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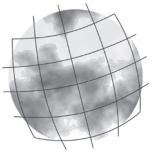

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CONTENT

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EXPLORING THE DETERMINANTS OF LOCAL PEOPLE'S ATTITUDE TOWARDS NATIONAL PARKS IN POLAND

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Abstract
The article examines the attitudes of local communities towards national parks in Poland. Specifically, it aims to recognize the main factors determining the residents' individual attitudes towards the Babia Góra National Park (Polish Carpathian Mts). The analysis is based on the results of questionnaire surveys carried out among the residents of the municipalities within which the park is located. Research results show that individual attitudes of residents towards national parks are determined by: a) the perception of the park's managing entity, b) the level of access to natural resources covered by legal protection, and c) a subjectively assessed balance of gains and losses related to the park's impact on the lives of individuals and the local economy. The analysis concluded, inter alia, that not all factors determining the residents' attitudes and opinions create the potential for social conflict. Moreover, the entities managing national parks should be more involved in creating development opportunities for local communities. This issue should also be more widely reflected in nature conservation policy in Poland.

Key words
National park, social attitudes, local development, the Babia Góra region, Poland

RESEARCH PROBLEM

In the management of environmentally valuable areas, social participation plays an increasingly important role. In the case of protected areas, a co-management model based on the permanent cooperation between park management and local communities, which should lead to a synthesis of nature conservation goals with socio-economic ones, is recommended. The model assumes that the development of cooperation will lead to mutual trust and a search for new solutions conducive to preventing or mitigating social conflicts around the issue of nature conservation. The interactive model of national park management should lead to increased

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public support for activities undertaken by these and other land-based forms of nature conservation (Borrini-Feyerabend et al. 2004, 2013; Dudley 2013; Mika et al. 2015; Królikowska 2007; Phillips 2003).

In Central European countries, regulations enabling social participation in decision making processes concerning protected areas accompany broader systemic changes. Entities managing these areas recognize the necessity of taking into account social interest in the activities they undertake and are implementing participatory methods on an increasing scale; they open up to discussion and strive to reach compromises (Ginalski 2008; Švajda 2010). Unfortunately, building positive relations with residents often results in considerable difficulties stemming from social conflicts around national parks that have accumulated in previous decades, conflicts of interest and a lack of mutual trust (Domański and Partyka 1992; Gliński 2001; Hibszer 2013; Królikowska 2007; Mika and Zawilińska 2015).

Currently, scholars extensively discuss the social aspects related to the administration of protected areas. Many authors emphasize that the attitude of local communities towards national parks is crucial for the proper functioning of these areas and the successful implementation of their conservation objectives (Borrini-Feyerabend et al. 2004; Törn et al. 2007; Wells et al. 1992). However, the attitudes of the inhabitants towards parks are conditioned by the local context: the historical, geographical, cultural and political conditions in which these forms of protection function (i.e. Alexander 2000; Baral and Heinen 2007; Silori 2007; Vodouhe et al. 2010; Walpole and Goodwin 2001). In each case, the context sets out an exceptional and unique mosaic of conditions in which today's park management entities are obliged to build socially expected relations with the local population, the authorities, and the business sphere. Additionally, in Poland, the attitude of local communities towards national parks is largely conditioned by the way these areas were established in the 20th century through top-down administrative decisions that failed to take residents' voices into account. Older generations still recall the difficult relationship between residents and park authorities and a subjective sense of wrongdoing associated with the government's decision to place private lands under legal protection (Grabowski and Marmuszewski 1985; Osiniak et al. 1993; Górecki et al. 1998; Terlecka and Górecki 1998).

PURPOSE AND RESEARCH METHODOLOGY

The aim of the study is to identify the main factors shaping the attitudes of local communities towards the Babia Góra National Park located in the Polish Carpathians. The analysis was based on the results of questionnaire surveys carried out in 2015 on a sample of n = 152 residents of municipalities within the park borders – Jabłonka, Lipnica Wielka and Zawoja. The selection of the sample was based

on a quota; the aim was to obtain a composition of respondents similar to that of residents in terms of age and gender. The questionnaire contained a set of 22 questions (variables) in the form of statements to which the respondents had to respond using the Likert scale – a five- and four-level scale (the so-called forced selection scale). For the selected group of variables, exploratory factor analysis was carried out using promax rotation in order to identify the main components indicating the determinants of social attitudes towards the park. In addition, the respondents evaluated selected phenomena (12 variables) which have a direct or indirect connection with the presence and operation of the Babia Góra National Park in the local system. This assessment consisted in the subjective qualification of these phenomena as "advantageous" or "unfavourable" from the point of view of the social situation and local development. The data sets presenting the analysed problems (variables) are reproduced in tables: 2, 3 and 4.

Previous studies on the attitude of the local population towards the Babia Góra National Park (Mika et al. 2015) indicate that people who live further away from its borders, people in "younger" age groups, individuals with a higher level of education, and those who do not own private land within the conservancy borders are more favourable towards the park. People who maintain a generally more positive attitude towards the park more often than others believe that the Babia Góra National Park has a positive impact on the economic situation of the region. They perceive an economic benefit in tourist spending and the park as an institution – an employer and a contractor (Mika and Zawilińska 2016; Mika et al. 2016). The community also recognizes and appreciates the influence of the park on the publicization of the town.

Despite a relatively good understanding of the declared attitude of the local population towards this park, the scholarly literature lacks a study that presents the factors determining the real attitude of the inhabitants to the Babia Góra National Park in an analytical, multithreaded, and critical manner.

RESULTS

Characteristics of survey respondents

The study involved people over the age of 15. The identity of the respondents in terms of their place of residence, age and education level are presented in table 1. The respondents were mostly women (58.5%). Most often they had secondary (30.3%) or vocational (28.9%) education. Among respondents with higher education (21.8% of respondents), the largest group (45%) were people aged 26-35. Interviewees and their immediate family members usually (90%) were not professionally associated with Babia Góra National Park. On the other hand, work related to tourist service was performed by 9.2% of respondents.

Table 1 Demographic characteristics of respondents and their place of residence

Gender		Education	
Male	41,5 %	Higher education	21,8 %
Female	58,5 %	Secondary school	30,3 %
		Vocational degree	28,9 %
		Primary school	19,0 %
Age		**Municipality**	
15–25	19,1 %		
26–35	16,9 %	Jabłonka	17,6 %
36–45	19,0 %	Lipnica Wielka	38,0 %
46–60	23,2 %	Zawoja	44,4 %
>60	21,8 %		

Source: own research.

The social attitude towards nature conservation

The analysis sought to gauge the attitudes of locals towards the Babia Góra National Park by identifying the respondents' broader attitude to nature protection. According to the distribution of answers in table 2, the vast majority of respondents declared a positive attitude to the idea of nature conservation and the role played by national parks in this endeavour. They nearly fully supported (95%) the necessity of environmental education for the younger generation. However, the assertion that "even more protected areas should be created in Poland" raised some concern. 58.9% of respondents supported such a proposal. Almost 70% of investigated said

Table 2 Selected opinions of respondents on the subject of nature conservation

Variable	Strongly agree	Agree	Neither, nor	Disagree	Strongly disagree
	[%]				
We must protect nature for future generations	58,5	40,1	0	0	1,4
National parks play an important role in nature conservation in Poland	48,6	44,4	3,5	2,1	1,4
Even more protected areas should be created in Poland	24,1	34,8	18,4	17,0	5,7
The younger generation should know more about the need to protect nature	53,8	41,2	2,3	2,7	0
I think I know enough about the way national parks in Poland function	16,3	53,2	9,9	17,1	3,5
I would like to know more about how national parks can support the local economy and residents	22,5	54,2	9,9	12,0	1,4

Source: own research.

they knew enough about the way national parks operate in Poland and just over three quarters of them would like to know more about how national parks can support the local economy and residents (table 2).

The attitude of the inhabitants towards Babia Góra National Park

In light of the survey results, an image of strong functional dependencies between the Babia Góra National Park and communities in the municipalities related administratively with this park emerged. In the study, as many as 84.5% of respondents agreed with the statement that the Babia Góra National Park affects the lives of the residents of their village and 59.8% admitted that the presence of this park affects their lives – directly or indirectly. Although most respondents (87.3%) declared that they were satisfied with the existence of a national park in their village, only 34.8% would accept extending its borders.

Searching for factors determining the population's relationship with the national park in the local system, the researchers conducted an exploratory factor analysis of variables presented in the form of statements that describe the actual or potential relations of the park with its spatial and social surroundings. The list of variables and average values of grades calculated from the four-level Likert scale and their standard deviations appear in table 3. Values of Kaisera-Mayer-Olkin (0.721) and Bartlett's sphericity tests (chi-square = 489.1, $p<0.000$) justify a factor analysis. Using the principal component analysis with promax rotation, five factors were delineated with eigenvalue above 1 (table 3). These factors explain 61.9% of the total variance of variables.

Determinants that differentiate the attitudes of residents towards the Babia Góra National Park can be summarized in the following categories: "the involvement of the park management board in local affairs" (Factor 1), "the subjective experience of the park's impact on the life of an individual and the social group" (Factor 2), "the relationship between the quality of life and the values of nature" (Factor 3), "access to natural resources" (Factor 4) and "the perceived balance of gains and losses" (Factor 5).

Factor 1 is most strongly correlated with the variables regarding the assessment of the Babia Góra National Park management board as a decision-making entity in local economic matters. The attitude of the inhabitants to the national park is therefore strongly conditioned by the way in which the performance of its managing entity is perceived and assessed. The respondents' opinions indicated that the authorities of their municipalities should be firm towards the Babia Góra management in matters that are a concern to residents. Therefore, residents recognize the role of park management as an important local development actor. The vast majority (80.3%) of respondents supported such a thesis. Interestingly, almost half of the respondents – 45.6% agreed with an even more radical statement that

Table 3 Identified factors, factorial loadings and average values of variables

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Arithmetic mean	SD
Factor 1. Involvement of the park management board in local affairs							
Residents should have access to detailed information about the finances of the Babia Góra National Park	,852					2,90	0,84
Residents should be better informed about the activities of the Babia Góra National Park	,758					3,29	0,58
The park management should be even more involved in the affairs of the residents of our village	,683					3,01	0,71
Municipal authorities and residents should have a greater impact on decision made regarding the operation of the Babia Góra National Park	,666					3,23	0,68
Factor 2. Subjective experience of the park's impact on the life of an individual and social group							
The Babia Góra National Park influences the lives of the inhabitants of our village		,915				3,14	0,80
The presence of the Babia Góra National Park affects my life		,821				2,76	0,84
Factor 3. Relationship between the quality of life and the values of nature							
Tourism develops in our village only because of the Babia Góra National Park existence			,802			2,35	0,96
The proximity to nature in Babia Góra National Park is of great importance for the health and well-being of the inhabitants of the town			,709			3,32	0,63
Factor 4. Access to natural resources							
Residents should be allowed to use the natural resources of the park to a greater extent				,861		3,25	0,92
The national park limits the development of our village				,614		2,23	0,84
Factor 5. Perceived balance of gains and losses							
The noise and car traffic associated with tourism are burdensome to me					,778	2,18	0,81
The presence of the national park causes more loses than creates benefits for the residents					,688	2,06	0,78

The table includes variables with factor loads above 0.5; Kaiser-Mayer-Olkin test: 0.721, Bartlett's sphericity test: chi-squared = 489.1, p<0.000, Total Explained Variance = 61.9%.
The arithmetic mean of the 1-4; rating scale:
1 – I strongly disagree, 2 – I rather disagree, 3 – I agree rather, 4 – I strongly agree.

