely connected study objectives relating to KBE sector
	10) Modern agricultural manufacturing 3) Technology of materials and high-tech manufacturing 9) Entrepreneurship 8) Tourism 2) Healthcare.	Present application of modern geographical studies connecting relevant sectors: Modern agricultural manufacturing, Technology of materials and high-tech manufacturing, Entrepreneurship, Tourism and Healthcare.	3. Determines the importance of functional changes in natural-geographical environment that occur during seasonal changes. 4. Analyses interaction between natural and geographical environment with a diversity of living beings.

Table 2 Number of fields, components, study objectives for STEM subjects per programs. in Bosnia and Herzegovina, 2019.

Subject	Number of fields	Number of components	Number of study objectives	Number of indicators at the end of secondary education
Geography	4	16	49	144

Source: *http://www.fipa.gov.ba/ local_v2 / default_bs.asp (25. 01. 2018).*

The graduates that have practical and relevant STEM regulations set in their educational experiences will be very demanded for in all sectors of work. It is estimated that in the next five years, larger companies in Bosnia and Herzegovina will have to employ STEM-qualified workers. Data on the labor market also show that the set of basic cognitive knowledges, skills and abilities are connected to STEM education, and they are demanded now, not only in traditional STEM profession, but also in almost all sectors of employment and types of jobs (Carnevale, Smith, & Melton, 2011; Rothwell, 2013). Geography strongly connects STEM (IT/ information technologies science, engineering, and mathematics) disciplines using geographic technology/tools that may offer better understanding of interdisciplinary occurrences for solving important problems. Relevant sectors of economy based on knowledge in Bosnia and Herzegovina.

1. Information – Communication Technologies (ICT),
2. Healthcare and medicine,
3. Technology of materials and high-technological manufacturing,
4. Energy production, energy transfer, efficiency,
5. Business and finance,
6. Art, entertainment and media,
7. Sport,
8. Tourism,
9. Entrepreneurship,
10. Modern agricultural manufacturing.

ORGANIZATION OF A STEM WORKSHOP IN BOSNIA AND HERZEGOVINA

These studies are represented by groups of professors/teachers of geography, biology, mathematics, physics, chemistry and information technologies. The group would be divided into two teams of members who would present disciplines during the workshops along with connectivity with other subjects. Additional group work occurred as the result of experts from the USA, (Joseph Merlion 2007), and the local expert team from Bosnia and Herzegovina. The American experts have also joined and presented themselves and their experience in STEM education in the USA. Insight into the newest studies and discussions on how to improve the STEM education and learning, including how to ensure the engagement and success of students in primary and secondary schools. In 2017, in cooperation with the USAID and Save the Children in Sarajevo, there were 30 experts and leaders invited to STEM for learning in order to learn how to participate in a series of workshops founded on deliberations to understand ideas and develop recommendation for the future of STEM education. (Atkinson, R. D., Hugo, J., Lundgren, D., Shapiro, M. J., & Thomas, J. (2007).

The key components of visions are the result of a series of workshops and discussion held in 2018. They were organized in Sarajevo in the Department for USAID and with Save the Children for education with expert and financial support. Almost 45 individuals from Bosnia and Herzegovina, that represent a wide spectrum of expertise, experience and perspectives, were invited to exchange knowledge and ideas for the possible future of STEM education. We have summarized the results of these discussions, and they contain what has come out as expert recommendations. Namely, it is emphasized that the desire for STEM education, as lifelong education, is present among all youth in all local communities in Bosnia and Herzegovina. Participants in this project were ask to take from their own experience and knowledge, and to apply that to the evidence behind examples of innovative and promising new approaches that are held in local communities across Bosnia and Herzegovina. (Figure 1 and 2)

Figure 1
STEM workshop with other subjects by learning outcomes in Sarajevo, 2018
Source: *Save the Children*

Considering the challenges of remaking STEM education in a large scope, the STEM vision is represented in this study in its starting point upon the key groups of stakeholders, including the policy creators, researchers, educators and leaders of local projects in Bosnia and Herzegovina (Nurković, R., 2012). These activities in workshops offer significant obstacles for entrance and encourage creative ex-

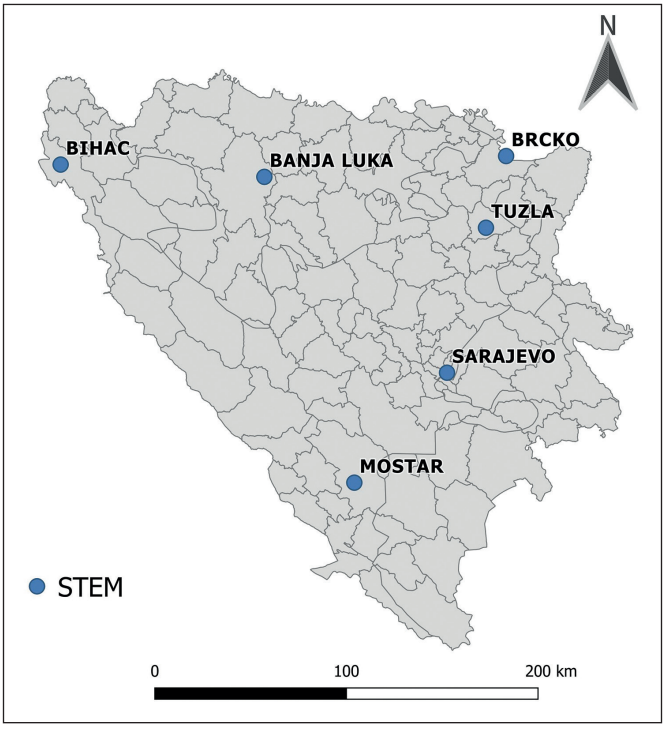

Figure 2
STEM workshop with other subjects by learning outcomes in Sarajevo, 2018.

pression of ideas, and, at the same time, engage various students in complex and challenging contents. Through the process of research and detection, they notice that STEM is all-present, and that they have something to contribute to the field and to learn to use the team approach in solving problems and challenges from the real world. The experts claim this. Those are the types of thinking about growth and habits that show capabilities for academic work and perseverance and lifelong learning in a fast-changing world (Dweck, Walton, & Cohen, 2014; Sharples, 2000). The educational experiences include interdisciplinary approaches in solving „great challenges", and STEM education includes students of all ages in solving great challenges. Great challenges are those that have not yet been solved on a local, national or global level. Great challenges may include, for example, preserving water or improving the quality of water; better understanding of the human brain in order to create new ways to prevent, treat, and treat disabilities and defects of the brain; development of new technologies that enable a better approach to healthcare; solving the infrastructure problems; or, creation of solar energy using costs of the competitive and electric vehicles that are accessible (Chen, J. A., Metcalf, S. J., & Tutwiler, M. S. 2014).

The task of children and youth, faced with a great challenge, is to understand the importance of STEM in their lives and to see the value of STEM in answering questions that improve their own lives and the lives of others. Great challenges also offer a platform for including culturally relevant approaches and contents into the STEM instructions (Dangermond,J. 2013). These portraits include various images, descriptions or images of that which represents STEM work, including a series of tasks and activities that use STEM; and, who they see doing and leading the work in STEM education. Communities and youth in all settlements and geographical locations in Bosnia and Herzegovina are equally exposed to social and popular media that focus on STEM, as well as the wide diversity of toys and games that are accessible and inclusive, and that effectively promote belief of all students that are enabled to understand and shape the world through STEM disciplines. This is when the local experts of STEM expressed their objections in the sense of advantages and weaknesses of students currently studying at universities throughout Bosnia and Herzegovina. The advantages are that students 1) gain a lot of information, 2) have a solid theoretical knowledge,) have a solid practical background, 4) know foreign languages better than previous generations, 5) gain a solid education from mathematics and sciences in school prior to enrolment into a university, 6) do not study only for the purposes of ensuring a career.

The project promises that there will be an evaluation system and quality measurement system through the STEM programme by 2019, which will, at the same time, serve also as a foundation of professional development of each individual teacher. A teaching license will be adopted, and it will be renewable. The main condition for renewing of the license, except the success in the current work in STEM education for primary and secondary schools in Bosnia and Herzegovina, will be participation of individuals in a system of professional improvement and development of geography teachers. The study contents will be unburdened from unnecessary factology and better connected to life and development of science, technics and technology; they will stimulate application of methodology focused on child/student and on development of critical thinking, where students would be able to solve problems and apply their knowledge from the STEM programme upon completion of their primary and secondary education (Demski, J. 2009).

The students would not only be evaluated, they would also evaluate their teachers, where the system of internal evaluation would be in place. They would also perform a self-evaluation, as well as, integral and external evaluations in order to improve the effectiveness of the education process and all-inclusive monitoring of the work of educational institutions and teachers. All that was researched through STEM education is valid for whole Bosnia and Herzegovina, regardless of the curriculum that was in place. However, it was necessary to perform the whole process of education for the teachers of geography, mathematics, physics, chemistry, biology and information technologies, with the support of experts from

the USA through workshops by learning outcomes and subject in smaller groups. The Agency for preschool, primary and secondary education, within the Ministry Council of Bosnia and Herzegovina, will lead and coordinate anticipated education reforms (James, R. K., Lamb, C. E., Householder, D. L., & Bailey, M. A.2000).

CONCLUSIONS

The analysis confirms a high level of interdependence between STEM education and economic activities in sectors of knowledge in Bosnia and Herzegovina. More than 60 % of schools in Bosnia and Herzegovina accepts STEM education. From this, we should recognize geography as STEM education in Bosnia and Herzegovina. Geographical departments in the University of Sarajevo will have benefits from this innovation since they will attract more students interested in STEM education. STEM education, which contains these six basic principles, promises a powerful transformation in the approach towards all students in Bosnia and Herzegovina. Coordinated inclusion and pooling of resources among a series of interested parties, may together offer encouragement of the study and evidence, as well as a possibility and access to a high-quality STEM experiences of learning, which will help to ensure that all children of the nation gain a much needed and deserved education. Surely, the challenges remain, however, lessons may be learned and ideas for progress may be developed based on works of modern innovators and regions, districts, schools, communities, and non-profit organizations that are already creating changes. In this process of unveiling and disseminating knowledge, and through a wide-spread national, regional and local learning networks, they may go back to STEM until 2026 vision presented here, in order to adapt and perfect the STEM future education in order to gain new experiences and new evidence, especially, the knowledge of which approach functions best in which contexts and how it serves various students (Nurković, R. 2014).

In conclusion, the basic STEM 2026 is a vision for an innovative future that enables a process of mapping backwards. It is a process that stimulates action amongst key interest groups and this helps to identify what we already know, what needs to be discovered, and what needs to be developed in order to achieve the final goal – creation of justice in STEM for promotion of lifelong learning amongst youth in Bosnia and Herzegovina. From the student aspect, it is necessary to have motivation (recommendation of the engagement). This has to make sense and to be attractive for them, in order for them to be absorbed in the material. In other words, it is synchronized exercising when they lose desire and will for learning. The surprise, discovery and curiosity should be some of the leading principles in teaching children to learn. The focus is on the „know", „understand" and „use". Completing each lesson with a situation and leading students through later experience is one of the ways of teaching. The idea is that the curriculum is surely covered; the

question that remains is the question of methodology which is used in order to motivate students to learn. This contributes to the economy based on knowledge, where the general aim of the project is still leaning on 10 already defined competencies and predisposed education system. It is considered to be a very general approach, when we assess the real situation in our school. The remaining challenge is how to adapt the curricula according to this general goal (Desimone, L. M. 2009).

What we may offer is a pragmatic approach to the implementation of the existing educational structure. One opinion is that the „learning to learn" could be the most important educational field that may be used as the main topic, and the second opinion is that we must use something „more attractive" for children to desire to go to school. It is necessary to include APOSO in this starting phase in one meeting, in order for them to understand the whole process. Generally speaking, we should bring STEM in touch with the implementation of the existing curricula – one or two projects per semester, and those are of integrative nature (even including the wider communities, creating internships – there are a whole series of opportunities). The focus is on how we teach (for children to understand the logic behind it), and not what we teach – how to help children to achieve the learning objectives. Mr. Merlino will update the team of experts with these new findings during this pre-planning meeting in Sarajevo. In the meantime, local expert team in Bosnia and Herzegovina will have enough time to meet, think about and process all this new information. Also, discussions and dialogue between American and local experts (in groups) are planned. Soon, we will decide on exact time, dynamics, preparation, time frame, homework, etc. The purpose is not have a rigid agenda at this time, in order for us to be able to adapt to our needs in the near future. The meeting with the expanded STEM working groups was held from 14th to 16th of June of 2017 (2.5 days). The American STEM experts (3 persons in total) arrived on 13th of June, 2017, when the first STEM meeting with local STEM experts regarding all questions at the time and the anticipated questions (besides the Skype meeting that was held prior to 13th of June, 2017).

REFERENCES

AL MAMUN, MD R., JACKSON,T., WHITE, G. (2015). *White Does the Geography Major Fit in STEM.* Journal of Geography and Geology; Vol. 7, No. 1; 2015 ISSN 1916-9779 E-ISSN 1916-9787 Published by Canadian Center of Science and Education Mason, J. (2003) Researching Your Own Practice; The Discipline of Noticing. London. Routledge-Falmer

ASGHAR, A. , ELLINGTON, R. , RICE, E. , JOHNSON, F. , & PRIME, G. M. (2012). *Supporting STEM Education in Secondary Science Contexts*. Interdisciplinary Journal of Problem-Based Learning, 6 (2).

ATKINSON, R. D., HUGO, J., LUNDGREN, D., SHAPIRO, M. J., & THOMAS, J. (2007). *Addressing the STEM challenge by expanding specialty math and science high schools*. NCSSMST Journal, 12, pp. 14–23.

BAILEY, A., KAUFMAN, E., & SUBOTIC, S. (2015). *Education, technology, and the 21st century skills gap.* Accessible at: https://www.bcgperspectives.com/content/articles/ public sector education technology twenty first century skills gap wef/

PALMER, S. , TOLSON, M. , YOUNG K., CAMPBELL M. (2015). The relationship between engineering bachelor qualifications and occupational status in Australia, *Australasian Journal of Engineering Education*. Volume 20, Issue 2, pp. 103-112.

CHEN, J. A., METCALF, S. J., & TUTWILER, M. S. (2014). Motivation and beliefs about the nature of scientific knowledge within an immersive virtual ecosystems environment. *Journal of Contemporary Educational Psychology*, 39 (2), pp. 112–123.

DANGERMOND J. (2013). Keynote, 2013. Geodesign Summit (ESRI, Redlands, CA). Accessible at: http://www. geodesignsummit.com/agenda/agenda.html

DEMSKI, J. 2009). *STEM picks up speed. T.H.E*. Journal, 36 (1), 22-26. Desimone, L. M. (2009). *Improving impact studies of teachers' professional development: Toward better conceptualizations and measures*. Educational Researcher, 38(3), pp. 181–199. http://dx.doi.org/10.3102/0013189X08331140

DWECK, C. S. 2006. *Mindset: The new psychology of success.* New York, NY: Random House. Dweck, C. S., Walton, G. M., & Cohen, G. L. (2014). *Mindsets and skills that promote long-term learning.* Seattle, WA: Bill & Melinda Gates Foundation.

DWECK, WALTON, & COHEN, 2014; Sharples, (2000). *A Vision for Innovation in STEM Education*, 2026. Accessible at: https://innovation.ed.gov/what-we-do/stem/.

FONTICHIARO, K., ELKORDY, A. (2015). *Chart students' growth with digital badges*. ISTE. Accessible at: https://www.iste.org/explore/articleDetail?articleid=320

FONTICHIARO, K., KRISTIN, ED. (2015). *Pushback: Information Literacy Doesn't Mean What You Think It Means*. E Book accessible at: http://www.slideshare.net/si641/pushback-information-literacy-does-not-mean-what-you-think-itmeans (class project). 100 p. 187 views as of May 20.

JAMES, R. K., LAMB, C. E., HOUSEHOLDER, D. L., & BAILEY, M. A. (2000). Integrating science, mathematics, and technology in middle school technology-rich environments: A study of implementation and change. *School Science and Mathematics,* 100(1), 27-35. http://dx.doi. org/10.1111/j.1949-8594.2000.tb17317.x

MERLINO, J. F. (2007). The 21st Century Partnership for STEM Education (21PSTEM), 2007.

MATLOVIČ, R. (2014). Transformácia programov vysokoškolskej geografickej edukácie v kontexte novej paradigmy orientovanej na výsledky vzdelávania. *Geografia*, 22, 3, pp. 83-91.

MATLOVIČ, R., MATLOVIČOVÁ, K. (2017). Neoliberalization of the higher education in Slovakia: a geographical perspective. *Geografický časop*is, 69, 4, 2017, pp. 313-337.

MATLOVIČ, R.; MATLOVIČOVÁ, K. (2012). Spoločenská relevancia a budovanie značky geografie. *Geografie,* 117, 1, pp. 33-51.

MATLOVIČ, R.; MATLOVIČOVÁ, K. (2016). The Position of Tourism and Territorial Marketing in the Context of Paradigmatic Change to Tertiary Geography Education in Slovakia. *GeoJournal of Tourism and Geosites*, 9, 2, 18, pp.133-144.

NURKOVIC, R., (2018). Rural development in Bosnia and Herzegovina under the influence of local communities, *Revue Roumaine de Géographie/Romanian Journal of Geography* 62, (2), Bucureşti. Accessible at: http://www.rjgeo.ro/latest_issue.html, pp.203–216

NURKOVIĆ, R. (2014). Influence of industry on changes in rural settlements on example of the ironworks in municipality of Zenica, *EURORURAL* 14, Brno, Czech Republic, pp. 25-37

NURKOVIĆ, R., (2012) Socio-economic transformation of Bosnia and Herzegovina, *Rural Studies* Vol.27 Local and regional development-challenges and policy issues, WARSZAWA 2012, pp. 151-161

NURKOVIĆ, R., (2012). Rural space as a product of contemporary economic-geographic development in Bosnia and Herzegovina, *IGC COLOGNE 2012*. 32 International Geographical Congress, University of Cologen, Institute of Geography, Germany, pp.178-179

SANDERS, M. (2009). STEM, STEM education, The Technology Teacher, 68(4). pp. 20-26.

STRAUSS, A. & CORBIN, J. (1998). *Basics of Qualitative Research - Techniques and Procedures for Developing Grounded Theory* . California, Sage, 2nd Edition.

DATA SOURCES

Foreing trade chamber of Bosnia and Herzegovina (EFTA, the EU, others 2010-2018) Overview of registered FDI in BH by countries and companies from May 1994 to June, 30 2018. (Companies with capital over 1 mil. KM) Ministry of Foreign Trade and Economic Affairs of Bosnia and Herzegovina, Sarajevo, 2018

Agency for Statistics of Bosnia and Herzegovina, Sarajevo, 2007-2018

FIPA - Agency for promotion of foreign investments in Bosnia and Herzegovina, 2011, URL: http://www.fipa.gov.ba/ local_v2 / default_bs.asp (25. 01. 2018). http://en.volksbank.com/investor_relations/group_information/ownership_structure (14. 01. 2018). http://www.fipa.gov.ba (2018)

Geoheritage, (https://link.springer.com/journal/12371)

GeoJournal of Tourism and Geosites (http://gtg.webhost.uoradea.ro/)

http://www.ziraatbosnia.ba/turkish/text.php?tekst=16 (14. 01. 2018).

International Journal of Heritage Studies, (https://www.tandfonline.com/loi/rjhs20)

Journal of Hospitality Leisure Sport & Tourism Education (https://www.sciencedirect.com/journal/journal-of-hospitality-leisure-sport-and-tourism-education)

Journal of Sustainable Tourism (https://www.tandfonline.com/loi/rsus20)
Law on Foreign Direct Investment in Bosnia and Herzegovina, Ministry of Foreign Trade and Economic Affairs of Bosnia and Herzegovina, Sarajevo, in 1998.

ABBREVIATIONS

BH - Bosnia and Herzegovina
EU - European Union
FBiH - Federation of Bosnia and Herzegovina
FDI - foreign direct investment
IMF - International Monetary Fund
KM - Convertible mark
RS - Republic of Serbian
STEM - Science, Technology, Engineering and Mathematics
UNCTAD - United Nations Conference on Trade and Development
USA - United States
USAID - United States Agency for International Development
WTO - World Trade Organisation

FOLIA GEOGRAPHICA • ISSN 1336-6157 (hard copy) • ISSN 2454-1001 (online)

SPORT, AS AN INFLUENCING FACTOR OF THE QUALITY OF LIFE AND REGIONAL COMPETITIVENESS
The Case Study of Jászárokszállás (Hungary)

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Received: February 15, 2020 | Revised: April 20, 2020 | Accepted: May 6, 2020
Paper No. 20-62/1-557

Abstract
The definition and measurement of the concept of regional competitiveness raises many questions. Experts of this topic initially examined the competitiveness of a region with hard statistical indicators. However, another aspect of judging competitiveness is the consideration of soft factors. This study is based on a qualitative survey in a small town in Hungary, in which we examined sport as a soft factor of territorial competitiveness. The aim of the research is to investigate whether and how sport in rural areas contributes to improving the quality of life of local people, community development and population retention. Our results show the positive effects of setting up a new sports center in a small town like Jászárokszállás. The number of residents who are active in sport has increased significantly with new services available locally. We can say that sport had positive impact not only the direct motivation of the respondents but also other areas of life. So, we can reasonably assume that it was recognizable for employers, co-workers, family members and neighbours too. In our study we could show the significance and positive influence of sport and the Sports Centre not only at the level of individuals, but also in shaping and increasing community activity. The circle of acquaintances and social activity among the respondents who use the services has increased significantly in recent years Based on our results we concluded that sport can play an important role in improving the competitiveness of rural areas. Its positive impact on individuals and communities contributes to making small-town life more attractive, which can be gradually expanded through conscious construction.

Key words
Sports investments, well-being, motivational factor, sustainable development, community development.

INTRODUCTION

Territorial competitiveness and its measurement

Competitiveness is a difficult to measure, competition and competitiveness are determined in many ways in international and national literature. According to Enyedi (1996, 1998), the objective of competition between territorial units is different

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from other types of competition - such as competition between employees and companies - since the main objective is to increase regional income, which can increase well-being and living standards. Lengyel (2012) draws attention to the complexity of the content of competitiveness, according to him, competitiveness is a collective concept, which expresses the tendency and willingness to compete and the ability to gain competitive position, what primarily is shown by in some way measured success and the ability to be it. The issue of the competitiveness of municipalities raises a very diverse questions, it includes the quality of life in the municipalities, in which social, economic and environmental infrastructure, the quantity and quality of available services play an important role (Lengyel, 2003). Thus, when judging the competitiveness of an area, not only economic factors but also social and environmental aspects must be taken into account, especially when it comes to sustainable competitiveness (Doyle and Perez Alaniz, 2017).

The most basic finding is that as a result of competition in the territorial sense, the quality of life of locals increases (Kitson et al. 2004). However, measuring this raises some basic questions. According to Csath (2018), one of the questions of interpretation is how much emphasis can be placed on the definition of so-called hard, measurable factors and less easily measurable soft factors when determining competitiveness. Generally, hard indicators are those that are written by processing statistical data with values calculated from mathematical relationships. In contrast, soft indicators are generated through qualitative research in a subjective approach. In this case, the data are usually based on questionnaire surveys, interviews or focus group studies (Rišová, 2016). Fekete and Berzsenyi (2018) says that in the analysis of competitiveness, most of the literature evaluates the competitiveness of a region or region with hard factors. Most of these factors are, for example, unemployment, employment, Gross income serving as personal income tax base per capita are available from statistical databases. In addition to the "hard" factors, the research will also use soft quantitative information, available through a questionnaire survey, since in terms of quality of life it doesn't matter, which factors of municipality's attraction / competitiveness are appreciated by the population and how satisfied they are with them. Koltai (2005) also notes that the methods of analyzing the competitiveness of settlements on a statistical basis are well complemented by questionnaire surveys, since they are also capable of revealing the underlying socio-economic processes. In his study, he is looking for an answer in a representative questionnaire survey, what are the quality aspects that affect the competitiveness of cities that the Hungarian population prefers when choosing their place of residence. In his research carried out in 2004-05 he classified his competitiveness factors into four factors with the help of factor analysis: service factor, existence factor, environment factor, human factor. Koltai's market research results are also trying to answer, whether the public opinion is right, that the cities that provide high income and living standards, their labor market abilities, their living

environment and cultural, educational, sporting, health and commercial services are successful (Koltai, 2014). Developing infrastructure is essential in the life of all settlements regardless of their size. In addition to the declining population in general, in a small town is a really serious task to expands the service functions (Bujdosó et al. 2016). In addition a number of studies highlight the role of education, tourism and regional marketing, image building (Matlovic and Matlovicová (2016); Matlovicová et al. (2016, a); Matlovicová et al. (2019).