Source: own research.

"the management of the Babia Góra National Park does not take into account the interests of residents at all", which may indicate a hidden and inexpressible antipathy towards the administrative body among a segment of the local community.

Factor 2 points to the existence of a connection between the attitude of residents to the national park and the individual persons' beliefs about the actual or potential impact of this national park on their lives and the life of the community to which they belong more broadly.

Factors 3 and 4 relate to social attitudes and the perception of the park through the prism of its protected natural resources. Factor 3 emphasizes the importance of nature preservation as a value defined from the point of view of the quality of the environment of everyday life and the value that, through the development of tourism, creates one of the local foundations of economic growth. In turn, factor 4 indicates the importance of conflict in the local economy, resulting from the legal restrictions on the residents' access to resources lying within the park boundaries and the limits placed on economic activity due to nature conservation. As many as 79.6% of the respondents admitted that residents should be allowed to use the natural resources of the park to a greater extent; i.e., for logging, forest undergrowth, the use of meadows, etc. In contrast, 31.6% of respondents agreed with the statement: "the national park limits the development of our village."

Factor 5 seems to be not completely unambiguous. Variables that are highly correlated with it indicate the importance of subjective beliefs and views of respondents regarding the gains or losses (difficulties) that the presence of the national park brings to the local system. The problem of balancing gains and losses is multi-threaded and concerns a wider spectrum of variables than those that express the highest correlation with factor 5. Therefore, this problem requires further analysis and development.

The issue of the subjective perception of gains and losses has been further elaborated in the next research question. Respondents were asked to rate selected issues related to the presence of the national park in their town. The list of the studied variables and their qualifications is presented in table 4. These issues were assessed by respondents in two ways – either as favourable phenomena (positive assessment) or unfavourable or difficult (negative assessment), depending on the respondents' subjective experiences and views.

The assessment diversity of all the analysed variables clearly indicates the lack of consensus among the local population in matters related to the Babia Góra National Park. Most of the respondents considered the "gains" to be: the proximity of nature, the development of tourism, the opportunity to work in the park and the development of ecological (organic) farming production. Interestingly, respondents positively assessed the peripheral location of their villages in relation to large cities.

Table 4 The respondents´ evaluation of selected phenomena related to the presence of the Babia Góra National Park in the local system

Variable	Rating [%]	
	Negative	Positive
The proximity to nature	3	97
Tourism development	3	97
Limitations in obtaining a building permit	83	17
The price increase for building plots (real estate)	54	46
The opportunity to work in the park	6	94
The peripheral location of the village in relation to large cities	18	82
Limitations in economic investments due to nature conservation	75	25
Buying construction plots for recreational purposes by people from cities	27	73
The development of organic (ecological) agricultural production	7	93
Restrictions on changing the qualification of agricultural land for construction plots	80	20
Restrictions on the disposal and access to private land within the boundaries of the national park	81	19
A strong commitment of ecological organizations in matters of rural development	50	50

Source: own research.

All manner of restrictions imposed by the park's presence on the free use of resources were recognized as "disadvantages" (losses, impediments). Legal regulations include, among others, such issues as: changing the qualifications of agricultural land to building plots, obtaining a building permit, disposing of and access to private lands within the national park as well as economic investments. While such negative evaluations could have been expected, it seems surprising that as many as 20-25% of respondents considered these regulations to be "benefits".

Among the analysed variables, the evaluation of three issues clearly divides the studied community. These are: the purchase of building plots (for recreational purposes) by non-village people, the increase in the prices of individual building plots (real estate) and significant interest of environmental organizations in the matters of rural development. Since the 1980s, the areas surrounding the Babia Góra National Park attracted the development of second homes whose owners are mostly residents of the agglomerations lying on the foreland of the Carpathians (agglomeration of Krakow, the Katowice conurbation). Clearly, residents evaluate the buying-up of property and price increases that follow rather ambiguously.

Using the non-parametric *U* Mann-Whitney test, attempts were made to verify whether the assessments of variables in Table 3 and in table 4 differ depending

on the age of the respondents. Two generational groups were compared in the ranges up to and over the age of 35. It became apparent that for the examined issues, there were no significant statistical differences between these age groups. Additionally, the respondents' opinions did not differ depending on gender.

Interestingly, in the case of problematic issues contained in table 4, the level of education did not figure as a variable differentiating classification nor assessment. Thus, since the variables: age, gender and education do not affect the perception of the Babia Góra National Park, one can assume that the highly subjective beliefs of individuals or the particular interests of certain residents' groups account for the presented assessments of the balance of gains and losses stemming from the presence of the park and its impact on the trajectory of local processes.

CONCLUSIONS

Separate factors determining the attitude of the local population towards the Babia Góra National Park indicate three dimensions in which the attitudes of individuals are shaped. The first dimension concerns the perception and attitude of residents towards the park's managing entity, the second refers to the issue of the community's access to resources subject to legal protection the third relates to a subjectively assessed set of benefits and losses (loss, impediments) in connection with the presence of the park and the role it plays in the local economy. These dimensions indicate that the opinions and attitudes of residents are determined by the phenomena, conditions and situations that are related to the park area as well as those that relate to the park's direct and indirect impact on the course of the social and economic processes in its spatial environment. Although the determinants of the attitudes and opinions indicate a specific historic developmental and geographical context of the Babia Góra region, the content of these factors proves universal and can be generalized to other national parks in Poland.

Not every determinant of social attitudes and opinions has the potential for functional and social conflict. Undoubtedly, the conflict of interest between the park's managing entity and some residents as well as local authorities can cause deputes. The basis of this tension is not only the legal restriction of access to the park's resources but also different attitudes towards what constitutes good management (Domański and Partyka 1992). The fact that currently there are no major social conflicts in the Babia Góra region is due to the fact that the direct causative impact of the Babia Góra National Park on the local community is limited, among other things, due to the small size of the park, a small amount of private land within it and limited size of the park's buffer zone. It seems that the indirect impact of this park on its residents' quality of the life due to, among other things, the economic benefits of tourism development and perceived benefits from the proximity of nature and the peripheral location of the region, is more important for the assessment of the gain-loss balance in social perception.

Previous studies indirectly indicate the emergence of a generational change in the social attitudes towards the Babia Góra National Park (Mika et al. 2015; Zawilińska 2016, 2017). Serafin and Zawilińska (2017) and Hibszer (2013) reported similar observations for other national parks. These scholars identify environmental education and cooperation between parks and schools as a potential factor of change. In the context of the factors determining the attitude of the inhabitants to the national park, the following question arises: will the declared attitude of the representatives of the young generation be more favourable to the idea and functioning of the national park if the same people face a conflict of interest with the park? Young people are more accustomed to the existence of legal barriers and limitations in connection with the protection of nature and their attitude is not burdened with the past. However, little is known about how and in what way the attitudes of young people towards national parks or, more broadly, nature conservation is shaped in the process of transferring values between generations, i.e. in families. The relation between the national park and the local community is based, on the one hand, on references to values and their juxtaposition, weighing and contrasting each other and, on the other hand, on balancing benefits and losses, mainly economic ones. One can risk advancing the thesis that only the first of these aspects of the relationship and learned conviction about the superior value of nature conservation affect the described attitudes of the young generation. However, is such a basis for shaping opinions enough when people want to, to a greater extent use natural resources in conditions of legal restrictions? It seems that in the future the real attitude of this social group towards protected areas in this national park will depend on whether its representatives will be able to find and take advantage of developmental alternatives that the national park will offer them in its role as an driver of local development.

The involvement of entities managing national parks in creating developmental opportunities for local communities should be reflected in the policy of nature conservation, which, moreover, is in line with the new paradigm, proposed by the IUCN, defining the way these forms of nature conservancies function. Earlier detailed research in the Babia Góra region clearly showed that there are such spheres of the local economy in which the increase in institutional activity and capital or advisory involvement of national parks would bring additional economic benefits to the inhabitants (Mika et al. 2015). However, achieving such a goal on a larger scale in Polish conditions will not be easy. This requires not only a change in thinking about the function of national parks at the central level but also an institutional reorganization of park managers by extending their objectives of action and equipping human resources with competences in the social sphere, management and politics. It is not certain whether strengthening the role of national parks as actors of local development would improve their relations with local authorities.

There is no doubt, however, that striving to develop mechanisms that will lead to building a relatively lasting support among the local population for the presence and operation of national parks in Poland is an inalienable duty of both the institutions of power and nature conservation institutions.

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ORGANIZATION FOR THE DEVELOPMENT OF THE SENEGAL RIVER BASIN (OMVS) AND INTEGRATED WATER RESOURCES MANAGEMENT (IWRM):

WHAT BENEFITS AND DIFFICULTIES OF THE OMVS FOR IWRM IN SENEGAL?

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Abstract
This article describes how the role of integrated approach to water resources management (IWRM) for the use of water resources socially equitable, economically efficient and environmentally sustainable and provision of water services is linked to, and can be used as a tool to fight against poverty in Senegal. This present paper is concerned with the consequences of adoption of an IWRM approach to reducing poverty in Senegal, and demonstrates links between the concept of IWRM and poverty. The methodology adopted in this study is based on the collection of data and information from available sources and statistics (organisms and Internet). The results show that Senegal, country located at the extreme west of African continent has many constraints of political, social, economic and environmental hampering the good management of available water resources. These constraints focus on the sectorial approach of water management, the immobility of actors of this management, overlapping responsibilities, lack of financial mains, inescapable scarcity, the constant degradation and the unequal distribution of water. Consequences are dramatic and contribute significantly to the impoverishment of population. Unlike the fragmented water management which has negative impacts on the lives of poor, IWRM approach is an important strategy for reducing poverty. Although poverty reduction is a complex issue requiring targeted actions and specific strategies, water is a major component, and many aspects of IWRM approach are relevant to poverty reduction by maximizing welfare economic and social being.

Key words
Management, Water resources, Basin organization, Arrangements, Senegal River Basin

INTRODUCTION

Water is a major issue for sustainable development. Indeed, as Klaus Toepfler, Director General of United Nations Environment Program (UNEP), « *water is closely linked to health, agriculture, energy and biodiversity. Without progress in the field of*

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water, it will be difficult or impossible to reach the other Millennium Development Goals » (Kouam Kenmogne GR *et al.*, 2006). Faced with the combined pressures of increasing demand and the continuing deterioration of water quality, past management models are no longer sufficient for the task; it is now necessary to break out of the technological mirage and rethink in depth the approaches that will satisfy human needs while maintaining the quality of the natural systems that support the very existence of the human community (Burton, 2001). Many developed countries have understood this and have taken action to manage their water resources efficiently (UN-WATER / WWAP, 2006). In this regard include the European countries that have increased their shares and reinforced ed their political and economic commitments to the implementation structures management (Water Framework Directive; International Office for Water; International Network of Basin Organizations...). This allowed the implementation a balanced management of aquatic environments throughout the watershed (by involving users, experts and local politicians), the fight against pollution, floods and mudflows, improved warning systems and coordination of decision-making bodies. On the other hand, developing countries, although engaged in reforms to achieve national and international goals for integrated water resources management, have unfortunately not been equally successful. Thus, the challenges of water management in these developing countries are numerous: providing drinking water to the population; maintain water quality; create an interactive dynamic water management framework; prevent natural disasters and rationally allocate water resources. In Senegal, in the context of water resources management, the disparities observed both in the distribution of water resources and in their quality are indicative of enormous challenges. Added to this is the need to satisfy growing demand, environmental protection, compliance with regional and international obligations.