Garelli (2002) also points out that competitiveness, if it is only indicated by economic indicators, cannot guarantee the improvement of quality of life. That is why real competitiveness must strike a balance between economic results and the social results of the nation. This also requires attention to historical-cultural characteristics, traditions and value systems.

Sport as a value system

Several studies have demonstrated the positive impact of sport on the physical, mental and mental state of an individual (Keresztes, 2007). There are fewer athletes smoking, eating healthier, more confident, having fewer psychosomatic symptoms (Mikulán et al. 2010). In addition, those who do sports are able to make friendships, more satisfied with their looks, more future-oriented, and self-regulated behaviour (Petrozhak et al. 2019). All in all, the beneficial effect of sport on health can be demonstrated in all three (somatic, psychic, psychosocial) dimensions of health (Pikó-Keresztes, 2010).

According to Kovács (2015), all this shows that if regular sports appear as a value in the life of an individual, they can gain long-term benefits, even for their entire life, compared to non-athletes. According to Izzo (2005), sport itself can be considered a value since it contributes to the personality development, social socialization, social relationships and development of the individual besides the above mentioned positive effects. In addition, Bailey (2005) believes that sport is also an important tool of social inclusion of disadvantaged groups, and it plays an important role in bridging cultural and ethnic differences.

Many definitions of sport are known; in our study, we examine sport as part of lifestyle in the context of lifestyle-health. The quality of life is influenced by many factors, and the Rahman-model summarizes it in its input-output approach, in which health plays a central role (Sebestyén, 2005). Sport plays an important role in regional sustainable development, some of its areas contribute greatly to improving the quality of life of the population (Lindsey and Chapman, 2017). The European Union distinguishes two basic areas of sport, distinguishes sport as an economic activity, and sports as a social phenomenon. The Union has a clear direction for its member states, with the aim of creating communities whose life-force, quality of life and well-being assume the basis of individual health (Nagy, 2010).

The positive effects of recreational sport have a fundamental impact on the decisions of those involved. Civilization harm reaches the vast majority of the population, causing different problems at the individual level, however, the perception, understanding and response to the problems may vary considerably - think of the relationship between physical and mental health (Brudzinski and Ebben, 2010. The importance and order of exercise motivation may vary widely across different social groups. Of course, differences between men and women are also determined by differences in body building and social expectations. The latter can be explained, that the general importance for women of having a good appearance and meeting social expectations, while for men it is more important to experience competition and develop competencies (Koivula, 1999). It is important that the positive effects of sport on the level of individuals and then summarized in a well-defined social group can be measurable and measurable..

Impact of sport on local community

Among the local government population conservation efforts, economic development ideas are mentioned first and foremost, when settlements seek to attract businesses by supporting businesses, attracting investors, and establishing industrial parks (Guagliano and Riela, 2005). Kőmíves and co-authors (2018) studied sport as a factor in maintaining the population in the countryside. Their research concludes that sport can play a significant role in keeping young people in the countryside. However, in order to become attractive to young people, municipalities also need adequate sports infrastructure and sports facilities. Sports can also play an important role in strengthening the local identity of settlements, when properly combined with the benefits of rural life, can make the life of small towns very attractive to people. Sport, therefore, not only has an impact at the individual level, but also plays an important role in shaping relationships between people. Closer relationships and friendships can occur spontaneously while doing sports. Working together, striving for a common goal is a community-building force and also helps you to integrate into the community (Schulenkorf, 2012).

The social impact of sporting events on the quality of life of the local community is particularly significant. While mega-events often provoke resentment from the local population due to the congestion and other inconvenience they cause, smaller events are generally welcomed by the local community (Slender et al. 2015). Sporting events proportional to the number of local residents can also enhance the sense of community and the pride of residents in their place of residence (Bujdosó and David, 2013). But there are many factors which contribute to marginalization such as people's education, etnichity and gender. This is especially important in rural areas where can be poor and disadvantaged in comparison to urban areas (Brunn et al. 2018). In these areas, social conflicts may intensify and the

number of crimes may increase, which significantly reduces the sense of security of local residents (Matlovicová et al. 2016, b). Significant social inequalities not only cause problems in the short term such as social tension, crime etc. (Matlovicová, 2010), but also reduce the pace of long-term economic development, as unanimously acknowledged by economists. Expanding the opportunities of recreational sports as a community activity can also help members of the marginalized society (Matlovicová et al. 2016, a). The involvement of local volunteers in the organization and running of sporting events and the use of existing sports facilities open to the local community can, in particular, enhance the positive social impact. (Vargáné and Serre, 2016). Furthermore, the environmental effects of smaller sporting events can usually be managed more efficiently than mega-events that attract larger numbers of visitors causing traffic problems, air and noise pollution. The use of existing infrastructure and the proportion of visitors proportional to the size of the local community do not, in experience, cause irreversible damage to the natural environment (Gibson et al. 2012).

OBJECTIVES

In our study, sport as a soft factor of territorial competitiveness was examined from three aspects: (1) whether and how it contributes to an individual's quality of life (2) whether and how it contributes to local community development (3) whether it contributes to increasing the population retention capacity of rural areas.

THEORETICAL FRAMEWORK

Rural development is a complex activity that goes beyond the primary and exclusive development of the economy. In addition to economic development, it is also about improving the quality of life in rural communities. Quality of life is also a complex concept with its subjective components besides its objective factors. The European Union has a clear direction for its member countries, with the aim of creating communities that create the health conditions for individual prosperity. The basic aim of the research is to examine, through a case study, whether the establishment of a sports center in a rural municipality can be considered as an investment in improving the quality of life. In other words, what impact does the use of sports services and consumer activity have on the subjective quality of life of consumers.

DATA AND METHODS

Introduction of Jászárokszállás

The area of the municipality is 77.17 km2, with 7734 permanent residents based on the 2016 CSO (Hungarian Central Statistical Office) data. Analysing demographic conditions, we can say that one of the biggest challenges in rural areas, the population retention also appears here. The number of inhabitants decreased by 8% be-

tween 2002 and 2016, which follows the national trend. Jászárokszállás also shows the aging process as in Europe, but we can see as positive that the number of 0-2 year olds has increased by 16% since the turn of the millennium until 2016. However, in the other age groups there is a decline between 2000 and 2016.

Until the end of the Second World War, the traditional agriculture and craft industry were dominant in the settlement, however, the industrialization process of the 1970s brought a significant change in the life of Jászárokszállás. From 2002, the municipality can use the title of "Industrial Park". Companies operating in the Industrial Park, which is also significant at regional level, provide jobs for thousands of people. It has a decisive role in expanding employment opportunities and has an impact on the local economy.

Primary research

Between January and March of 2019, we surveyed respondents' attitudes, habits and motivations to the sport at the Sports Centre (Eleven Ház). The questionnaire was conducted both on-site and on-line. The total number of evaluable questionnaires was 121, of which 50 were personal interviews and 71 were completed online.

The proportion of local residents was 78.5% in the study sample. This points to the small town's role in the network of settlements, the proximity of the central towns limit its central functions in the service sector. A larger proportion of respondents lived in neighboring smaller villages, and the significance of those who arrived from distances more than 20 km was negligible in the sample.

Significantly more women (75.2%) appear in the study sample, which was influenced by their preference for group sessions in the Sports Centre, in addition to their higher willingness to respond. The majority of participants (80.2%) were in the age group between 18 and 50 years of age. However, within the group, different motivations appear between young and middle-aged adults. The low presence of people under 18 (4.1%) can also be explained by the fact that they have access to sporting activities in school physical education classes. We tried to find out the reason for lower participation rate (15.7%) among people over 50 years of age in the context studies.

Based on highest level of education, the respondents with college or university graduation were over-represented in the sample (58.7%). The share of people with secondary education is 36.4%, while those with only basic education are basically young people who have not reached the age of 18.

Another part of our primary research was to conduct an in-depth interview with the owner of "Eleven Ház" Sports Centre. With the help of the interview we got answers about the conditions of the realized investment, the characteristics of the guests, the number of employees, the intention to cooperate with other actors of the settlement, and the future development ideas.

Brief introduction of the investment (Eleven Ház)

The "Eleven Ház" is implemented and owned by a local entrepreneur. During the in-depth interview with him, first we get an answer about the idea of investing. According to him, the sport was always close to the family, they liked to take a sauna, but they could do it only in Jászberény or Gyöngyös, 20 km away.

After many years of planning, implementation was decided. Their goal was to bring unavailable services to Jászárokszállás without having to travel. They sought complexity with the intention of reaching as many people as possible. To do this, a preliminary needs assessment was carried out and hundreds of questionnaires were received from local residents describing what they needed, what kind of sports they do and what they want to do. They formed their services according to the results. The amount of the investment was 120,000,000 HUF, of which EU support was 25,000,000 HUF.

Based on guest data, an average of 3,000 entries are registered per month, broken down by gender: male: 44%, female: 56%. Table 1 shows that most guests are in the 21-40 age group. Examining the "Eleven Ház" catchment area, the following data were obtained, broken down by place of residence: Jászárokszállás 56%, neighboring settlements 32%, other 12%.

Table 1 Rate of guests by age in a monthly average

Age	Head	Rate (%)
0-10	2	3.52
11-20	89	14.95
21-30	159	26.71
31-40	141	23.69
41-50	108	18.14
51-60	47	7.89
61-70	25	4.20
71-	5	0.84
Total	595	100.00

Source: *Own calculation based on the in-depth interview. 2019.*

The sports facility provides permanent employment for a total of 21 people, including 10 staff members and 11 trainers. The "Eleven Ház" places great emphasis on co-operation with other actors of the town in organizing joint events. The "Hello Nyár" event is co-organized with the Local Government of Jászárokszállás on the open-air bath of the settlement. Students of the municipal gymnasium and elementary school as well as elementary schools of two neighboring settlements (Visznek, Vámosgyörk) visit the "Eleven Ház" each year for physical education. The

Challenge Day, organized by the Parent Working Community of the Jászárokszállás Primary School, is provided by the facility. In addition, other sport, social or charitable events are supported by donations.

RESULTS AND DISCUSSION

The presence of the Sports Centre in the town is considered very important by the vast majority (89.3%) of respondents, which can be attributed to the fact that residents of small towns continue to carry out a lifestyle similar to that of large cities. Work often involves more mental stress while minimizing physical strain. This transformation process has created a real need in the sports services market. 58.7% of respondents were extremely dissatisfied with the availability of local sports facilities before the investment. A very significant effect of the opening of the "Eleven Ház" can be seen in the result of the survey: 31.4% of participants did not practise any sport activities at all in the previous period. Most of the attendants are very active in sports and can be said port belong to their lifestyle. 49.6% of the study group use the Sports Centre several times a week.

Our study also looked at what motivational factors play a role in using the services of "Eleven Ház". As a result, it can be stated that the interviwees most often do sports for health related reasons, the most important factors are preserving health, stress relieving and improving well-being. Thus, most of the decisive reasons can be related to the prevention and solution of the problems caused by the modern lifestyle. The main reason for this is that most of today's jobs involve minimal or unbalanced physical strain on the employee. Mental, psychical and physical stressor effects are very different. However, free and easy physical activities can have positive effects on all three categories. For many people, improving performance, a good mood, and a better look are also important goals (Figure 1).

Figure 2 gives an appropriate answer to the question of whether these motivational factors achieve any positive change? Examining the impact of using the opportunities afforded by the Sports Centre, we can conclude that the subjective judgment of the respondents has a positive impact on all aspects. On a scale of 1-5, the average values are above 3.5. Respondents perceive the benefits of sport "on their own skin", both in their private lives and at work. Most obviously, the respondents described the positive changes in the physical state of their body in the first place. However, there is also an improvement in the general mental and psychological state, and the beneficial effects of physical activity in other areas of life (e.g. social relationships).

Another important topic of our study was the assessment of the community-forming significance of sport and the new Sports Centre. The community-building impact was felt at the level of individuals, where respondents were able to spend their free time in good company and become more open to new social rela-

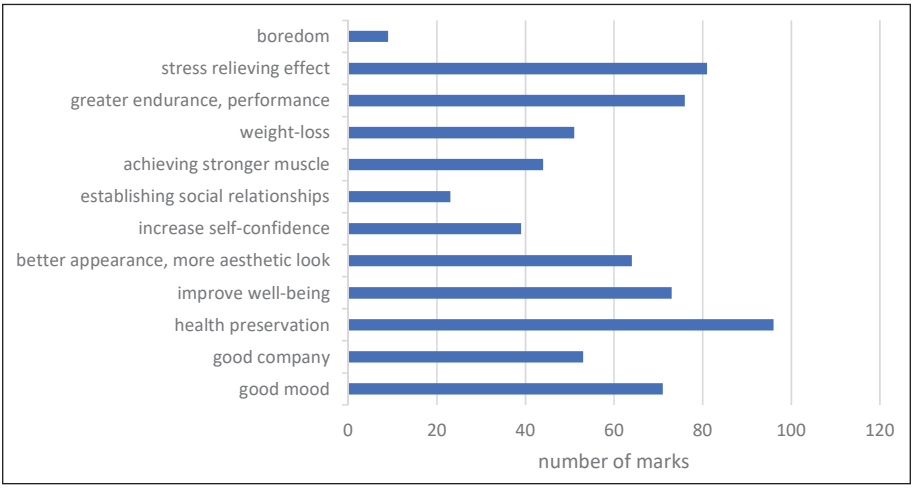

Figure 1
Importance of motivational factors
Source: *Own calculation. N=121. 2019*

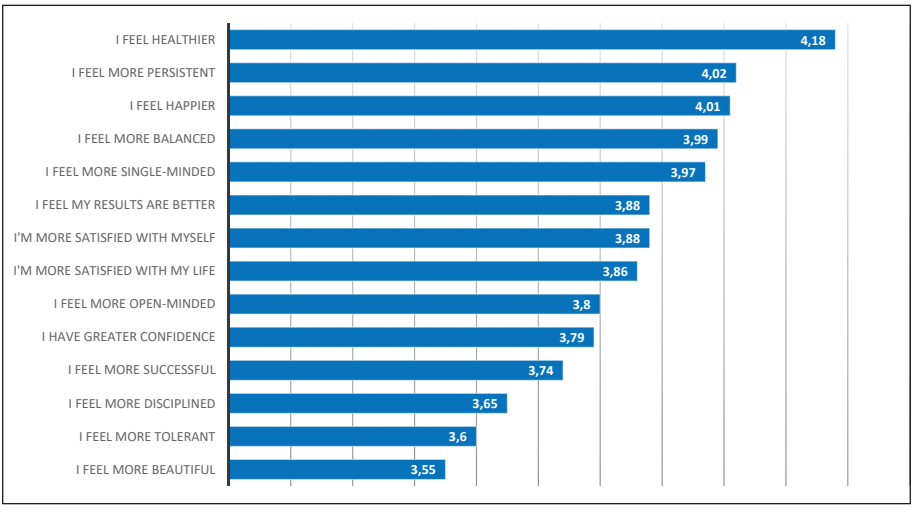

Figure 2
The impact of sport on the individual on average of the 1-5 Likert scale
Source: *Own calculation. N=121. 2019*

tionships. Most of these, of course, take place within a narrower circle of personal friendships, but larger events can also enhance the feeling of belonging to a larger group. New sport facilities resulted in an average of 9.23 new acquaintances for the interviewees, with the highest marked response reaching 50. Meanwhile, the number of those who did not expand their circle of acquaintances was insignificant.

Respondents rated the role of the "Eleven Ház" in shaping the local community as very significant, representing an average of 4.36 on a 1-5 Likert scale. This means that, according to 50.4% of the responses the activity of the Sports Centre contributes fully to the building of the local community, and only 17.4% judging that its role is neutral and does not contribute to community development at urban level. The perception of the "Eleven Ház" as a new venue was even more positive, with an average response rate of 4.47 and 57.9% of respondents attaching great importance to the organization of events.

Relationship studies

We have previously highlighted the positive impact of Sports Centre in encouraging a new segment of the population to exercise regularly in the town. This was also evident in the evaluation of the motivational factors, which showed that the increase of self-confidence (p=0.016) and the improvement of well-being (p=0.042) had a much greater role in the case of non-athletes (Figure 3).

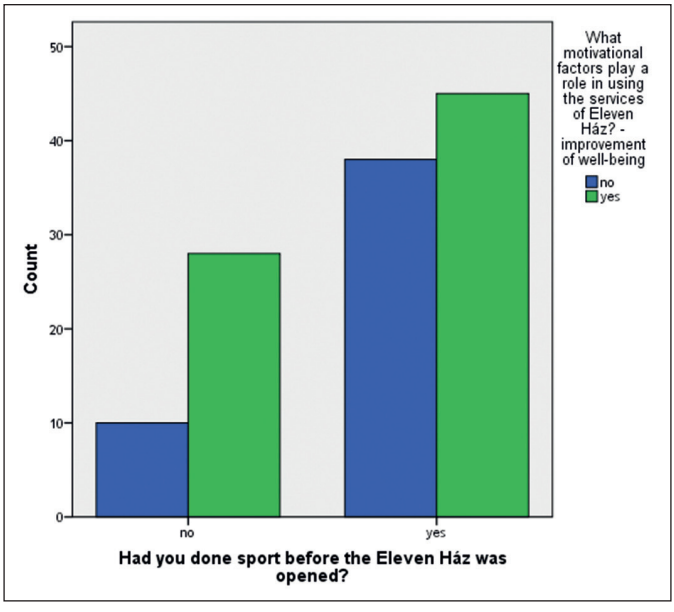

Figure 3
The role of the Sports Centre in improving the well-being
Source: *Own calculation. N=121. 2019*

Only among them appeared to a considerable extent (p=0.027) the significance of banishing boredom, as they introduced a whole new activity into their daily lives. For people who have been active in the past, significant progress has been

made in being able to perform similar physical activities under better conditions and at a higher standard. On the other hand, they had the opportunity to establish new social relationships through the opportunities offered by the venue and group activities.

The new sport facilities have had a positive impact on both regularly sporting and less active people. The differences between the two groups were generally minimal in terms of the impact of the investment, but had a slightly greater positive impact on previously non-athletes in other areas of life (workplace, community integration).

The main possible motivations for sports (e.g. maintaining health, improving well-being) are emphasized in all social groups irrespective of age. However, a better lookvand more aesthetic appearance is particularly important for young people in their 20s, while it is less motivating for those over 50 (p=0.012). This is even more the case for increasing self-confidence (p =0.003), for which a similar relationship can be observed (Figure 4).

Weight loss is important for people between the ages of 20 and 50, while it is less important for those over the age of 50. For the older age groups, besides the more general goals (wellbeing, health preservation, stress relieving), leisure time that is useful in good company and mood is more emphasized.

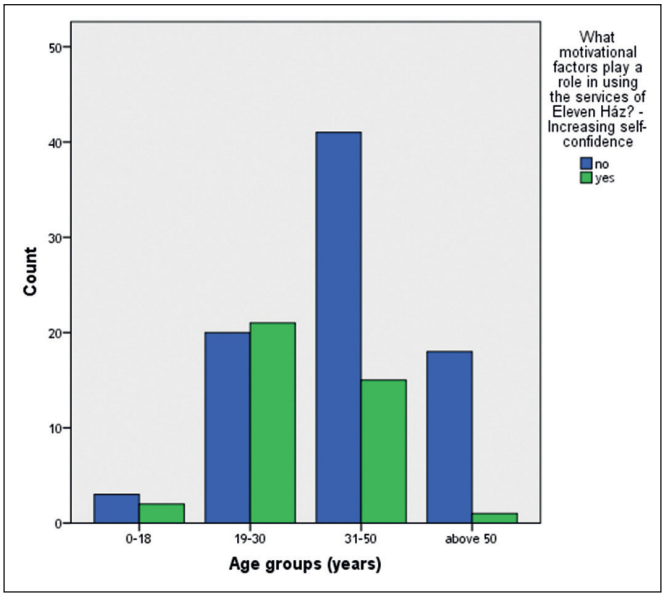

Figure 4
Increasing self-confidence as a motivational factor in responders' age groups
Source: *Own calculation. N=121. 2019*

We could basically compare the answers of two groups in terms of the highest level of education, since only the number of people with tertiary and secondary education provided the appropriate background. There were hardly any differences between the two groups in the motivation for sports. In the case of effects, the majority of the responses found that the positive impact of sporting activities is higher for group of graduates than for those with a high school education. There was a statistically significant difference in that graduates felt more persistent, balanced, effective and healthier due to sport.

There was no statistically significant difference among the income categories regarding the assessment of motivation factors. Respondents are similarly exposed to the effects of civilization and to sport for similar reasons. At the same time, a smaller difference was seen in the fact that more people indicated higher appearance and better look in the average and higher income groups. At the same time, the increase of self-confidence was mainly focused on lower income groups. Contrary to our previous assumption, the mention of the stress-relieving effect did not increase in parallel with the increase in income, its significance was lower than average in the top category.

Participation in the events organized at the "Eleven Ház" was considered important by women (Figure 5), being much more active in this respect than men

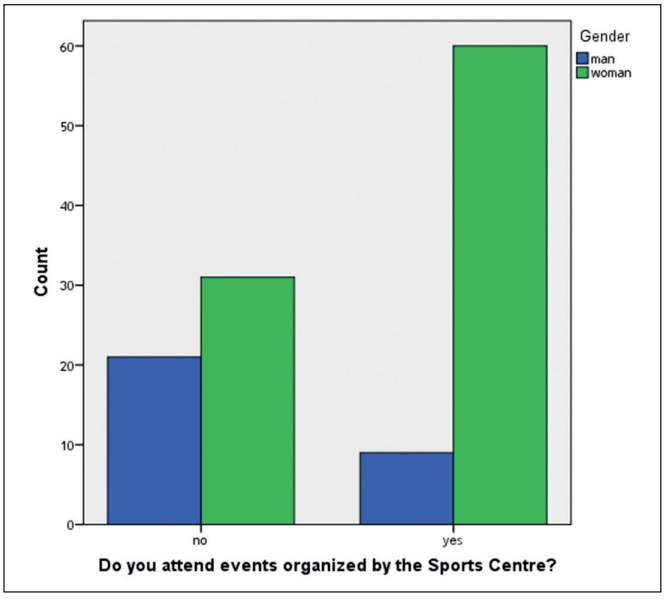

Figure 5
Participation in events by gender
Source: *Own calculation. N=121. 2019*

(p=0.001, Phi=0.313). There was no significant difference between the age groups in this respect, however, it can be said that the activity of middle-aged people was higher compared to young people. The highest level of education did not influence the distribution of the answers at all.

The proportion of young professionals who can be retained locally is a key factor of the city's competitiveness. There are many factors that influence the satisfaction of inhabitants with their place of residence, but sports services also clearly play a role. The role of the "Eleven Ház" was also viewed positively by respondents. However, due to the influence of other factors (which may be more important), the mean response (M=3.97) did not reach four (on a scale of 1 to 5.). And the average response rate for the affected age groups was lower than for the middle-aged.

CONCLUSIONS

The competitiveness of a region or a settlement is not only determined by the relevant economic performance indicators. It is also very important to take into account the quality of life and the resilience of the population. The human resource base of the area should not be narrowed by emigration or inactivity. At the same time, it is of paramount importance for employers that employees are able to perform consistently at a high level in the workplace. Today's jobs often impose a disproportional, one-sided burden on employees. While there is little chance for movement, the stress is intensified. At the same time, other sources of danger to diseases of civilization are present in people's lives, which is typical not only of the urban population but also of the countryside. The appearance of similar problems induces similar responses. It has become important for the rural adult population to have access to sports facilities. However, economies of scale do not allow this in villages, but in smaller towns it is already possible.

In our case study we show you the positive effects of setting up a new sports center in a small town like Jászárokszállás. The number of residents who are active in sport has increased significantly with new services available locally. As the harms of civilization often reach young people, it has become important for all age groups to preserve health, relieve stress, and improve well-being. In adittion, achieving attractive external and increased self-confidence has become more prominent for young people for obvious reasons. These can play an important role both to choose a couple or get a job. Motivations and positive effects of sporting activities showed little variation among different income groups. In the case of highest education level the difference between secondary and tertiary education is already noticeable, because graduates were more aware of their positive effects. In summary, we can say that sport had positive impact not only the direct motivation of the respondents but also other areas of life. So we can reasonably assume that it was recognizable for employers, co-workers, family members and neighbours too.

In our study we could show the significance and positive influence of sport and the Sports Centre not only at the level of individuals, but also in shaping and increasing community activity. The circle of acquaintances and social activity among the respondents who use the services has increased significantly in recent years. A new venue for events has appeared in the town, that filled a gap and improved the overall image of the city for the locals. Similar results can even be a tool to keep young people locally. If the scope of cooperation between the Sports Centre and the employers of the town will be further expanded, it may has direct importance for improving the competitiveness of the town. All in all, sport can play an important role in improving the competitiveness of rural areas. Its positive impact on individuals and communities contributes to making small-town life more attractive, which can be gradually expanded through conscious construction.