Given the degree of dependence on natural resources, it is therefore urgent to put in place a logical management framework that contributes to meeting these water challenges and optimizing the contribution of water to sustainable development. In the Senegal River Basin, the Senegal River Development Organization (OMVS) was set up on March 11, 1972, to implement a program of integrated and concerted management of water resources and ecosystems for a number of years, sustainable development of the basin. In Senegal, as in other state's residents and members of the OMVS, the body Its mission is therefore the safeguarding of the Senegal River, its tributaries and their catchment basins as well as the integrated management of its resources (OMVS, 2002a). The OMVS has as ambition to establish a global vision of the development of the Senegal River Basin integrating the d ifferent sectoral objectives, sometimes antagonists, such as hydropower, navigation, development of drinking water and sanitation, transport, rural development, mining and industry, in s based on a thorough analysis of the water resources of the basin and the ecosystems that depend on it.

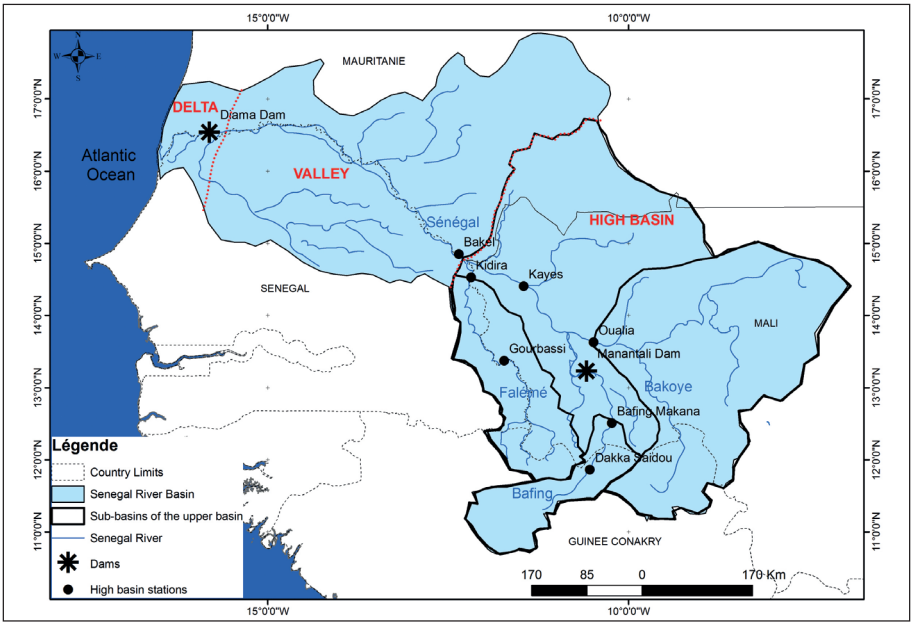

Figure 1 Location of the Senegalese part in the Senegal River Basin

Unlike Guinea and Mali with which it shares the OMVS, Senegal, like Mauritania, has most of its water resources in the Senegal River. In the principles that govern the current distribution of water resources by state within the OMVS, Senegal benefits from 1380 million m^3 / year (of which 4.9% for domestic use, 90.7% for agriculture and 3% for the industry) on a past average annual volume of about 20 billion m^3 at the Bakel station. The river, about 1800 km long, is fed by three main tributaries, the Bafing, the Bakoye and the Falémé (Figure 1). The hydrographic system of the Senegal River constitutes a natural heritage, of exceptional interests, at the disposal of Senegal but also of Guinea, Mali and Mauritania which are also riverside. The Senegal River basin, with an area of 271,573 km^2, is generally divided into three entities (OMVS, Project FEM / BFS, 2008) : the upper basin, the valley and the delta, and covers 14% of the surface area. total of Senegal. The Senegalese part of the Senegal River basin is vast of 27500 km2 or 10.1% of the entire basin (OMVS and HYCOS, 2007). The Senegal River and its tributaries, including Falémé, and its tributaries, including Lake Guiers, cross totally or partially five administrative regions of the country (Kédougou, Tambacounda, Matam, Louga, Saint Louis).

An approach of sustainable management of its water resources is implemented by OMVS through Integrated Water Resources Management (IWRM). IWRM is a flexible tool to tackle the challenges of water. Thus, an IWRM approach is a process that promotes the development and coordinated management of water, land, and related resources, with the goal of maximizing economic and social well-being

without compromising the sustainability of water resources. ecosystems (Global Water Partnership, 2009). IWRM is based on the „Dublin Principles" which stipulate, among other things, that water is a finite and essential resource for life, that water management should be conducted in a participatory manner that includes users and planners of water management and policies, and this at all administrative levels. The real actions undertaken to improve water management in the river basin are to improve knowledge of water resources, communication, information, education and awareness-raising, water, creating an environment conducive to the application of IWRM through legal, organizational and political reforms.

As part of the process of reforming the water sector, since 1981 Senegal has adopted a water code, which was subsequently revised and adapted to the principles of IWRM. The water code determines the water use plans and organizes the preservation and qualitative protection of water resources (Ministry of HydraulicsDGPRE, 2007). It is with this in mind that the Government of Senegal instructed its ministries involved in the water sector the development of a national integrated water resources management policy, involving all stakeholders in the sector: populations, communities, users and professionals. Thus, a Integrated Water Resources Management Action Plan (IWRM-AP), initiated since 2004, was born of the political will of Senegal to hold a planning tool forpriority actions, adapted to the national context. The implementation of this tool and tool is essential for sustainable development and coordinated water management, and improves the management of water resources by taking into account all the resources in the face of current and future needs, by preserving the environment. Thus, it is in line with the recommendations of the various international conferences in which Senegal has participated and the orientations defined by the government, to achieve the Sustainable Development Goals (SDG).

The management of water resources in Senegal suffers from poor governance, the fragmentation of its institutions and the absence of a determined policy aimed at improving water resources. It results Today, there is increasing degradation and exploitation of water resources in the face of increasing demand. This has a negative impact on the socio-economic and environmental level, hence the need to establish better water resource management that would constitute a guarantee for the improvement of living conditions of the population and the fight against poverty. For this purpose, as part of this study, we will focus on water resources management carried out by OMVS.

OBJECTIVES

The purpose of this article is to present the various advantages and inconveniences of the OMVS for water resources management in the part of the Senegal River in Senegal.

THEORETICAL FRAMEWORK

This study focuses on the issue of integrated management of water resources of the Senegal River within the framework of the basin organization. It proceeds by analyzing the various advantages and disadvantages of the model of water resources management of the Senegal River applied by the OMVS, at the level of Senegal. She answers different questions:

- What the body bassi No OMVS is an integration framework under regional example for IWRM?
- How is the OMVS a testing ground for IWRM in which Senegal, a member country, can learn a lot?
- What are the advantages and disadvantages of water management operated by OMVS in the Senegalese part of the Senegal River Basin?

To do so, the combined approach of observations and interviews for the collection of information on the socio - economic and environmental aspects of water management in the Senegal basin is preferred here. Other information used comes from the OMVS, the Directorate of Management and Planning of Water Resources and the Ministry of Hydraulics.

DATA AND METHODS

This work is based on two parts: data collection and document analysis. For data collection, a multidisciplinary literature search and semi-structured interviews were conducted with stakeholders. The scientific articles were searched through different databases to cover a range of unpublished documents (books, reports, dissertations, theses, articles ...) on the issues of integrated water resources management in the Senegal River within the framework of the OMVS ' organization. This in-depth review of the literature has enabled us to collect various available data and information on the problem of IWRM in Senegal River Basin and in basins where similar studies have been conducted. This information was supplemented by the study of reports and glossaries from the International Network of Basin Organizations (INBO), national official documents and statistical data from the organization for the development of the Senegal River (OMVS), the Direction of Management and Planning of Water Resources (DGPRE), the Ministry of Hydraulics and other Ministry.

Finally, to complete the database, interviews were conducted with some strategic institutional and non-institutional actors of the issue. The use of these interviews allowed respondents' opinions to be probed and their interpretation of the problems to be clarified. Other sources of data included consultant reports, strategic planning documents, legislation and policy documents. A number of consultant studies have been completed for the study area and this rich database is

available for review. These reports verified the interview data. The research method produced a rich range of opinions from different stakeholders.

RESULTS AND DISCUSSION

The benefits of IWRM as part of the OMVS

In the Senegal River Basin, various concrete actions, ranging from the physical realization of structures, to sensitization and capacity building, are led by OMVS in the field of water resources development, some of which are covered by IWRM. The realized works are essentially the anti-salt dam at Diama in the delta, the regulator dam multipurpose Manantali, embankments in banks right and left in the delta, the interconnected network of high voltage lines, the link roads. OMVS also carried out enhanced hardware capabilities (restored measurement network, computer equipment acquired, dashboard needs / resources and website implemented, simulation and management software created), financial (increased budget) and human (enhanced national services, continuing training program and scientific advisory committee at the observatory level set up). Several information and awareness-raising efforts are being carried out by OMVS, such as the creation of TV and radio programs, the publication of articles in the print media, the publication of project bulletins and the publication of the journal. OMVS, the establishment of a flood warning plan. These actions or initiatives also concern different aspects (Ndiaye, 2007) Legal (Conventions, Charters, Codes...) and institutional (Conference of Heads of State and Government, High Commission, Societies of Management, Commissions...).

The OMVS, a transversal development and resource management structure

The OMVS is a transversal structure (covering several countries and aspects) which favors a global vision of development and resource management in the Senegal River Basin. From his cross, she manages to guaranteed management of integrated water resources management, better than the industry structure development of the riparian countries (national services). It is able to gain the confidence of sectoral structures to foster the harmonious development of all development sectors through coordinated management of water and related non-biased resources (OMVS, 2002a). The control of water resources is a good tool for sustainable socioeconomic development (Gray and Sadoff, 2007).

OMVS is an exemplary integration framework for IWRM in Senegal, Bachelor of 1972, in cooperation with other States bordering the river (Mali, Mauritania), was granted an on developing a program joint and several development (Ministère de l'Hydraulique/DGPRE, 2007). This resulted in the realization, in full co-operation and co-ownership, of hydraulic works (Diama and Manantali

dams in particular) for multiple purposes and consequences, but mixed (some are positive and others negative). Availability of fresh water against a decrease in recession space;prevention of the drying of the river facing impaired water quality; an integration of local populations facing a value upheaval and land tenure (Tab. 1). Through these major developments, OMVS has introduced a rational use, integrated and coordinated water resources of the basin, which allowed him to reach their mastery. In a climate of transparency, good understanding, dialogue and mutual respect, the idea of a Water Charter for the Senegal River Basin was adopted in May 2002.

Table 1 Impacts of large dams on the economic, environmental and social

At the plan	Positive impacts	Negative impacts
Economic	• The availability of fresh water and agricultural development (crop production, livestock, fisheries...); • the production and supply of energy and drinking water in Dakar and Nouakchott (but with a delay in the energy component); • Tourism and shipping (with a delay orneglect of this sector).	• Reduced recession space and pastoral and the difficulty of the traditional agro-pastoral economy; • The weakness of the irrigable crop potential; • Invasion of aquatic plants disrupting navigation (impeding traffic) and agriculture (by obstructing irrigation pumps and canals); • Falling diversity and quantity of fish; • A rich valley that has become a very poor area: increased poverty, famine and debt.
environmental	• Permanent flooding of important ecosystems; • The restoration of vegetation; • Revitalizing wetland ecosystems; • Preventing the drying of the river bed (with the support of low flows by Manantali) and the regular intrusion of salt water (with Diama).	• The proliferation of harmful aquatic plants; • The modification of the hydrological regime with the imbalance s and profound ecosystem upheavals; • Soil salinization and shoreline erosion; • Modification of sediment transport; • The silting / sedimentation; • Biological and chemical pollution of river waters through the misuse of fertilizers and pesticides; • Alteration of water quality and salinization.
Social, health and cultural	• Opening up and the integration of local populations; • The appearance of associations; • Mitigation of the exodus and the arrival of a workforce from the south of the country.	• The proliferation of vectors and the recrudescence of waterborne diseases (malaria, bilharzias, cholera); • A profound upheaval in value and the land tenure system through hydro-agricultural developments; • The loss of homes.

Citing in its preamble the *United Nations Convention on the Law* of the Non-*Navigational Uses of International Watercourses*, this Charter emerges as an emulation of IWRM, stressing *„ that the sharing of water resources between uses, their management and their development will have to take into account the objective of sustainable development, by associating the different actors: users, managers, decision-makers, developers and experts concerned, in a global and integrated approach „* (OMVS, 20 2b). This Water Charter, a key element of regional stability, is a text that shows the progress of the OMVS in the integrated management of river water (OMVS, 2002b). Through this Charter and other related programs, the OMVS is therefore a testing ground for IWRM in member countries such as Senegal.

Freshwater, as a limited and vulnerable resource, mostly shared between multiple uses and actors and here political entity, requires, for its protection and sampling, an integrated management that implies a neutral and transversal structure (like the OMVS). The joint management of the Senegal River, within the framework of the OMVS, allows the riparian States to federate and give more strength to their common interests. OMVS more credit in the collection of water charges that el es other organizations samplers and water *polluters.*

It is the only entity specifically able to take into account the interdependence between states on the shared resource in their own context. A place of dialogue, even small, even limited, its implementation is an essential stage of cooperation to better manage transboundary water (Vanessa, 2009).

The OMVS Charter defines a number of rules relating to the preservation and protection of the balance of ecosystems in the basin (Ndiaye, 2003). It also calls on Senegal, like the other riparianStates, to work towards the harmonization of its national legislation in this field (Article 16 of the Charter). Moreover, while almost all basin organizations in Africa do not attach any importance to the notion of ecological flow (minimum flow required for the protection of fish and their habitats) (Varis, 2004), Article 2 of this Charter recognizes the environment as a sector of resource use.

The OMVS, an institutional and administrative framework adapted to the basin scale

In contrast to the sectoral development structures that respect the limits of the administrative division in the regions, departments, districts and even communes, OMVS offers, at the scale of the Senegal River and its tributaries, a global vision of the resource to be used for the economic and social well- being of all the administrative entities of the Senegalese part of the basin. For example, the network for sharing information on water through the hydrological structures of the Member States is more promising at the basin scale than at the level of administrative divisions (ABFN, 2010).

To give shape and content to the cooperation between the three States, the OMVS has an institutional framework that governs the activities to be undertaken in connection with the development of the Senegal River and the concerted and coordinated development of its resources. To do it, she is equipped with four types of organs: 1. deliberative (the Conference of Heads of State and Government); 2. executives (the Ministers Council); 3. Participatory (Locals Coordination Committees: LCC and Nationals: NCC); 4. Advisory (the Standing Water Commission : SWC). These LCC and NCC follow the OMVS programs (such as the Environmental Impacts Mitigation and Monitoring Program, the Regional Health Program, the Integrated Water and Environmental Management Project of the Basin Senegal River: GEF/ OMVS). These consultative structures (NCC and LCC) include local authorities, professional associations and cooperatives, representatives of the administrative authority and representatives of associations / NGOs (Ndiaye, 2007). They allow ed the coordination of the activities of the program at national and local level and the participation of the populations of the basin (OMVS, Haut-Commissariat 2007). As for the SWC, it is responsible for issuing opinions and recommendations on the equitable use of water resources between different uses, while its composition reflects the concern to better involve the public in the management of water. In addition to the represen tatives of the States and technicians who are full members, users, local authorities, NGOs and decentralized management committees have been granted observer status. The institutional architecture of the OMVS is in conformity with the integrated management principle.

The OMVS is a suitable policy framework across the Senegal River Basin. Because water exceeds territorial sovereignty, according to organizations such as UNESCO, the OMVS which manages it in the Senegal River Basin is a supranational body independent of riparian states. Indeed, important consequences derive from this, such as overcoming national sovereignty issues and the search for new forms of governance.

The OMVS, a transversal collaborative framework for consultation between stakeholders

The OMVS is a complex organization that seeks, as much as IWRM, to federate a multiplicity of actors and interests (Le Goff *et al*., 2005). In the basin, it allows the creation of a consultation framework between actors and sectoral structures of development. OMVS allows improved and fixed a number of problems arising from the management at the local, community,county, regional, in the more organized in a collaborative framework adapted to the pelvis (ABFN 2010). To be in line with the objectives set by the *Dublin Declaration,* e character Coordinated and Equitable Management of Water Resources in the Senegal River Basin by OMVS is based on the equitable distribution of resources from the basin and is based

on three principles: equitable and reasonable use and participation, the obligation not to cause significant harm and the obligation to cooperate. Despite the achievement of an extraordinary integration point in the common management of the River, water sharing can sometimes generate conflicts (Kipping, 2005). Indeed, it was during this period of watershed under OMVS that the Senegal-Mauritania conflict of 1989 was one of the most violent related to water. To remedy this, the OMVS has for some years been laying the foundations for IWRM. This one, through the Charter of the river (OMVS, 2002b), through an effective and broader involvement of all water stakeholders, through the emergence of endogenous and dynamic participatory structures (which are responsible for IWRM), in a global and integrated approach. Beyond endogenous and dynamic participatory structures such as LCC and NCC years of the Senegalese part of the Senegal River Basin, two drinking water supply offices, eleven water user associations, two Unions Water User Associations and a Local Water Committee have been set up (Cissé, 2008).

The establishment of User Associations in the Senegalese part of the Senegal River Basin facilitates the mobilization of local populations around the management of water resources in the basin. Two types of User Associations have been created: those for IWRM in the fight against harmful aquatic plants in the Delta and those for the management of Drinking Water Adduction (case at Thiagar and Khor at Senegal). In addition, it is noted the reinforcement of the capacities of the actors at different levels (agricultures, breeders, fishermen, mining, industrial, etc.), the establishment of frameworks of dialogue between actors and their participation in the construction of the IWRM, the strong involvement of women and the strong representation of water users in the grassroots bodies...

The OMVS, a regulatory framework for a shared vision of the resource between users

Within OMVS, sustainable water management in the transboundary basin of the Senegal River can not do otherwise than in a shared vision of water resources between users. The OMVS therefore promotes the development of such a vision among Senegalese, Mauritanian, Malian and Guinean users through the dialogue that is essential to prevent conflicts and preserve the basin's resources. For this sharing of the resource, it is not the volume of water that is distributed according to the states (it is the benefits of regional development that are distributed and not the resource itself), but rather an assessment of the needs of different users of a state, according to water availability and priorities. These needs are assessed, on the basis of the expression made bythe States and the users of the basin, by the SWC which enacts measures of management of the structures for an optimized operation of the hydrological system. As for the priorities, they areclearly defined by the Water Charter which stipulates that „the *distribution of water between uses is based in particular on the following general principles: the ob-*

ligation to ensure the balanced management of water resources, fair and reasonable use of the waters of the river, the obligation to preserve the environment [...] „(Article 4) (OMVS, 2002b). The OMVS is therefore an appropriate framework for the planning, mobilization, management and protection of the water resources of the Senegal River Basin. This framework is expected to be further developed through the PGIRE (Integrated Water Resources Management Program) and the development of multipurpose uses.

Today, the Senegal River basin is experiencing an increase and a great diversity of users who are often competitors and whose interests are contradictory (Faye, 2015). However, this multiplicity of users leads to a more complex sharing and more probable tensions. In addition, the lack of direct participation of all categories of users of the resource generates a gap between the OMVS water needs and the actual water needs of users. Moreover, effective concerted management stems from complicated negotiation between local actors and users (if the management actions are harmful to users' needs), but also from the difficult conciliation (in case of conflicts) between competing users.

To fight against conflicts of use and better distribute resources between users, the a management participative and inclusive approaches different (Irvin and Stansbury 2004) are now frequently encountered in the sectors of the Senegalese part of the basin. The OMVS has in the sense of a set of mechanisms of prevention are conflicts between users that share its waters and resolution of conflicts when they occur. She wears also a special focus on promoting good governance of water resources in the Senegal River Basin through IWRM. It mobilizes also to facilitate the understanding, support and participation of users in the database in the process of shared vision. Although a set of benefits related to the management of the waters of the Senegal River applied by the OMVS is noted, many environmental, economic, social and political problems arise.

The difficulties of OMVS water management in Senegal

Despite OMVS ‚more inclusive attitude towards improving the situation in the basin, the situation is far from perfect, both on the left and right bank. Although effective and efficient management of water resources is a major challenge at the dawn of the third millennium, many internal and external factors hinder it in Senegal. A diagnosis can raise the constraints of IWRM applied by OMVS in senegalease part of the Senegal River Basin.

Insufficient support to the management framework best suited to IWRM

If, in an IWRM context, water is used as a vector of development, the development of the basin's water resources in a perspective of sustainable development rather faces several difficulties. Thus, Senegal may be trapped by its low economic level or meet technical, institutional and financial limits (Sadoff and Grey, 2002). The causes

of the problems of water control in the basin are ultimately multiple and generally due to the relatively low economic level of riparian states. Although ,re water resources basin is nt the basis for sustainable development, its division or fragmentation between the territories of the four basin states becomes a further obstacle (Julien, 2006).

Although the OMVS is useful, the overlapping of responsibilities with offices leads to conflicting decisions, duplication, wastage of already inadequate financial, human, technical and logistical resources. Although the joint management of the Senegal River, through the OMVS, allows the riparian states to federate and give more strength to their common interests, it also faces divergent interests (Le Goff *et al.,* 2005). At the level of Senegal, we can highlight:

- The primary objectives given to the OMVS (which are the irrigation crop) different from that of Mali (which are the electricity and the realization of the project of opening up by navigation);
- The difficulties related to the abandonment of national sovereignty over the Senegal River, its tributaries, its distributors and its works of common interest built by the OMVS (For example, the project to revitalize the fossil valleys that wanted to divert the waters of the Senegal River to Senegal could sign the return of state sovereignty and suspicious noises.This project was finally abandoned in the face of the refusal of Mauritania who feared that this shared water resource is considered a national property as Senegal).