REFERENCES

BAILEY, R. (2005). Evaluating the Relationship between Physical Education, Sport and Social Inclusion. *Educational Review* 57(1), pp. 71-90.

BRUDZYNSKI, L., EBBEN, W. P. (2010). Body Image as a Motivator and Barrier to Exercise Participation. *International Journal of Exercise Science* 3(1), pp. 14-24.

BUJDOSÓ, Z., DÁVID, L. (2013). Extreme sports and other activities in tourism with special regard to the Mátra Mountain. *Journal of Physical Education and Sport* 13(1), pp. 39-45.

BUJDOSÓ Z., GYURKÓ Á., HÁGEN I. (2016). Socio-economic aspects of the urbanisation in Northern Hungary in the 21st century. *Folia Geographica* 58(2), pp. 35-53.

BRUNN, S., MATLOVIČOVÁ, K.; MUŠINKA, A.; MATLOVIČ,, R. (2018). Policy implications of the vagaries in population estimates on the accuracy of sociographical mapping of contemporary Slovak Roma communities. *GeoJournal,* 83, 4, 2018, 853-869., https://doi.org/10.1007/s10708-017-9804-9.

CSATH, M. (2018). Tudás- és innovációalapú versenyképesség. *Pénzügyi Szemle* 63(1), pp. 65-79.

DOYLE, E., PEREZ-ALANIZ, M. (2017). From the Concept to the Measurement of Sustainable Competitiveness: Social and Environmental Aspects. *Entrepreneurial Business and Economics Review* 5(4), pp. 35-59.

ENYEDI, Gy. (1996). Regionális folyamatok Magyarországon az átmenet időszakában. Hilscher Rezső Szociálpolitikai Egyesület, *Ember-település-régió sorozat*, Budapest.

ENYEDI, Gy. (1998). Sikeres régiók. In *Tények könyve*. Greger-Delacroix, Budapest, pp. 409-411.

FEKETE-BERZSENYI, H. (2018). A települési versenyképesség aspektusai a Balaton Régióban. In.: Torgyik J. (szerk.) Néhány társadalomtudományi kutatás és innováció. International Research Institute. Komárom, p. 98-105.

GARELLI, S. (2002). Competitiveness of Nations: The Fundamentals. (www.compilerpress.ca/competitiveness/ AnnoGarelli CN Fundamentals.

GIBSON, H. J., KAPLANIDOU, K., KANG, S. J. (2012). Small-scale event sport tourism: A case study in sustainable tourism. *Sport Management Review* 15 (2012), pp. 160-170.

GUAGLIANO, C., RIELA, S. (2005). Do special economic areas metter in attracting FDI? Evidence from Poland, Hungary and Czech Republic. ISLA – Department of Economics, Università „Luigi Bocconi", Milánó. 21 p.

IZZO, R. E. (2010). The Educational Value of Competitive Sport. *Sport Science Review* 19(3–4), pp. 155–164.

KERESZTES, N. (2007). Ifjúság és sport. In Pikó Bettina (szerk.): Ifjúság, káros szenvedélyek és egészség a modern társadalomban. Budapest, L'Harmattan, pp. 184-199.

KITSON, M., MARTIN, R., TYLER, P. (2004): Regional Competitiveness: An Elusive yet Key Concept? *Regional Studies* 38(9), pp. 991-999.

KOIVULA, N. (1999). Sport participation: Differences in motivation and actual participation due to gender typing. *Journal of Sport Behavior* 22(3), pp. 360-380.

KOLTAI, Z. (2005). A magyarországi városok versenyképességének lakossági megítélése. *Tér és Társadalom* 19 (3-4), pp. 23-41.

KOLTAI Z. (2014). Sikeres és versenyképes városok. Piackutatás a magyar települések körében. PTE FEEK, Pécs.

KOVÁCS, K. (2015). A sportolás, mint támogató faktor a felsőoktatásban. Oktatáskutatók könyvtára 2. Kapitális Nyomdaipari Kft, Debrecen, 270 p.

KŐMÍVES, P. M., SZABADOS, GY. N., KULCSÁR, G., BÁCSNÉ BÁBA, É., FENYVES, V., DAJNOKI, K. (2018). „Visszatérni vidékre" A sport megtartó ereje „Return to the countryside" –The retention possibility of the sport. *International Journal of Engineering and Management Sciences* (IJEMS) Vol. 3. (2018). No. 4. pp. 292-307.

LENGYEL, I. (2003). Verseny és területi fejlődés: Térségek versenyképessége Magyarországon, JatePress, Szeged, pp. 256-304.

LENGYEL, I. (2012). Regionális növekedés, fejlődés, területi tőke és versenyképesség. In: Bajmócy Zoltán – Lengyel Imre – Málovics György (szerk.) Regionális innovációs képesség, versenyképesség és fenntarthatóság. JATEPress, Szeged, pp. 151-174.

LINDSEY, I., CHAPMAN, T. (2017): Enhancing the Contribution of Sport to the Sustainable Development Goals. Commonwealth Secretariat, Marlborough House, Pall Mall, London, 139 p.

MATLOVIČOVÁ, K. (2010). Perception of Crime Risk in Presov City. *Geographia Cassoviensis* 4 (2), pp. 98-106.

MATLOVIČOVÁ, K., KOLESÁROVÁ, J., MATLOVIČ, R. (2016, a) Selected Theoretical Aspects of the Destination Marketing Based on Participation of Marginalized

Communities. Conference: 8th International Annual Scientific Conference on Hotel Services, Tourism and Education Location: Prague, CZECH REPUBLIC Date: OCT 19, 2016, pp: 128-143.

MATLOVIČOVÁ, K., MOCAK, P., KOLESAROVA, J. (2016, b). Environment of estates and crime prevention urban environment formation and modification. *Geographica Pannonica,* 20 (3), pp. 168-180.

MATLOVIČ, R., MATLOVIČOVÁ, K., (2016). The Position of Tourism and Territorial Marketing in the Context of Paradigmatic Change to Tertiary Geography Education in Slovakia. *GeoJournal of Tourism and Geosites*, 9, 2, 18, 133-144.

MATLOVIČOVÁ, K., TIRPAKOVA, E., MOCAK, P. (2019). City Brand Image: Semiotic Perspective a Case Study of Prague. *Folia Geographica*, 61(1), pp. 120-142

MIKULÁN, R., KERESZTES, N., PIKÓ, B. (2010). A sport, mint védőfaktor: fizikai aktivitás, egészség, káros szenvedélyek. In: Pikó B. (szerk.): Védőfaktorok nyomában. A káros szenvedélyek megelőzése és egészségfejlesztés serdülőkorban. Budapest, L'Harmattan – Nemzeti Drogmegelőzési Intézet, pp. 115-130.

NAGY, Á. (2010). A sportmenedzselés és- szervezésfejlesztési lehetőségei a Debreceni Egyetemen. Ihrig Károly Gazdálkodás- és Szervezéstudományok Doktori Iskola. Doktori értekezés, Debrecen. 159 p.

PETROZHAK, O. L., STOVBA, I. R., STOLYAROVA, N. V., TAMOZHNIKOVA, G. V. (2019): Correlations between self-attitude and body image in university students. *Journal of Physical Education and Sport* 19(4), pp. 2518-2521.

PIKÓ, B., KERESZTES, N. (2010). Serdülők egészségmagatartása két szociális coping-mechanizmus tükrében. In: Pikó B. (szerk.) Védőfaktorok nyomában. A káros szenvedélyek megelőzése és egészségfejlesztés serdülőkorban. Budapest, L'Harmattan — Nemzeti Drogmegelőzési Intézet, pp. 103-113.

RIŠOVÁ, K. (2016). Meranie subjektívnej a objektívnej dimenzie kvality života z geografického hľadiska – Prehľad prístupov. *Folia Geographica* 58(2), pp. 54-69.

SCHULENKORF, N. (2012). Sustainable community development through sport and events: A conceptual framework for Sport-for-Development projects. *Sport Management Review* 15(1), 1-12. https://doi.org/10.1016/j.smr.2011.06.001

SEBESTYÉN, T. (2005). Rahman életminőség modell. In: Kopp M. – Pikó B. (2006): A kultúra és az életminőség kapcsolata.

SLENDER, H., STRAATMEIJER, J., HOVER, P., CEVAAL, A. (2015). Impact of sport events on local communities: dimensions and measures. *12th European Association for Sociology of Sport (EASS) Conference* 2015, Dublin, Ireland, Volume 12.

VARGÁNÉ Cs. K., SERRA Gy. (2016). A sportturizmus lehetőségei a vidékfejlesztésben az Észak-Alföldi Régió példáján. The opportunities of sport tourism in rural development as seen through the example of the North Great Plains Region. KÖZTES EURÓPA *Társadalomtudományi folyóirat*. VIII. évf. 1-2. szám. Szeged. pp. 145-157.

FOLIA GEOGRAPHICA • ISSN 1336-6157 (hard copy) • ISSN 2454-1001 (online)

AIR QUALITY IN CELLARS: A CASE STUDY OF WINE CELLAR IN SĂLACEA, ROMANIA

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Received: November 29, 2019 | Revised: January 16, 2020 | Accepted: January 26, 2020
Paper No. 20-62/1-552

Abstract
The space, like cellars, where locals keep food products plays an important role. Cellars are ideal spaces because they provide balance and do not allow thermal shock. The purpose of a cellar is to extend the shelf life of the products, regardless of season and weather conditions. The cellar must meet certain conditions, such

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as constant temperature and humidity, lack of unpleasant odours, darkness etc. In this respect, this study has analysed air temperature, relative air humidity and fungi in a cellar located in the village of Sălacea, Bihor County, Romania. The results obtained show that the temperature inside the cellar during the monitored period falls within the optimal parameters for preservation of products and the constant presence of mould may develop pathologies in persons who spend more hours working in this environment. Bringing these parameters to normal values is an important task for cellar owners, whose solving is necessary for preserving products over a long period of time.

Key words
Cellar, authentic, fungi, temperature, humidity, heritage.

INTRODUCTION

Sălacea is the village of "the 1,000 cellars", dug directly into the bedrock. Microclimate monitoring and analysis of the airborne fungi in the underground cellars are extremely significant for human health (owners, visitors, etc.), as well as for the safety of the products that are kept inside these cellars. The approach is part of a vast plan of microclimate monitoring and fungi analysis inside wine cellars in order to support their preservation and their possible introduction into the national cultural heritage (Matlovicova et al. 2019).

Sălacea village, located in the northwest of Romania, Bihor county, is one of the most representative settlement, specific for the contact area between the Pannonian Plain (Ierului Valley subsidence plain) and the Western Hills (Sălacea Hills) (Figure 1). With an altitude ranging between 100 m in the north-western part and 160 m in south-east, the topography of Sălacea village has favoured building over 950 cellars, some of them dating back 200-300 years (Kéri and Kántor, 2009). These are evidence of the time when winegrowing represented a priority for the inhabitants of this area, the traces of such occupation being deeply dug into the ground in the form of cellars.

Together with an ethnography specialist and an architect, an authentic cellar model, made of wood, mud brick and reed, completely covered by earth, was identified and chosen for performing the monitoring between 02/04/2018 and 02/05/2018. The facade is entirely made of oak wood and it is not decorated (Figures 2 and 3). The cellar is dug at about 2-3 m deep. The facade focuses on the door which is made of oak wood and wrought iron (Figure 2).

The purpose of the study is to investigate the air quality in the identified cellar in order to observe the storage conditions of the products intended for consumption, but also the effects on the health of people who are working in such space for a longer period of time.

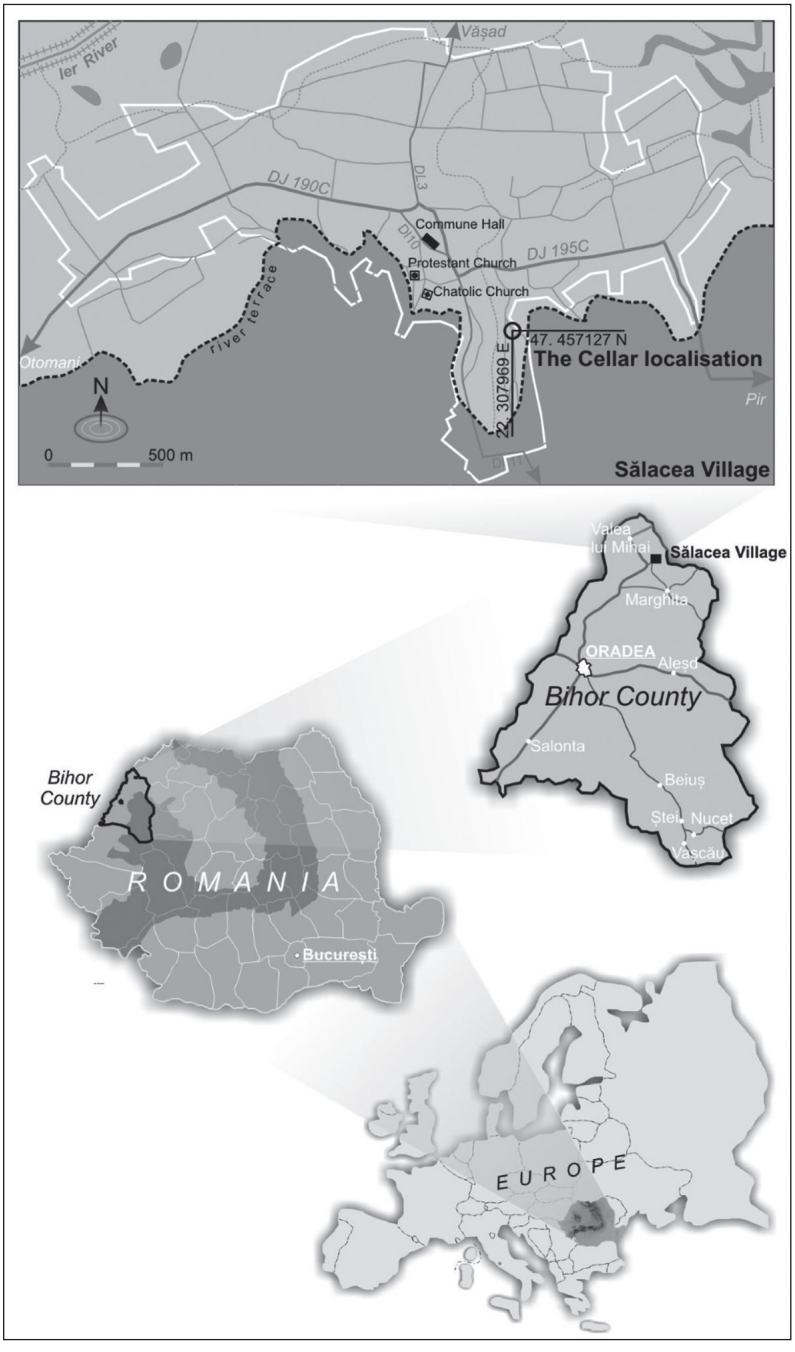

Figure 1
Geographical location of the monitored cellar

Figure 2
Facade of rebuilt traditional cellar, Sălacea

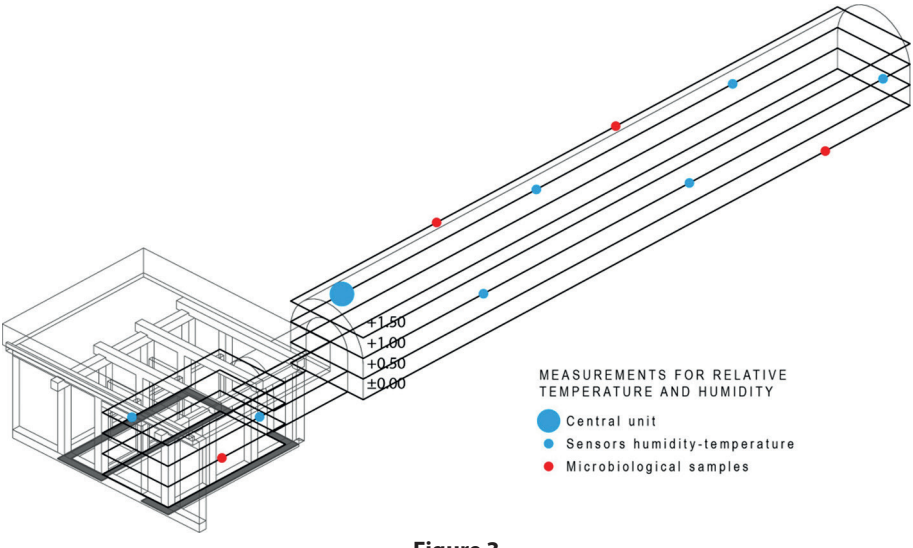

Figure 3
Cellar plan, location of the sensors used for temperature and humidity monitoring and microbiological samples (Author A. Lincu, 2019)

LITERATURE REVIEW

The international literature reveals several studies on the monitoring of indoor climate and bacterial and fungal aerosols in wine cellars. We mention in this sense, for cellars, the paper of Górny and Dutkiewicz (2002); Oneţ et al. (2018), Ilieş et al. (2018, 2019), Indrie et al. (2019) studied indoor air quality of museums, historic wooden churches and sport halls; concerning the airborne fungal in wine cellars, the studies of Haas et al. (2010) and Khan and Karuppayil (2012). Zavrl (2012) analyses indoor climate in the cellars from building heritage in Slovenia. Similar research has been done in other underground indoor environments such as caves, mines, etc. Concerning the caves, a series of studies were performed, of which we mention: Zhou et al. (2007) presenting the fungal world of cave ecosystems of China; Vaughan et al. (2011) regarding the caverns from Arizona. Other studies mentioned: Vanderwolf et al. (2013); Frączek and Kozdrój (2013); Frączek et al. (2013) studied airborne bacteria and fungi in subterranean and earth sanatoriums. Man et al. (2015) investigated fungi in caves located in central China. Other papers: Out et al. (2016) and more recently Rawat et al. (2017). Gębarowska et al. (2018) have analysed airborne bacteria and fungi in salt mines in Poland; Roohi et al. (2012) analysed bacteria from salt mines in Pakistan. Pusz et al. (2014) about airborne fungi in a copper mine and the study conducted by Rdzanek et al. (2015) in a coal mine.

Regarding fungi, yeasts and slime moulds in caves, papers were written by researchers such as: Shapiro and Pringle (2010) concerning anthropogenic influences on the diversity of fungi isolated in caves located in Kentucky and Tennessee. Other papers: Novakova (2009), Ogorek et al. (2013, 2014); Vanderwolf et al., (2013) etc. Docampo et al. (2011) wrote about fungal spore content of the atmosphere in the Cave of Nerja, Spain; Kuzmina et al. (2012) on microbiota of the Kinderlinskaya Cave (Russia) and Xianshu et al. (2008) about microorganisms deteriorating the earth heritage in Cambodia. Nieves-Rivera (2003) wrote on the mycological survey of a cave from Puerto Rico.

METHODS

The relative air temperature and humidity inside the cellar were measured using *Klimalogg Pro thermo-hygrometer* between April and May 2018, seven sensors and the central unit being installed. The sensors transmit the data from a maximum distance of 100 m with a frequency of 868 MHz. Also, the air temperature measurement range is -39.6°C to 59.9°C and air humidity ranges from 1% to 99% with 1% margin.

Inside the cellar, the sensors were located at a height of 1.5 m and the temperature measured by each sensor varied by 0.1°C.

The fungal contamination was determined using the conventional techniques of open plates called Koch sedimentation method (Cernei et al., 2013). The sedimen-

tation method consisted in exposing the Petri plates with a diameter of 100 cm2 that contain Sabouraud agar medium with the addition of chloramphenicol (0.5 g/l) for the qualitative determination of fungi (Vanderwolf et al. 2013). The plates were exposed for 4 hours. A group of two plates were exposed in the middle of the storage cellar at the height of the table (60 cm from the floor), two plates in a corner, on the floor and two plates were exposed up, at the ceiling level. The exposure was carried out by opening the lids of Petri plates and their placement with opening part towards the ground, altogether with the culture medium plates. After exposure, the Petri plates were coated and transported to the laboratory where they were incubated in a thermostat for 10 days at 25oC in the dark to allow for the development of slow-growing colonies. For carrying out the plans, facades and volume measurements, the following software programs were used: Archicad (2018), Artlantis (2017), Adobe Illustrator CC (2017) and Adobe Photoshop CC (2015).

RESULTS AND DISCUSSION

Most of the cellars are made of burnt brick, but there are also cellars made of wood or mud brick and thatched roof. Their layout (Figure 3) includes: a hall where, if the surface allows, grapes are pressed and wine is made. Then, another room allows the passage to the cellar room, often named "the neck" by the locals, the storage place of various products (beverages, wine, juices, compotes, "pălincă" – traditional fruit spirit beverage) and different supplies (fruit and vegetables, pickles, etc.).

This study contains an analysis of the air temperature and humidity inside a cellar in Sălacea, Bihor county, between 02/04/2018 and 02/05/2018. Thus, the average air temperature inside the cellar was 10.2°C. The highest air temperature recorded inside was 15.1°C on 2nd May 2018 at 6:00 p.m., and the lowest air temperature was 3.9°C on 02/04/2018 and 03/04/2018 at 6:00 a.m. (Figure 4). It should be noted that the temperature pattern inside the cellar was determined by the outdoor temperature (Figures 4 and 5), the outdoor minimum and maximum air temperature values during the monitored period in Sălacea were between 4°C on 02/04/2018 and 03/04/2018 and 32°C on 02/05/2018. These values occurred against the background of a specific atmospheric circulation above Europe characterised on 03/04/2018 by high pressure in Romania, 1,015-1,020 hPa at the geopotential height of 500 hPa, meanwhile in the Western and Northern Europe two depresionary cores with centre pressure of just 885-900 hPa (map of 3rd March, with geopotential height of 500 hPa) were developing, situation similar with the one of 02/05/2018, when the maximum temperature for the reported period was recorded. At that time Romania was still covered by a high pressure field, 1,010-1,015 hPa in the troposphere of 500 hPa, and the Western and Northern Europe was under the influence of the depresionary baric condition with 985-990 hPa in the centre (map of 02.05.2018 at the level of 500 hPa). Therefore, we note that

both thermal extremes of the reported period have occurred in the same type of atmospheric circulation, predominantly with the baric condition high in altitude, therefore they were not determined by a different atmospheric circulation but by the radiative warming of the crust which manifested stronger at the end of the analysed monitoring period, together with enhancement of the solar radiation and increase of the sunlight specific to spring months.

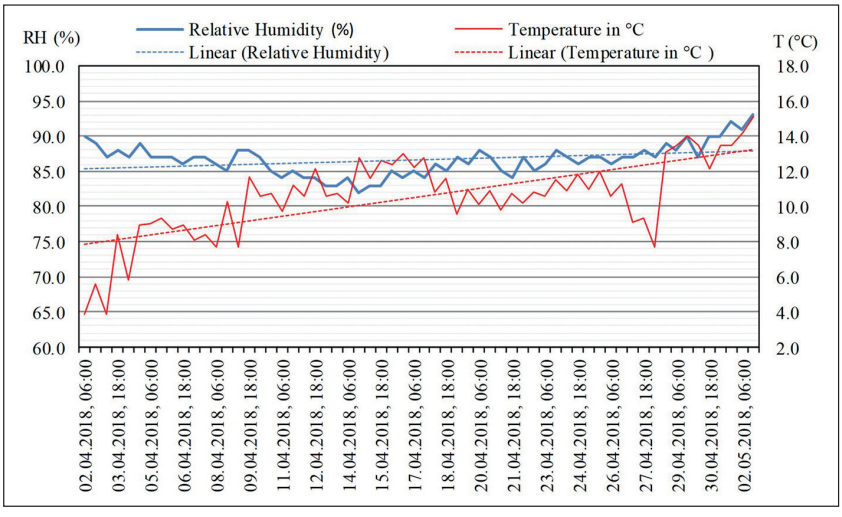

Figure 4
Variation of the air temperature and the concentration of relative humidity indoor of the cellar studied in Sălacea during the period 02/04/2018 – 02/05/2018.

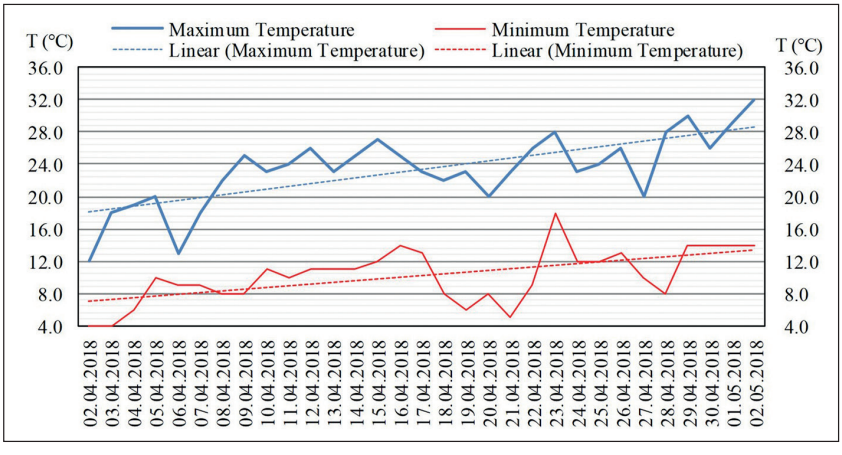

Figure 5
Variation of the outdoor air temperature in Sălacea during the period 02/04/2018 – 02/05/2018.