In general, OMVS may face serious challenges related to insufficient institutional development, domestic and external political pressures, inadequate budgets, poor management and technical capacity. The objectives and strategies of the OMVS come often in conflict with the policy priorities of different States members. According to Vanessa (2009), there is a significant gap between the texts that establish the interstate basin organizations and the reality, hence their failure in the role of director of management. In Senegal, a failure of management by OMVS can be due to three reasons:

- The lack of means of control enabling it to guarantee the implementation of the commitments of Senegal as those of the other riparian States of the river and to establish this governance;
- The significant influence of donors like the World Bank and the fond money i nternational on the directions taken by the OMVS (or by Senegal) that can cause the a dispersion of decision-making power of the OMVS in planning activities and how it works;
- The lack of direct participation of all categories of users of the resource, which generates a gap between needs and activities, detrimental to the legitimacy of the OMVS.

By making use of private investment to finance projects in the Senegal River Basin, an investment negotiated and obtained individually (without consulting the other States bordering) and escapes thus the control of other States, Senegal can s overstepping of vision coordinated and cooperative sharing of resources within the OMVS. In addition Despite the recognized priority of concerted water resources management within OMVS, water resources management is often done on a sectoral basis. Very few actions are done in a concerted manner and very often there is an overlap of skills of local actors. To this is added a legislative, legal and regulatory vagueness (Kouam Kenmogne *et al.,* 2006) and the weak association of populations to projects. However, these populations are the first to suffer from the procession of environmental, economic, social, political and health calamities that flow of the major developments in the basin (example of the outbreak of malaria and schistosomiasis in the river valley). In addition, private companies such as Sugar Company Senegal (SCS) and Senegalese waters, which are very active in the field, are often marginalized from the management of water resources under OMVS.

Even if the participation of the populations of the basin is envisaged within the framework of the OMVS, it is generally less so within the national framework in Senegal. Moreover, few agreements in the river's charters provide for procedures allowing the population to participate in decision-making within the OMVS. Despite the various charters OMVS has adopted over the years, it is clear that an institutional vacuum persists. Moreover, some decisions taken by the OMVS are not in line with the local reality. Indeed, the availability of fresh water, relative to the installations, was accompanied by a decrease of the recess space and pastoral and a failure of the traditional agro-pastoral economy. As a result, OMVS not only failed to achieve certain goals set for it, but the programs implemented also resulted in many negative externalities in social, economic and environmental terms (Boinet, 2011).

Another major bias in the process is the lack of integration of the integrated management plan. Indeed, if the plan is compiled and centrally drafted by the OMVS, it is put in place by each locality of the riparian states of the watershed. This return to administrative rather than hydrological units is debatable because consultation between localities may be generally non-existent despite the presence of a basin organization to ensure overall coordination of management. The basin management and development plan may not contain sufficient data and information to plan for the proper use of water resources. Furthermore, integrated management does not always guarantee its primary goal of managing the necessary water resources that is to protect biodiversity in this basin.

The management of watershed resources usually generates tensions between different user groups (Julien, 2006) even though Senegal is generally subject to

the same sovereign jurisdiction as the other countries of the basin : they share the same official language, their systems political and legal are similar, and both colonial history and religion (Islam) share a unifying role (Kipping, 2005). And the difficulty of managing a notch further increases when states will share several basins (Sadoff and Grey. 2002) : this is the case between the Senegal and Guinea, which shares nt the basins of the Senegal and Gambia. The maximization of immediate national interests or difficult diplomatic relations may indeed run counter to the benefits that can be derived from co-operative management at the hydrological system level, as has been the case in the past in the past. basin (Gould and Zobrist, 1989). International tensions around the resource are as likely as many. In fact, the Senegal Basin is on the list of 17 transboundary watersheds that are most at risk of international conflict worldwide (Wolf et al., 2003).

The others types of problem of water management in the Senegal River Basin

Although watershed management advocated by the OMVS, while water a territorial element, can treat the diver questions interactions e etween water users, physical and natural resources socio-economic systems (Miaillier, 2007), many internal and external factors impede the sound management of water resources in the Senegal River Basin. From the point of view of its content, the basin management plan may encounter serious deficiencies and significant errors and inaccuracies of data and of information provided to the database, which the e ur sharing has a negative impact on the joint management of the Senegal River. The asymmetry of data and information between riparian states is also reflected in their mistrust and reluctance to conclude international agreements on shared water resources (Banque africaine de developpement, 2000). In the basin, this asymmetry is linked to the fact that the institutions responsible for the collection, processing and dissemination of data and information in the States bordering did not autonomous financially and operationally.

The water of the Senegal River basin, although constituting the basis of reflection and intense planning (major developments), is particularly insufficient because of the presence of three aggravating factors : its great spatial and temporal variability, its sharp decrease and the weak „second-rate resources" (the meager means) of the basin societies (OMVS and WHYCOS, 2007). The Senegal doit usually accommodate a hydrology „difficult" (Sadoff and Grey, 2007) because it rested e of low resources (institutional, financial, human, technological) to dedicate to managing its water x (Durand-Dastès, 2005), compared to developed countries. In the riparian states of the basin, as in southern countries, water management is therefore carried out in an „extreme environment „ (Giordano and Lautze, 2009) : extreme dependence on shared waters between four sovereign states, extreme poverty of the populations.

Informal management of pond water is also a problem. However, this informality does not cover the entire basin but strictly natural tributaries (sections of Bakoye and undeveloped Falémé) represents 40% of the flow of the river, 60% controlled (conditioned by the Manantali releases) are the result of the management of the basin which is also based mainly on the management of the two dams). In addition, the technology transfer of Watershed Management (setting up reliable observation networks and effective management platforms, mobilizing human and material resources, exchanging information, monitoring and evaluating projects and programs) are increasingly difficult (Julien, 2006).

Another failure appears at level of the participatory aspect with d are local residents of the River, given the cultural and political context, which have a low level of participation in management bodies. The administrative units to facilitate participatory planned phases in the process of realization of the watershed plan suffer as a lack of skills and manage difficult ment to mobilize are people for consultation with stakeholders. More, the satisfaction of the uses (ecological, domestic and industrial) and the hydroelectric production, thanks to the good availability of the water resources of the river, are to the detriment of other axes like the improvement of the agricultural productivity, the development of the farming and fish farming, or the development of forestry. The multiplicity of actors and issues (agricultural, industrial, hydroelectric, tourism) on the basin can be a source of incompatibility between the optimum needs of each of them.

Generally, the are major constraints to the management of water basin are related to the physical environment (climate factors of order, irregularity and low rainfall), environmental economic (weak basic infrastructure traditional control and management methods, low funding and lack of resources), the institutional framework (still weak capacities of the actors, insufficient regulatory frameworks) and legislative, legal and regulatory uncertainty.

Given the difficult socio-economic and environmental contexts (Shah *et al.*, 2006; Schulze, 2007), the challenges the people of the Senegalese part of the basin are facing s, are multiple and very overwhelming: they are demographic, economic and hydroclimatic. In this extreme environment and following the guiding principles adopted by the internationally recognized Dublin Conference, the current issues of IWRM are of several kinds (Institut International D'INGENIERIE de l'Eau et de l'Environnement, 2010). In the basin, they are linked to the guarantee of water for the populations and the production activities to limit conflicts of use, the protection of the ecosystems and the biodiversity, the management of the great spatial variability time, the a public awareness and establishing the legitimacy of the OMVS.

CONCLUSIONS

At the end of this study, it should be considered that in the water resource management issue, a basin organization constitutes a frame of reference for the implementation of integrated management of water resources by basin. In the Senegal River basin, the OMVS has shown a remarkable ability to adapt to the changes and realities of the environment, which gives every reason to be optimistic about the management of the river's waters. However, while the legal and institutional framework of OMVS appears solid, the consequences of its actions are at least mixed.

The OMVS, through its transversality, provides integrated management of water resources in the Senegal River Basin. Through its action, the confidence of all development sectors, through coordinated management of water and related resources without bias, can be gained. As a neutral structure, OMVS thus manages to secure and manage in an integrated manner the basin water resources although limited and vulnerable. In the Senegalese part of the basin, the OMVS administers a global and shared vision of the resource for the economic and social well-being of all the administrative entities. It is a neutral and credible transversal institution that has created a framework for dialogue between stakeholders and users, which has made it possible to preserve the basin's resources and also to prevent and manage the conflicts that are linked to them. In sum, OMVS is an appropriate framework for planning, mobilizing, managing and protecting water resources. Nevertheless, problems remain.

The joint management of the Senegal River is fraught with divergences of interest due to a difference of objectives and difficulties related to the abandonment of national sovereignty over the river, OMVS management failures due to weakness of s means and the direct participation of all categories of users, the negative externalities of the large developments in the basin. Added to a lack of monitoring mechanisms and control compliance, insufficient own resources OMVS, an insufficient support to the management framework best suited é e IWRM, the results of some programmatic components remained well below expectations. However, this cruel record does not hinder the fact that OMVS remains one of the most advanced and armed basin organizations.

These differents problems noted not peuve nt be solved sectorally and separately from one another, and must be addressed as part of an approach to IWRM. However, in terms of IWRM, Senegal has, through the OMVS, an institutional framework and regulation of the hydrological sector. However, the improvement of this water policy based on IWRM will serve as a framework for the improvement of the water sector in Senegal. As a result, the state must obtain, in the basin, water resource projects for which the political, socio-economic and environmental issues have been reasonably examined by the OMVS. To remedy the various problems and issues noted in the Senegalese part of the basin, the OMVS,

in addition to the implementation of major developments and the definition of conventions and charters for the control of water, must strengthen the framework, institutional, legislative, regulatory and financial management and financing for good water policy in the basin. This requires a harmonization of the legislative and regulatory framework of water resources management favorable to the implementation of IWRM. In the, we must plan the use, protection, conservation and sustainable and rational management of water resources based on needs and community priorities. OMVS would benefit from creating channels of direct communication with other actors in the management and protection of the resource.

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LOCAL ACTION GROUP AS A TOOL OF INTER-MUNICIPAL COOPERATION: CASE STUDY OF SLOVAKIA

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Abstract
The main role of municipalities and their self-governments is to provide adequate public services and support for the local development. A significant limiting factor in achieving their effectiveness and quality is the insufficient size of municipalities, which makes impossible to realize economies of scale, and the absence of sufficient level of the human and social capital. A large number of small municipalities and a fragmented settlement structure are typical for the territory of Slovakia. In this respect, the support for inter-municipal cooperation as an alternative to amalgamations of the local self-governments is a possible solution. One of the platforms of this cooperation is Local Action Group (LAG), which is now receiving increased attention. Support for inter-municipal cooperation in the form of LAGs has also appeared in the "Call for proposals 21/PRV/2017" under the Rural Development Programme of the Slovak Republic 2014 – 2020. The aim of the paper is to assess the spatial allocation of financial means from the above-mentioned call to individual LAGs across the self-governing regions of the Slovak Republic in relation to their socio-economic status. Financial allocations were monitored in the total volume as well as in respect to the number of inhabitants of LAGs and socio-economic status of the regions was defined by a set of 14 selected socio-economic indicators. The regression and correlation analysis was used to assess the spatial justice of the distribution of financial means to LAGs, with the Pearson correlation coefficient as a measure of the linear correlation between paired data. The obtained results show that funding volumes have developed a growing tendency towards the least developed regions in the south-east of Slovakia, however, considering the level of socio-economic status of the individual regions of the Slovak Republic, the allocation of financial means is not quite optimal.