Moreover, the times of the day when the maximum and minimum temperatures occurred inside the cellar were determined by the moments they were produced outdoor, but they were delayed by 1-2 or even 3 hours due to the thermal inertia generated by the cellar; this inertia was caused by the topographical conditions where the cellar is located as well as the construction method and the materials used for building it, even if the cellar had the doors open for ventilation this time of the year.

The optimal storage temperature for fruit and vegetables ranges between +1 and +5°C, while for beverages and juices it ranges between 4-20°C and 7-12°C, for wine (8-10°C in the case of white wines and 10-12°C for red wine) (Budiş, 2004; Ieşeanu and Celac, 2007; Order no. 359/671/137 of 2002). A higher temperature speeds up the ripening of fruit and contributes to beverage spoilage.

Therefore, temperature inside the cellar during the monitored period ranges within the optimal parameters for the storage of wine, fruit and vegetable juice.

Humidity is another parameter that needs to be monitored. In rooms where fruits are stored, humidity must range between 85-90%, while for beverage storage (fruit and vegetable juice) this should be maximum 75% (Order no. 359/671/137 of 2002) and it may reach 80% for wine storage. A relative higher humidity allows mould to develop, thus contributing to the change of colour, taste and smell of the stored product.

The average value of air humidity inside the cellar was 86.9%, the biggest value of air humidity was 93% on 02/05/2018 at 6:00 p.m., and the minimum value was 82% on 14/04/2018 at 6:00 p.m. It should be noted that the maximum humidity value was recorded on the same date as the maximum temperature (02/05/2018) due to an advection of warm and humid air, as opposed to the minimum humidity value which occurred on a warm and dry day, as a result of a tropical dry-air mass originating above the Arabian Peninsula (map of 14th April at the geopotential of 850 hPa).

Humidity inside the cellar during the monitoring period is not covered by the optimal storage parameters for fruit and vegetable juices; however, it meets the parameters for storage of alcoholic beverages (spirits and wine) as well as for fruits, the recorded values are acceptable taking into consideration that the doors of the cellar were open for ventilation purposes, thus being created the conditions for a higher humidity than the one achieved in a closed space.

Fungi are well known components of the bioaerosols in wine production and storage cellars. They are usually found on the surfaces of the walls and wine bottles and may be released into the air during work operations and air movements in cellars (Piecková, 2016; Mandl et al., 2010).

Investigations on the diversity of fungi were made in the air inside the storage cellars from Sălacea village. A quantitative interpretation of the results describing the air quality inside the storage cellar is very difficult. After the morphological

comparisons of the fungi on Sabouraud agar (phenotypic characteristics, such as colour, shape, size, colony surface texture, hyphal pigmentation) (Kirk et al., 2011), samples of fungal colonies were aseptically sampled for staining with lactophenol cotton blue and characterising spore and hyphae. Based on the microscopy analysis of fungi isolated colonies, the conidiophores and conidia fungal structures were examined with the Optical Microscope (Optic 40X). After this procedure members of the genus were microscopically identified: *Cladosporium*, *Penicillium*, *Aspergillus*, *Trichoderma*, *Ulocladium*, *Geotrichum*, *Fusarium* and *Alternaria* (Table 1).

Table 1 Cultural and morphological characteristics of the airborne fungi identified in the wine cellars in Sălacea

IDENTIFIED FUNGI	CHARACTERISTICS
Cladosporium sp.	Are the most frequently isolated airborne fungi, some species are pathogenic to humans; the colonies are olivaceous-black, suede-like to floccose; at microscope the conidiophores are straight and it can be observed the presence of shield-shaped conidia with a distinct hilum.
Penicillium sp.	Is a saprophytic fungus with green colonies, dense brush-like spore-bearing structures, simple conidiophores terminated by clusters of flask-shaped phialides.
Aspergillus sp.	Some species are saprophytes and other can be pathogenic to human beings; this fungus develops white colonies, brown to black with shades of green, distinctive conidial heads with flask-shaped phialides arranged in whorls on a vesicle.
Trichoderma sp.	Very common fungi, an opportunistic pathogen to humans, the colonies are white-yellow, conidiophores are highly branched and terminate in one or a few phialides, conidia are ellipsoidal.
Ulocladium sp.	Plant pathogens and food spoilage agents can cause serious infection in immune-suppressed individuals, the colonies are brown-black, woolly to cottony; present septate brown hyphae, brown conidiophores and brown conidia with round to oval shape.
Geotrichum sp.	Is a yeast that may cause opportunistic infections usually acquired via ingestion or inhalation; develop white, dry, powdery colonies, arthroconidia are unicellular, in chains, hyaline. The blastoconidia, conidiophores and pseudohyphae are absent.
Fusarium sp.	Opportunistic pathogens in humans, may cause storage rot, colonies are pale or bright-coloured with a cottony aerial mycelium, macroconidial are hyaline, fusiform, microconidia are one or two-celled, fusiform to ovoid, smaller than macroconidia.
Alternaria sp.	Plant pathogens, some species are causative agents of mycotic keratitis and onychomycosis, the colonies are olivaceous-black, conidia are oblavate, darkly pigmented, with short conical beaks.

The walls of the storage cellar were covered on a large surface by colonies of *Cladosporium* (*Zasmidium*) *cellare*, often referred to as a noble mould (Figure 6). This is a greenish-black sponge-like mould. According to the former practitioners, this mould is intended to provide optimal conditions for wine storage in cellars; in particular, it regulates air humidity and purifies it (Clemenz et al. 2008). *Cladosporium* is a potential allergenic mould.

Figure 6
Cladosporium cellare on the wall of the storage cellar in Sălacea

Fungi may develop in a wide variety of habitats. Different species of fungi require different conditions for optimal growth. Microbial metabolism is significantly influenced by the physical and chemical environment. Storage fungi, with lower requirements of humidity, are mainly the genus *Aspergillus* and *Penicillium*. Temperature is an important environmental factor affecting growth and mycotoxin production by moulds. Fungi are capable of surviving under the full range of temperatures normally experienced in environments in which they live. The temperature range usually reported for fungal growth is broad (10-35°C), with a few species capable of growth below or above this range. In general, the optimal temperature for mycotoxin production is below the optimal one for growth. The production of different mycotoxins by the same species is also related to the temperature level. For the food storage and wine production the temperature is the crucial variable. The rate of chemical reactions increases with temperature. The other impact of temperatures is variation, either on short term (e.g. diurnal variation) or long term (e.g. seasonal). Temperature variation is likely to be more critical. Moisture requirements of foodborne moulds are relatively low. Moisture control is the best and most economical means to control the environment in order to prevent mould growth and mycotoxin production. The simultaneous presence of different microorganisms, such as bacteria or other fungi, could disturb fungal growth and the production of mycotoxins. Therefore, several microorganisms have been reported as biological pest control agents (Centeno and Calvo, 2002). Diversity of fungi in

the storage cellar may be influenced by environmental conditions to a certain degree (Magyar et al., 2016; Haas et al., 2010).

The pathologies which can develop in people working many hours a day in the cellar are those which result from work accidents (Murphy, 2014). Therefore, among the most frequent causes of these accidents we mention: incorrect handling of objects; presence of obstacles, low light etc. Also, animals getting inside the cellars may lead to contagious diseases such as *hydatid disease*, *toxoplasmosis*, *leptospirosis*. Intoxication with carbon monoxide caused by the fermentation process (Sami, 2006) may lead to loss of consciousness, sleep apnoea and arrhythmic disorders etc., thus carbon monoxide represents an invisible danger being a colourless and odourless gas which gets inside the body through the airway. Carrying out the professional activity in a high-humidity environment with a relative low temperature favours the development of rheumatic pathologies and it exacerbates the symptoms of already existing rheumatic suffering (Wilder et al. 2003; Zeng et al. 2017; Dahlberg and Grubb, 2008).

The role of indoor fungi in the onset and development of non-infectious diseases, such as allergy and asthma, is known for a long time (Khan and Karuppayil, 2012). Generally speaking, fungi can cause lung disease in two ways: either as airborne allergens or as infection which causes a pathogen. Some types of fungi can affect lungs in both ways, often simultaneously. The most frequent fungus which causes lung infections is *Aspergillus fumigatus*. The allergic fungal agents that can cause rhinitis and asthma but they can also determine infections include the spores belonging to *Cladosporium spp*. and *Alternaria spp*. The volatile organic compounds and microtoxins released by moulds, such as *Stachybotrys spp*. (Denning et al., 2014) represent a third potential cause of fungal disease.

Systematic microclimate monitoring and fungal analysis inside wine cellars may support their preservation, but also ensure optimal conditions for the safety of products which are stored indoor and for the health of the locals and their visitors. The research could be extended to a larger number of cellars and the indoor microclimate and fungi monitoring could become permanent. All these could contribute to the wider action of registering the cellars on the national cultural heritage list (in case it is resumed because it had failed a long time ago; Matlovicova et al. 2014, 2016, 2017). Taking into consideration the structural features and the conditions inside the cellar, there can be risks for the health of people (visitors, locals, workers etc.). Pathologies which can be developed in people who work several hours a day in the cellar represent the cause of work accidents; development or worsening of chronic pathologies. Humidity inside the cellar during the monitored period does not fit into the optimal parameters for fruit and vegetable storage. The control of humidity inside a cellar must not be neglected because humidity is one of the main factors which have an influence on the products stored. In this respect several

measures may be taken in order to ensure an optimal humidity inside a cellar: cleaning the space of the cellar from the harvest that was not used the previous year; using furniture antiseptics; long-term storage of salt and lime; using professional dehumidifiers which can dry walls in depth. Moreover, the air quality inside the cellar and its constant freshening are significant for long-term storage of the fruits, vegetables, wines etc. under optimal conditions. Therefore, ventilation must be constantly provided so that the cellar is protected from strong air streams. It would be appropriately to have a ventilation system made of pipes: a pipe with the lower inlet should be installed near the floor in one corner of the cellar and another pipe with the lower inlet should be placed towards the ceiling of the cellar in the other corner so that the cold air gets in through the floor pipe and hot air gets out through the other pipe. This type of ventilation system may prevent the cellar from odours and becoming mouldy. The information obtained from qualitative analyses of fungi in the Sălacea storage cellar can be a useful tool for controlling indoor air quality. The constant presence of some moulds may be hazardous to human health and may potentially contaminate wines. Inside the Sălacea cellar the *Cladosporium cellare* is dominant genera among most of the common mycoflora in storage cellar, a potential allergenic mould.

CONCLUSIONS

One of the main contributions of the study is to provide the knowledge and data needed to support cellar owners in taking informed action to maintain an optimal microclimate in such a storage space.

The data obtained can be used by local authorities to support cellar owners in using the necessary technological devices to obtain the right product storage environment, thus contributing to the development of the local economy.

In the future it is intended to extend the research on a larger number of cellars.

Acknowledgement

The monitoring and sampling inside of the authentic cellar are not invasive. The research was possible by equal scientific involvement of all authors. The authors would like to thank to anonymous reviewers for their thoughtful suggestions and comments and to acknowledge the support of the grant PN-III-P1-1.2-PCCDI-2017-0686.

REFERENCES

BUDIȘ M. (2004). *Gospodăria rurală din România [Romanian rural household]*. București: Etnologică.

CENTENO S., CALVO M. (2002). Mycotoxins produced by fungi isolated from wine cork stoppers. *Pakistan Journal of Nutrition*, 1, 6, 267-269, doi: 10.3923/pjn.2002.267.269.

CERNEI E.R., MAXIM D.C., MAVRU R. et al. (2013). Bacteriological analysis of air (aeromicroflora) from the level of dental offices in Iaşi County Romanian. Romanian *Journal of Oral Rehabilitation*, 5, 4, 53-58.

CLEMENZ A., STERFLINGER K., KNEIFEL W. et al. (2008). Airborne fungal microflora of selected types of wine-cellars in Austria. *Mitteilungen Klosterneuburg*, 58, 17-22.

DAHLBERG G, GRUBB I. (2008). Chronic rheumatic arthritis and housing conditions. *Acta Genetica et Statistica Medica*, 2, 1, 42-56, doi: 10.1159/000150663.