Key words
inter-municipal cooperation, Local Action Group (LAG), regional development, socio-economic status, self-governing regions, the Slovak

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INTRODUCTION

Regional development as well as development of individual municipalities depend on their internal availability, whether of natural or socio-economic character. However, for many rural communities (especially the small ones), this development potential is insufficient as well as insufficiently utilized, mainly due to the absence of the corresponding level of human and social capital. These missing endogenous resources can be partly compensated by exogenous in the form of cooperation with other municipalities as well as local and regional entities.

The paper is precisely aimed at inter-municipal cooperation and its possibilities for regional development in the form of Local Action Group (LAG). Attention is directed to the spatial allocation of financial means to a particular LAGs within the regions of Slovakia. The socio-economic status of these regions has also been analysed, what makes it possible to define the major objective, and that is the assessment of the spatial justice of financial distributions to LAGs within individual regions of Slovakia in relation to their socio-economic status. Two partial objectives stem from the major objective in terms of the socio-economic analysis of the regions of Slovakia and the assessment of regional distribution of financial means to LAGs both, in the total volume as well as in relation to the number of inhabitants. We assume that in terms of regional policy and support for less developed regions, the largest amount of financial resources will be directed to the LAGs located in the regions with the lowest levels of socio-economic status.

THEORETICAL FRAMEWORK

The main mission of the local self-governments is to provide public services. In recent years, the emphasis on efficiency as well as quality of their provision have increased. In order to achieve the above-mentioned conditions, the suboptimal size of the local self-governments becomes an important limiting factor, which makes impossible to exploit economies of scale and the synergy effect resulting from the concentration of the social and human capital (Allers, van Ommeren 2016, p. 717). Fixed costs increase the average spending of small self-governments (Drew et al. 2016). A traditional way how to solve this problem is consolidation of the local self-governments (Bell, Warner 2015), whose the most common form is amalgamation, or merging of the local self-governments into larger units.

Niaounakis, Blank (2017, pp. 533-4) have drawn attention to several empirical studies, which point out that consolidation may not always lead to expected expenditure cuts of self-governments (Dollery, Johnson 2005, Fox, Gurley-Calvez 2006, Hanes, Wikström 2010, Drew 2016, Allers, Geertsema 2016). This is related to the fact that services provided by local self-governments are differentiated in terms of the effects of economies of scale. Another disadvantage of amalgamation is the loss of jurisdictional autonomy and local identity of originally autonomous

local self-governments, which merge into a larger unit (Niaounakis, Blank 2017, p. 534). For the reasons given above, in addition to the traditional approach, alternatives to the problem of efficiency and quality of providing public services by local authorities have been suggested. One of them is inter-municipal cooperation.

Reasons for the cooperation of different entities are based on the existence of the "synergy effect", or in other words, the fact that corporations will achieve better results than each entity individually. Cooperation can be generally considered as the interaction of a certain number of entities when achieving a particular common goal (Galvasová et al. 2007). Cooperation is an important element in the functioning of the public administration as well as in the development of municipalities and regions. According to Furmankiewicz (2002), De Jong (1986) and Hardin (1989), five different forms of interaction between two territorial self-governing entities can be defined: *conflict* (the problem lies in the fact that what is convenient for the first entity, is not convenient for the other one), *competition* (neighbouring entities can accept different solutions for unrelated problems, while the solution for the first entity reduces the chance for the success of the second entity), *control* (one entity is subordinate to the other one, whereby it manages a smaller part of the common territory), *coordination* (both entities are in the same relationship with possible solutions, and at the same time, they both prefer the same solution independently of each other) and *cooperation* (entities consciously cooperate from the aspect of common interest, along with the possible conflict in the distribution of potential benefits).

In order to develop inter-municipal cooperation, the last two forms of interaction are promising, although, in the case of mutual cooperation, it is also possible to overcome the obstacles in the form of conflict, competition and control.

Inter-municipal cooperation is, thus, a form of association of municipalities mainly based on the mutual cooperation, and it is one of the starting points for an effective solution and higher quality of performance of the transferred competences, when solving the problems of municipalities, especially the small ones. This fact is also emphasised by Hasprová et al. (2012), who state that the inter-municipal cooperation is a typical substitution for the so-called smallness of municipalities as well as their inability to provide independent public services.

An important and characteristic attribute of the inter-municipal cooperation can be seen in the fact that there is no complete transfer of the competences and responsibilities of municipalities to newly established organizations of the inter-municipal cooperation. Municipalities have at least indirect control over their decision-making (Swianiewicz 2011). A certain degree of autonomy and a possibility to cooperate with other municipalities that are interested in the cooperation, are maintained by municipalities.

Cooperation of municipalities is also considered as a politically more acceptable solution and its voluntariness is often promoted as well. Cooperation of municipalities, is not simpler in comparison to the amalgamation of municipalities (Ježek et al. 2015). According to Koprić (2012), a cooperation agreement between municipalities could be a functional substitution for the territorial consolidation.

According to Galvasová et al. (2007), Chabičovská, Binek (2007) or Teles (2016), it is possible to observe different characteristics of the inter-municipal cooperation based on its: *function* (efforts to achieve a common development of the territory), *goals* (development of the territory, creating the material and technical conditions, cooperating on projects), *instruments used* (non-financial – administrative instruments, institutional, material; financial – non-investment and investment incentives, capital shareholding, tax reductions), *stakeholders* (local government, self-government, non-profit organizations, entrepreneurs, citizens), *level of involvement of entities in the cooperation* (institutionalised cooperation, cooperation agreement, ad hoc cooperation) and *legal form* (micro-regions, common municipal offices, local action groups – in the form of interest groups, associations of legal entities and charitable organizations).

Kołsut (2015) affirms that regarding inter-municipal cooperation, the most frequently assessed issues are: the level of cooperation, cooperation subjects, cooperation issues, problems of cooperation network functioning and cooperation factors.

In addition to the indisputable benefits of inter-municipal cooperation, it is also necessary to point at its limitations. Hasprová et al. (2012) point to the following: the problem with ensuring democratic control, the loss of autonomy, conflicts of interest, the growth of bureaucracy, the lack of transparency of financial operations and activities of personnel management, and the fact that newly created entities of the inter-municipal cooperation are not directly responsible to the local voters at the same level as municipal authorities. Similarly, Teles (2016) points out that some of the weaknesses of the cooperation such as tendencies for democratic deficits, when no mechanism of responsibility or instability are introduced in case cooperative measures are not smooth and change over time, provide strong arguments for those who support an amalgamation.

Szmigiel-Rawska et al. (2010, p. 89) with regard to the restrictions of the inter-municipal cooperation indicate that "the cooperation is perceived as an action requiring additional administrative effort with uncertain effects because it depends on the good will of others".

Last but not least, according to Maes (1997), Ištok, Klamár (2005), processes of merging municipalities into the larger self-governing regions are very administratively demanding and sensitive to citizens, and therefore, they require careful preparation and a detailed research.

Inter-municipal cooperation and its development in Slovakia in the form of micro-regions became a central topic of various investigations: Buček (1997), Kukliš (2002), Tichý (2003), Ištok, Tej (2004), Žárska (2006), Klamár (2006), Slavík, Bačík (2007), Pustá, Dolná (2010), Pustá (2011), Falťan et al. (2011), Angelovič, Benč (2012), Grác (2014), Slavík et al. (2016), Falťan, Strussová (2016), in the form of local action groups: Tvrdoňová (2006), Hradiská (2007), Donauer, Rajčáková (2014), Babinský (2015), Ponťíková (2015), Wisterová (2016), Székely (2017), Kvasová (2018) and common municipal offices: Lovacká (2006), Slavík et al. (2010) and many others.

LOCAL ACTION GROUP (LAG) AS A TOOL OF THE INTER-MUNICIPAL COOPERATION IN SLOVAKIA

Persistent fragmentation of the structure of local self-governments is a typical feature for Slovakia. In foreign countries as well as in Slovakia, debates on solutions of this issue (e.g. Nižňanský 2004, Galvasová et al. 2007, Klimovský 2009, Pustá, Dolná 2010, Dušek 2010, Ježek et al. 2015) focus on two basic approaches that are aimed at increasing the efficiency and effectiveness of the municipal management, namely: amalgamation of municipalities or inter-municipal cooperation.

The term municipal amalgamation in the Slovak conditions means giving up or transferring the competences (autonomy) of one or more municipalities to a newly established municipality. A municipal amalgamation takes place in the form of merging at least two municipalities into one, or affiliating one municipality to another, usually the larger one (Nižňanský et al. 2014). The municipal amalgamation occurs either on a voluntary or forced basis. In many countries, volunteering plays a major role. The application of the principle of voluntarism, while merging municipalities, means considerable demands on the motivation of municipalities (Ježek et al. 2015). In case of constraint, internal resistance and disagreement might appear among the local residents as well as local stakeholders what might lead to the subsequent complications in the amalgamation process. Ali et al. (2012) have pointed to the negative consequences of the municipal amalgamation through the analysis of several works written by foreign authors. In the Slovak context, it was Klobučník et al. (2018) who have driven attention to this issue.

It has led to the preference of the second approach based on the principles of the inter-municipal cooperation. Local Action Group (LAG) is one of its platforms. They represent a partnership of the representatives of public, private and civil sectors operating on the entire and coherent territory. This concept is built upon the assumption that a determining role in the process of development of rural regions is attributed to the non-governmental organizations and communities of the local character that are able to define the values of the region. They also integrate and activate citizens, thereby complementing activities of self-governments. It is mainly cooperation among public administrations, entrepreneurs,

social organizations and representatives of local communities leading to the development of socio-economic initiatives as well as activation and integration of the local communities, and thus, their economic development (Czapiewska 2012). According to Guinjoan et al. (2016 in Székely 2017, p. 33) the shifts of concepts of rural development ("new paradigm of rural development") are going from sectorial focus to the spatial one, and/or from the top-down development strategy to the bottom-up one.

According to the Associations Act no. 83/1990 Coll. and its later amendments, LAGs represent public-private partnerships in which local communities, entrepreneurs, public administration, agricultural and forestry entities, young people, women as well as other important local stakeholders are represented. The main condition is that private sector representatives should make up at least 50% of the partnership.

Each LAG must meet certain conditions regarding partnership, territory and development strategies: population of the LAG must be between 10 and 150 thousand inhabitants; population density must not be higher than 150 inhabitants per km^2; the minimum number of municipalities of the LAG is 7; each LAG has legal personality; LAG have structure of authorities that are able to manage public funds as well as activities of LAG; members must operate in the territory of LAG, they must have a permanent or temporary residence, seat or business in the territory of LAG; LAG must have a local development strategy developed and led by the community (called the CLLD strategy) with clearly defined objectives and measures fostering local development; strategy referring to the territory of LAG must cover a coherent territory bordering the land registry of all municipalities involved (www.nsrv.sk).

For each municipality, becoming a member of the LAG brings several benefits: networking that provides exchange of information and experience; ensuring reciprocal knowledge and experience among members of LAGs; promoting cooperation with other LAGs; representing and debating the legitimate interests of all stakeholders; creating cooperative environment and supporting mutual aid; promoting and disseminating experience and examples of good practice; supporting and developing cooperation and partnerships of rural residents, representatives of the municipalities and towns, representatives of the non-profit sector as well as other micro, small and medium-sized enterprises active in rural areas; cooperating with the National Rural Development Network, the Managing and Paying Authority under the Rural Development Programme of the Slovak Republic and other components of the state government and self-governments; providing documents on the development, education and information activities for the rural development; organizing seminars, workshops, conferences and other professional meetings; the possibility of drawing subsidies from the LEADER subsidy program, which is intended exclusively for LAGs (Wisterová 2016).

LEADER as a main philosophy of the management and development of LAGs is aimed at supporting the development of rural areas through the pilot integrated strategies implemented into the specific territories on the basis of mutual cooperation between the local entities in a particular region (Slováková et al. 2015). LEADER can be characterised by seven key characteristics complementing and influencing each other: local development strategies, bottom-up approach, public-private partnerships: LAGs, facilitating innovation, integrated and multi-sectoral actions, networking and cooperation (CLLD management system, 2017).

The LEADER approach and profiling network of LAGs pointing to the viability of this inter-municipal cooperation platform are also created in the neighbouring countries. In Hungary, Katona-Kovács et al. (2011) evaluated active and passive participation of the cooperation partners within the network of LAGs. Kassai, Farkas (2013) focused on the opportunities and threats, with special regard to the institutional framework and governance of LAGs in the east of Hungary and Patkós (2018) traced the history of the LEADER programme and LAGs, the number of cooperating municipalities and dominant forms of the LAG management in Hungary. In the Czech Republic, Svobodová (2010) focused on the content analysis of the selected CLLD strategies of LAGs and identification of their problems. Varvažovská (2012) monitored the functioning of the LEADER programme and LAGs as well as benefits of the LAG membership, Pechrová, Boukalová (2015) created a LAG typology based on the organizational characteristics – 'stabilized', 'experienced', 'absorbing' and 'well-informed' LAGs. Pártlová, Hron (2016) focused on the use of LAGs' leaders as experts for directing resources where they are most needed and Nunvářová (2016) evaluated the strategic planning of LAGs and their contribution to the rural development in the Czech Republic. Semian, Nováček (2017) approached LAGs in the Czech Republic and they used history and historical and historicizing elements to present the region's image. Within the territory of Poland, Zajda, Kretek-Kamińska (2013) assessed the question whether the high level of professionalisation and economisation has a positive influence on the activities of its members or – the opposite – it constitutes a hindrance. Zajda (2014) addressed the analysis of the LAGs' main problems and their social capital in the six Polish voivodeships, Sienkiewicz (2015) monitored the LAGs' role in promoting local socio-economic development, on the example of the region of Lublin. Parlińska, Ignar (2016) assessed the financing of LAGs from sources of the LEADER programme in the Mazovia Voivodeship. Michalcewicz-Kaniowska et al. (2017) focused on the management of the LEADER programme and functioning of LAGs in terms of local and regional policy of sustainable development in Kujawsko-Pomeranian Voivodeship. In Croatia, for example, Lukić, Obad (2016) dealt with LAGs and Leader issues, in Slovenia it was Volk, Bojnec (2014) and in Romania, Mosora, Mosora (2012), Albu, Chitu (2014), Pocol, Kassai (2016) and many others.

DATA AND METHODS

When achieving the first partial goal in terms of assessing the level of development and socio-economic status of individual regions (self-governing regions were selected as the core observation units, and their selection is explained in the following text), the point-rating method was used as a basis. This method is, by its nature, one of the indirect methods, and it uses a set of predefined variables when evaluating data. The advantage of this method is above all, its ability to include the indicators presented in different units into one synthetic characteristic, which is a dimensionless quantity, and thus, to enable the comparison of the regions.

A set of 14 selected indicators was chosen while applying the method (gross birth rate, average monthly wage, monthly labour costs per employee, employment rate, unemployment rate, net monthly income per capita, net monthly expenses per capita, the number of completed dwellings per 1,000 inhabitants, regional gross domestic product per capita, gross value added per capita, labour productivity from turnover per employee in industry, labour productivity from turnover per employee in construction, the number of enterprises in total per 1,000 inhabitants, the number of tradesmen in total per 1,000 inhabitants), which characterise the level of development and socio-economic status of the assessed regions.

When assessing status of the regions, the following procedure was used: as the basis for the comparison for each selected indicator, its highest achieved level (the maximum value or the minimum according to the character of the indicator) was chosen in the region. It was used a maximum value of 100 points which was introduced as a base variable when comparing different regions. The values assigned to each indicator in different regions were compared with this value based on the relationship:

$$u_r = \frac{U_r}{U_{max}} . 100 , \qquad (1)$$

where u_r – is a calculated point level of the indicator in the selected region, U_r – a real value of the indicator in the region, U_{max} – a maximum value of the indicator in the observed file.

Assessing the point level of the selected indicators in individual regions and adding their ratings, an overall rating of the region, with the maximum achievable value of 1,400 points, was obtained.

The socio-economic status of the regions was assessed in the following years observed: 2001, 2004, 2008, 2012 and 2016, whereby the year 2001 was the first year of the assessment, 2004 represented the entry of the Slovak Republic into the EU, in 2008 the economic crisis appeared, 2012 was a comparative year and 2016 was the last assessed year with regard to the availability of statistical data.

Based on facts introduced by Korec (2005), Džupinová et al. (2008), Klamár (2011), Matlovič, Matlovičová (2011), Matlovičová et al. (2014), Matlovič et al. (2018) indicating the west-east gradient of the economic status of the Slovak regions, the hypothesis **H1** was formed: socio-economic status of the Slovak regions by means of the point-rating method in 2016, will have a declining trend in the west-east direction. In accordance with this hypothesis, the hypothesis **H2** was set up: development of the socio-economic status of the Slovak regions by means of the point-rating method in the years 2001 – 2016, will indicate weakening of the position of regions in the south-east of the Slovak Republic (the Banská Bystrica Region, the Prešov Region and the Košice Region).

Spatial distribution of the financial allocation to LAGs in the context of their socio-economic status was analysed by using the point-rating method. It was second partial aim of our study. This financial allocation consisted of two components: basic allocation and additional performance allocation. Financial allocation[1] to LAGs was consequently assessed as a whole for each region as well per person of the LAG (only the population of those LAGs for which the financial allocation was approved). It is important to explain the choice of the self-governing regions (NUTS3) as the evaluation units (and not for example the district level – LAU1) because of a large number of LAGs belonging to two or more districts (LAU1), what made their locating within this hierarchical level unambiguous. At the same time, statistical data of a larger number of assessing indicators are also available at the regional level (NUTS3).

In order to express spatial fairness of the allocated financial means to each LAG in relation to the socio-economic status of the region, a regression and correlation analysis method – Linear dependence of a pair of vectors, was used. An independent variable represented the socio-economic status of the region and the allocation of financial resources to LAGs in the region was represented by a dependent variable. The aim was to find out whether it is possible to assume certain dependence between variables and strength of this dependence. Suppose there is a relationship between the two variables, whose strength can be expressed by the shared variance, it is possible to do approximation with one variable by means of the other one and to create a regression model. The suitability of the model was

1 Basic financial allocation to LAG was established under the "Call for proposals 21/PRV/2017" according to the formula:

350,000 € + (number of habitants of LAG) * X + (size of the territory of LAG) * Y + (degree of unemployment of LAG minus 13.5%) * Z + (number of municipalities) * W,

while the coefficients were set in "Call for proposals 21/PRV/2017" at the level: X = 9.66, Y = 1,150.61, Z = 110,413.2, W = 12,395.25 and statistical data included in the calculation were collected as of 31 December 2014. Additional performance allocation was set in accordance with the conditions stated in the document Management System CLLD (LEADER and Community Development) for the programming period 2014 – 2020.

verified by ANOVA (Analysis of Variance) in the program STATISTICA, where the null hypothesis H0 was tested: "The model is not appropriate for use." The F value represented test characteristics, whose significance was given by the p-value indicating the smallest possible level of significance for rejection of the null hypothesis. When the p-value was ≤0.05, the null hypothesis was rejected at a given significance level $\alpha = 0.05$. The assessment of the strength of the linear relationship was indicated by the Pearson correlation coefficient (R) whose absolute values approaching 1 indicated a stronger relationship between the status of the region and the amount of funds allocated to LAGs. The coefficient of determination (R^2) is expressed as a percentage of the variation of the dependent variable explained by the variation in the independent variable.

When assessing the socio-economic status of the regions and the volume of funds allocated to each LAG in the region (total as well as per inhabitant), the **H3** hypothesis was formed: the volume of funds allocated under the "Call for proposals 21/PRV/2017" will increase with a decline of the socio-economic status of the regions.

ACHIEVED RESULTS

The socio-economic status of the regions of the Slovak Republic was assessed on the basis of the point-rating method (Figure 1). Based on a set of 14 selected indicators (gross birth rate, average monthly wage, monthly labour costs per employee, employment rate, unemployment rate, net monthly income per capita, net monthly expenses per capita, the number of completed dwellings per 1,000 inhabitants, regional gross domestic product per capita, gross value added per capita, labour productivity from turnover per employee in industry, labour productivity from turnover per employee in construction, the number of enterprises in total per 1,000 inhabitants, the number of tradesmen in total per 1,000 inhabitants) in 2016, the Bratislava Region was the best ranked region which earned 1,397.1 points out of a total possible 1,400 points. It earned a maximum of points in 12 out of 14 indicators, excluding the unemployment rate (the Trnava Region as the highest-ranked region – 4.4%) and the number of tradesmen per 1,000 inhabitants (the Žilina Region as the highest-ranked region). The neighbouring Trnava Region earned 950.5 points as the highest number after the Bratislava Region, and it represented 68.0% of the region's value. The status of this region is also evidenced in the fact that it gained the second highest number in 8 indicators and was ranked first regarding the unemployment rate. The Žilina Region was the third economically strongest region (861.7 pts). It ranked third and fourth in most indicators, whereby the indicator related to the number of tradesmen per 1,000 inhabitants was the highest in the Slovak Republic. In 2016, the Trenčín Region obtained a total number of 834.7 points and it was ranked fourth. The Nitra Region (797.3 pts) was

economically the weakest region in the most developed north-western part of the Slovak Republic.

Because of a 60.3 points drop, the economically strongest region in the south-eastern part of Slovakia, the Košice Region, was ranked sixth (737.0 pts) followed by the penultimate Banská Bystrica Region with only a few points less (722.3 pts). Absolutely, the economically weakest region of Slovakia is the Prešov Region with only 702.8 points, what represented the value of only 50.3% of the Bratislava Region and 73.9% of the Trnava Region. The negative results of the region are based on the fact that it got the lowest value in 9 indicators, however, it ranked second for birth rate, after the Bratislava Region (Figure 1).

Based on the above results, we can state that the hypothesis H1 has been confirmed.