DENNING D.W, PASHLEY C., HARTL D. et al. (2014). Fungal allergy in asthma-state of the art and research needs. *Clinical and Translational Allergy*, 4, 1, 14-21, doi: 10.1186/2045-7022-4-14.

DOCAMPO S., TRIGO M.M., RECIO M. et al. (2011). Fungal spore content of the atmosphere of the Cave of Nerja (southern Spain): diversity and origin. *Science of the Total Environment*, 409, 4, 835-843, doi: 10.1016/j.scitotenv.2010.10.048.

FRĄCZEK K., GÓRNY R.L., ROPEK D. (2013). Bioaerosols of subterraneotherapy chambers at salt mine health resort. *Aerobiologia*, 29, 4, 481-493, doi:10.1007/s10453-013-9298-y.

FRĄCZEK K., KOZDRÓJ J. (2013). Assessment of airborne Actinomycetes in subterranean and earth sanatoriums. *Ecological Chemistry and Engineering*, 20, 1, 151-161.

GĘBAROWSKA E., PUSZ W., KUCIŃSKA J. et al. (2018). Comparative analysis of airborne bacteria and fungi in two salt mines in Poland. *Aerobiologia*, 2018, 34, 2, 127-138, doi: 10.1007/s10453-017-9502-6.

GÓRNY R.L., DUTKIEWICZ R. (2002). Bacterial and fungal aerosols in indoor environment in Central and Eastern European countries. *Annals of Agricultural and Environmental Medicine*, 9, 17-23.

HAAS D., GALLER, H., HABIB J. et al. (2010). Concentrations of viable airborne fungal spores and trichloroanisole in wine cellars. *International Journal of Food Microbiology*, 144, 1, 126-132, doi: 10.1016/j.ijfoodmicro.2010.09.008.

HALEEM KHAN A.A., MOHAN KARUPPAYIL S. (2012). Fungal pollution of indoor environments and its management. *Saudi Journal of Biological Sciences,* 19, 4, 405-426, doi: 10.1016/j.sjbs.2012.06.002.

IEŞEANU A., CELAC A. (2007). Beciuri şi pivniţe din spaţiul pruto-nistrean [Caves and cellars in the Prut-Nistru region]. In International Conference: proceedings. Diversitatea expresiilor culturale ale habitatului traditional [Diversity of cultural expressions of the traditional habitat]. Chişinău: National Commission of the Republic of Moldova for UNESCO; Moldova Republic National Museum of Ethnography and Natural History, pp. 107-112.

ILIEŞ D.C., ONEŢ A., MARCU F.M. et al. (2018). Investigations on air quality in the historic wooden church in Oradea city, Romania. *Environmental Engineering and Management Journal,* 17, 11, 2731-2739, doi: 10.30638/eemj.2018.272.

ILIES D.C.,ONET A., HERMAN G., INDRIE L., ILIES A., BURTA L., GACEU O., MARCU F., BAIAS S., CACIORA T., MARCU A.P., OANA I. P., COSTEA M., ILIES M., WENDT J., MIHINCAU D. (2019). Exploring the indoor environment of heritage buildings and its role in conservation of valuable objects, In: *Environmental Engineering and Management Journal,* 18(12), 2579-2586, 2019.

INDRIE L., OANA D., ILIES M. et al. (2019). Indoor air quality of museums and conservation of textiles art works. Case study: Salacea Museum House. *Industria textilă Journal*, 70, 1, 88-93, wos:000459393600014.

KÉRI G., KÁNTOR A. (2009). *Az érmelleki szőlőművelés építészeti és tárgyi emlékeinek védelme [Protecting the constructions and items related to traditional viticulture on Valea Ierului]*. Hajdúböszörmény: Hajdúsági Civil Központ és Adattár Alapítvány.

KHAN A.A.H., KARUPPAYIL S.M. (2012). Fungal pollution of indoor environments and its management. *Saudi Journal of Biological Sciences,* 19, 4, 405-426, doi: 10.1016/j.sjbs.2012.06.002.

KIRK P.M., CANNON P.F., MINTER D.W. et al. (2011). *Dictionary of the Fungi. 10th Edition*. Trowbridge: Cromwell Press.

KUZMINA L.Y., GALIMZIANOVA N.F., ABDULLIN S.R. (2012). Microbiota of the Kinderlinskaya Cave (South Urals). *Microbiology*, 81, 2, 251-258, doi: 10.1134/S0026261712010109.

MAGYAR D., VASS M., LI D.W. (2016). Dispersal strategies of microfungi. In Li D.W. ed., *Biology of Microfungi*. Switzerland: Springer International Publishing, pp. 315-371, doi: 10.1007/978-3-319-29137-6.

MAN B., WANG H., XIANG X. (2015). Phylogenetic diversity of culturable fungi in the Heshang Cave, central China. *Frontiers in Microbiology*, 6, doi: 10.3389/fmicb.2015.01158.

MATLOVIČOVÁ K., HUSÁROVÁ M. (2017). Heritage Marketing a možnosti jeho využitia pri rozvoji turistickej destinácie. Prípadová Štúdia Hradu Čičva. /Potential of the Heritage Marketing in Tourist Destinations Development Cicva Castle Ruins Case Study. *Folia Geographica* 2017, Vol. 59, No 1, pp. 5-35

MATLOVICOVA, K., KOLESAROVA, J., MATLOVIC, R. (2016). Selected Theoretical Aspects of the Destination Marketing Based on Participation of Marginalized Communities. Conference: *8th International Annual Scientific Conference on Hotel Services, Tourism and Education Location*.Prague, Czech Republic. Sbornik mezinarodni vedecke konference: hotelnictvi, turismus a vzdelavani, pp. 128-143

MATLOVICOVA, K., KORMANIKOVA, J. (2014). City Brand-Image Associations Detection. Case Study of Prague. Conference: *International Multidisciplinary Scientific*

Conferences on Social Sciences and Arts (SGEM 2014) Location: Albena, Bulgaria, Sep. 01-10, 2014, pp. 139-146

MATLOVIČOVÁ K., TIRPÁKOVÁ E., MOCÁK P. (2019). City Brand Image: Semiotic Perspective. A Case Study of Prague. *Folia Geographica*, Volume 61, No. 1, pp. 120 -142

MANDL K., GEYRHOFER A., SCHATTAUER D. et al. (2010). Biodiversity of fungal microflora in wine-cellars. *Mitteilungen Klosterneuburg*, 60, 3, 350-354.

MURPHY J. (2014). *Are your cellars safe?*, Hospitality EXPO 2014. Dublin. doi: https://doi.org/10.21427/D7JX8H.

NIEVES-RIVERA A.M. (2003). Mycological survey of Rio Camuy Caves Park, Puerto Rico. *Journal of Cave and Karst Studies*, 65, 1, 23-28.

NOVAKOVA A. (2009). Microscopic fungi isolated from the Domica Cave system (Slovak Karst National Park, Slovakia). *International Journal of Speleology*, 38, 1, 71-82, doi: 10.5038/1827- 806X.38.1.8.

OGOREK R., LEJMAN A., MATKOWSKI K. (2013). Fungi isolated from Niedz´wiedzia Cave in Kletno (Lower Silesia, Poland). *International Journal of Speleology*, 42, 2, 161-166, doi: 10.5038/1827-806X.42.2.9.

OGOREK R., PUSZ W., LEJMAN A. et al. (2014). Microclimate effects on number and distribution of fungi in the Włodarz underground complex in the Owl Mountains (Góry Sowie), Poland. *Journal of Cave and Karst Studies*, 76, 2, 146-153, doi: 10.4311/2013MB0123.

ONEŢ A., ILIEŞ D.C., BUHAŞ S. et al. (2018). Miccrobial air contamination in indoor environment of University Sport Hall. *Journal of Environmental Protection and Ecology*, 19, 2, 694-703, wos:000438838100029.

ORDIN nr.359/671/137 din 2002 al ministrului agriculturii, alimentaţiei şi pădurilor, al ministrului sănătăţii şi familiei şi al preşedintelui Autorităţii Naţionale pentru Protecţia Consumatorilor din Romania pentru aprobarea Normelor cu privire la natura, conţinutul, fabricarea, calitatea, ambalarea, etichetarea, marcarea şi păstrarea sucurilor de legume [ORDER No. 359/671/137 of 2002 issued by the Minister of agriculture, food and forests, the Minister of health and family and the President of the National Authority from Romania for Consumer Protection regarding the approval of the Regulations on the nature, content, manufacturing, quality, packaging, labelling, marking and storage of vegetable juices], Retrieved from: http://www.cdep.ro/pls/legis/legis_pck.htp_act_text? idt=39663.

OUT B., BOYLE S., CHEEPTHAM N. (2016). Identification of fungi from soil in the Nakimu caves of Glacier National Park. *Journal of Experimental Microbiology & Immunology*, 2, 26-33.

PIECKOVÁ E. (2016). Domestic Environment: Indoor Mycobiota as a Public Health Risk Factor. In: Viegas C., Pinheiro A.C., Sabino R., et al. eds., *Environmental Mycology in Public Health. Fungi and Mycotoxins Risk Assessment and Management*, Academic Press, pp. 129-146.

PUSZ W., KITA W., WEBER R. (2014). Microhabitat influences the occurrence of airborne fungi in a copper mine in Poland. *Journal of Cave and Karst Studies*, 76, 1, 14-19, doi: 10.4311/2013MB0101.

RAWAT, S., RAUTELA R., JOHRI B. (2017). Fungal world of cave ecosistems. In: Satyanarayana T., Deshmukh S.K., Johri B.N., eds, *Developments in Fungal Biology and Applied Mycology*. Springer, 99-125, doi: 10.1007/978-981-10-4768-8_7.

RDZANEK M., PUSZ W., GĘBAROWSKA E. et al. (2015). Airborne bacteria and fungi in a coal mine in Poland. *Journal of Cave and Karst Studies*, 77, 3, 177-182, doi: 10.4311/2015MB0102.

ROOHI A., AHMED I., IQBAL M. et al. (2012). Preliminary isolation and characterization of halotolerant and halophilic bacteria from salt mines of Karak, Pakistan. *Pakistan Journal of Botany*, 44, 365-370.

SAMI Y. (2006). Occupational health risks of wine industry workers. *British Columbia Medical Journal*, 48, 8, 386-390.

SHAPIRO J., PRINGLE A. (2010). Anthropogenic influences on the diversity of fungi isolated from caves in Kentucky and Tennessee. *American Midland Naturalist*, 163, 1, 76-86, doi: 10.1674/ 0003-0031-163.1.76.

ŠIJANEC ZAVRL M. (2004) Analysing indoor Climate in Building Heritage in Slovenia. In: *European Research on Cultural Heritage, State-of-the-Art Studies*. ITAM, pp. 389-403. ISBN 80-86246-23-X.

VANDERWOLF K.J., MALLOCH D., MCALPINE D.F. (2013). A world review of fungi, yeasts, and slime molds in caves. *International Journal Speleology*, 42, 1, 77-96, doi: 10.5038/1827-806x.42.1.9.

VAUGHAN M.J., MAIER R.M., PRYOR B.M. (2011). Fungal communities on speleothem surfaces in Kartchner Caverns, Arizona, USA. I*nternational Journal Speleology*, 40, 1, 65-77, doi: 10.5038/1827-806X.40.1.8.

WILDER F.V., HALL B.J., BARRETT, J.P. (2003). Osteoarthritis pain and weather. *Rheumatology*, 42. 8, 955-963.

XIANSHU L., ARAI H., SHIMODA I. (2008). Enumeration of sulfur-oxidizing microorganisms on deteriorating stone of the Angkor monuments Cambodia. *Microbes and Environments*, 23, 4, 293-298, doi: 10.1064/jsme2.ME08521.

ZENG P, BENGTSSON C, KLARESKOG L. et al. (2017). Working in cold environment and risk of developing rheumatoid arthritis: results from the Swedish EIRA case–control study. *Rheumatic & Musculoskeletal Diseases Open*, 3, 2, 1-7, doi: 10.1136/rmdopen-2017-000488.

ZHOU J., GU Y., ZOU C.et al. (2007). Phylogenetic diversity of bacteria in an earthca-ve in Guizhou Province, Southwest of China. *Journal of Microbiology*, 45, 105-112.

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ISSN 1336-6157 (hard copy)
ISSN 2454-1001 (online)
EV 4949/14

Editor-in Chief: prof. RNDr. René Matlovič, PhD.

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DTP: Ing. Stanislav Kurimai

Publisher: University of Prešov,
Ul. 17. novembra 15, 080 01 Prešov, Slovakia, IČO 17 070 775

Official e-mail: foliageographica@unipo.sk

Periodicity: Twice a year in June and December

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