Even more problematic is the fact that the regions in the south-eastern part of Slovakia (Banská Bystrica, Košice and Prešov Regions) are not only economically the weakest regions in the country but their socio-economic situation has also deteriorated over the last 15 years. On the contrary, the improvement was recorded in more developed regions in the north-west of Slovakia (Figure 1). According to the Figure 1, it is clear that the Bratislava Region as well as the Trnava Region were always ranked first or second during the years considered (2001, 2004, 2008, 2012 and 2016). There was a gradual improvement in the position of three other regions in the north-western part of the Slovak Republic during the investigation period: The Trenčín Region – 5th, 5th, 4th, 4th, 4th place, the Žilina Region – 4th, 4th, 3rd, 3rd, 3rd place and the Nitra Region – 8th, 6th, 6th, 5th and 5th place. Regression and stagnation are clearly visible in all three regions in the south-east of the country: the Košice Region – 3rd, 3rd, 5th, 6th, 6th place, the Banská Bystrica Region – 6th, 7th, 7th, 7th, 7th place and the Prešov Region – 7th, 8th, 8th, 8th and 8th place.

The findings of this analysis fully confirm the hypothesis H2 about the weakening of the position of the regions in the south-eastern part of the Slovak Republic (Banská Bystrica, Prešov and Košice) in the context of the entire Slovakia between the years 2001 and 2016.

There are also sources confirming our findings (i.e. Korec 2005, Džupinová et al. 2008, Rajčáková, Švecová 2009, 2014, Padová et al. 2012, Klamár 2011, 2016, Matlovič, Matlovičová 2011, Matlovičová et al. 2014, Madajová et al. 2014, Matlovič et al. 2018), which indicate deepening of the differences between the economically prosperous north-west and the stagnant or declining south-east.

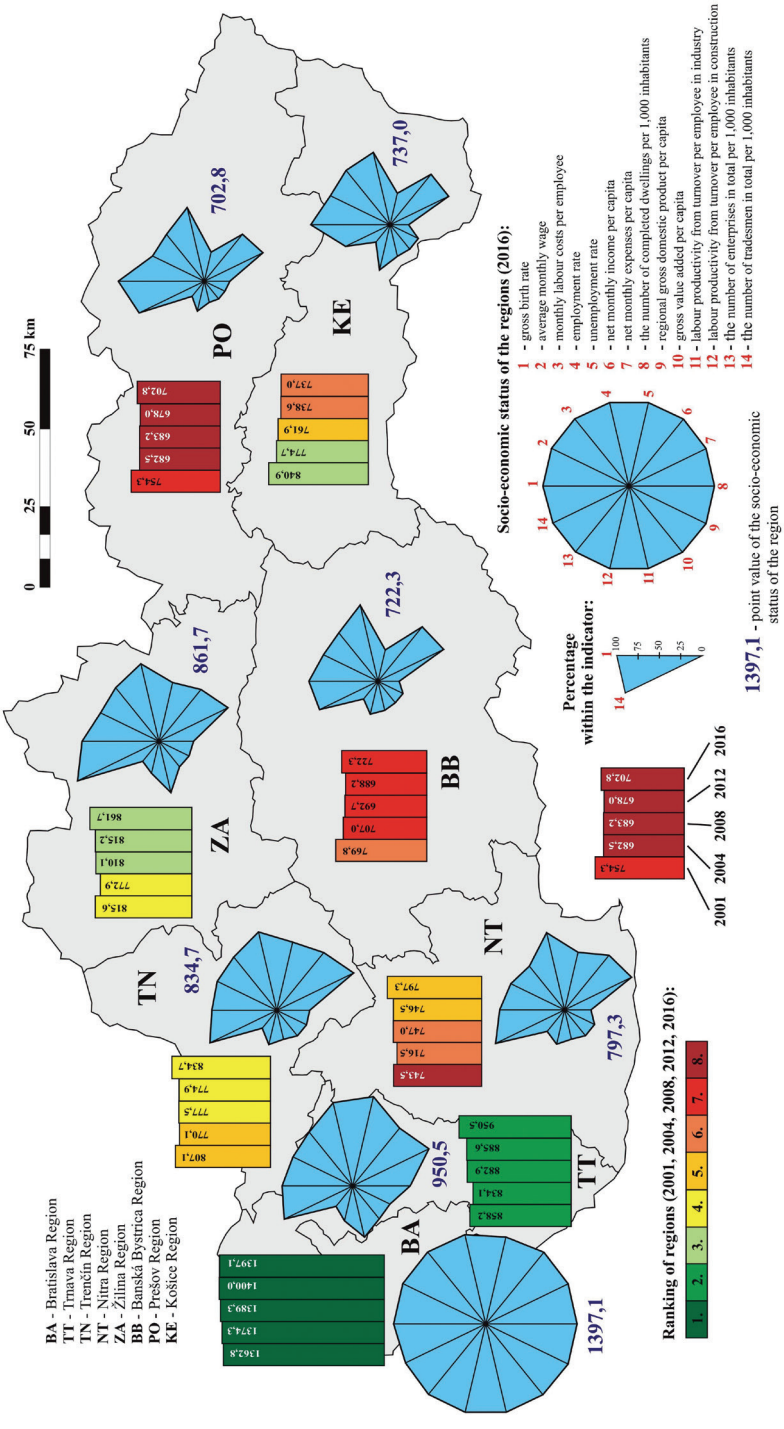

Figure 1
Socio-economic status of the regions of the Slovak Republic in the years 2001, 2004, 2008, 2012 and 2016
Source: www.statistics.sk, own elaboration

The development and, in particular, the situation in 2016 referring to individual indicators, bring us closer to the socio-economic status of the regions, what is only the first step in the analysis.

The second step focuses on the spatial distribution of financial means for the support and development of LAGs for which these public-private partnerships applied in 2017.

This support was based on the "Call for proposals 21/PRV/2017" for approval of the proposals for the Community-led Local Development Strategy and for granting the status of LAGs for the measure 19 – Support to LEADER Local Development and a sub-measure 19.2 – Support for the implementation of operations under the community-led local development strategy.

The entire territory of Slovakia was entitled to get support under this "Call for proposals 21/PRV/2017", while the Managing authority for the Rural Development Programme of the Slovak Republic 2014 – 2020 granted 87 requests out of 121 submitted by the LAGs at a total value of € 137,734,280 (Figure 2).

As mentioned in the methodology of the paper, the assessment of financial allocation had to be assessed at regional level, since the level of the districts was inadequate due to the location of several LAGs in the territory of two or more districts. Regarding regions, it was only a negligible minimum number of LAGs exceeding the regional boundaries (it was more significant only for the LAG OZ Podhoran at the borders of the Bratislava and Trnava Regions. The LAG was integrated into the Trnava Region, where it is also based according to the registration form database of the Rural Development Programme of the Slovak Republic for the period 2014 – 2020).

The least supported LAGs (only 2) were in the most economically developed region – the Bratislava Region (Figure 3). At the same time, the total financial allocation was the lowest from all regions, only € 3.05 million (Figures 3, 5). It is important to note that even if calculated per inhabitant (107,849 inhabitants in the supported LAGs of the region) it was the lowest number within the Slovak Republic – € 28.3 per inhabitant (Figures 4, 6). In the other two economically strong regions (the Trnava Region and the Trenčín Region), the support for LAGs was comparable. It was supported by 9 or 8 LAGs with a similar amount of funding of € 9.8 million and € 10.9 million, and in terms of per inhabitant, it was almost identical at an estimated € 42 per inhabitant. It is also possible to add the Žilina Region to these three economically mature regions. There were supported 8 LAGs with a total amount of financial means of € 13.1 million. Compared to the previous two regions, however, up to 363,151 inhabitants were supported, what was later demonstrated in less amount of funding per inhabitant (only € 36). The least developed region in the north-western part of Slovakia, the Nitra Region, had the most supported LAGs (11) in comparison to the above mentioned regions. It was granted the highest amount of financial resources per inhabitant (€ 51.7).

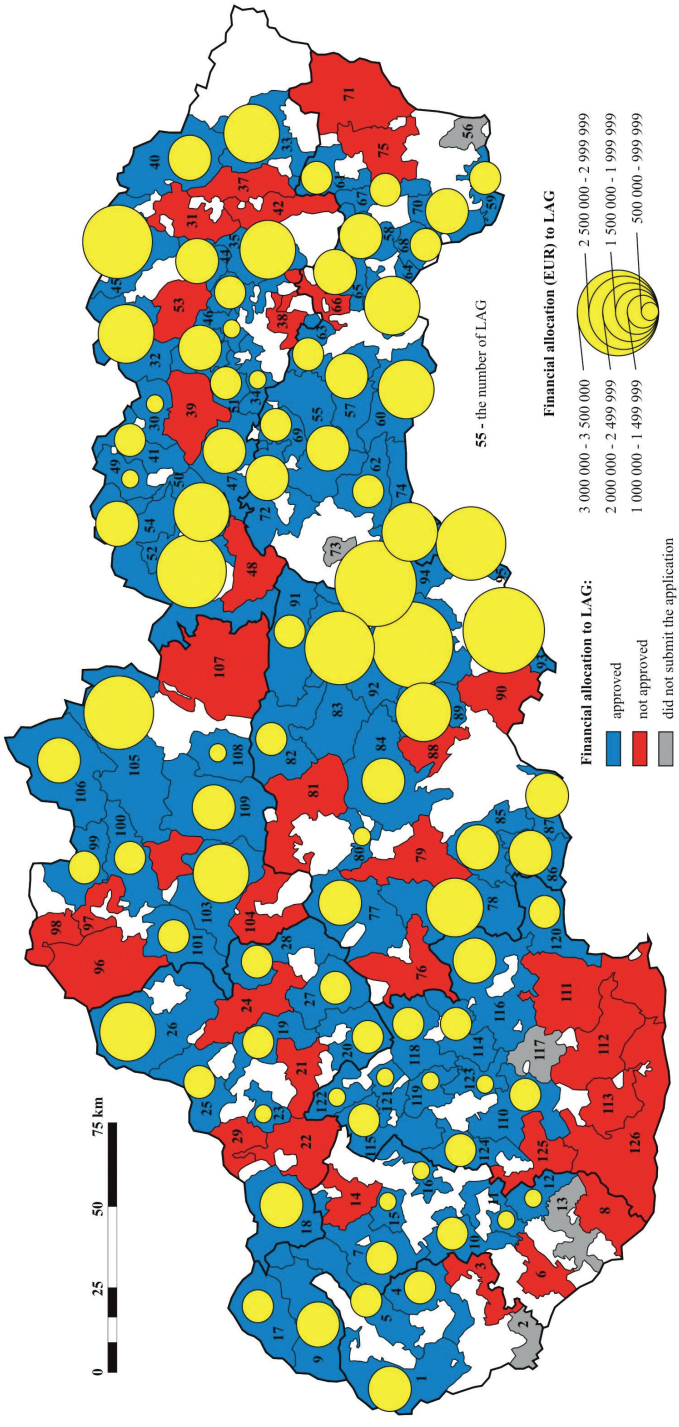

Figure 2
Financial allocation (EUR) to LAGs in 2017
Note: The list of LAGs with approved financial support introduced in the Table 2, in the Annex
Source: "Call for proposals 21/PRV/2017", own elaboration

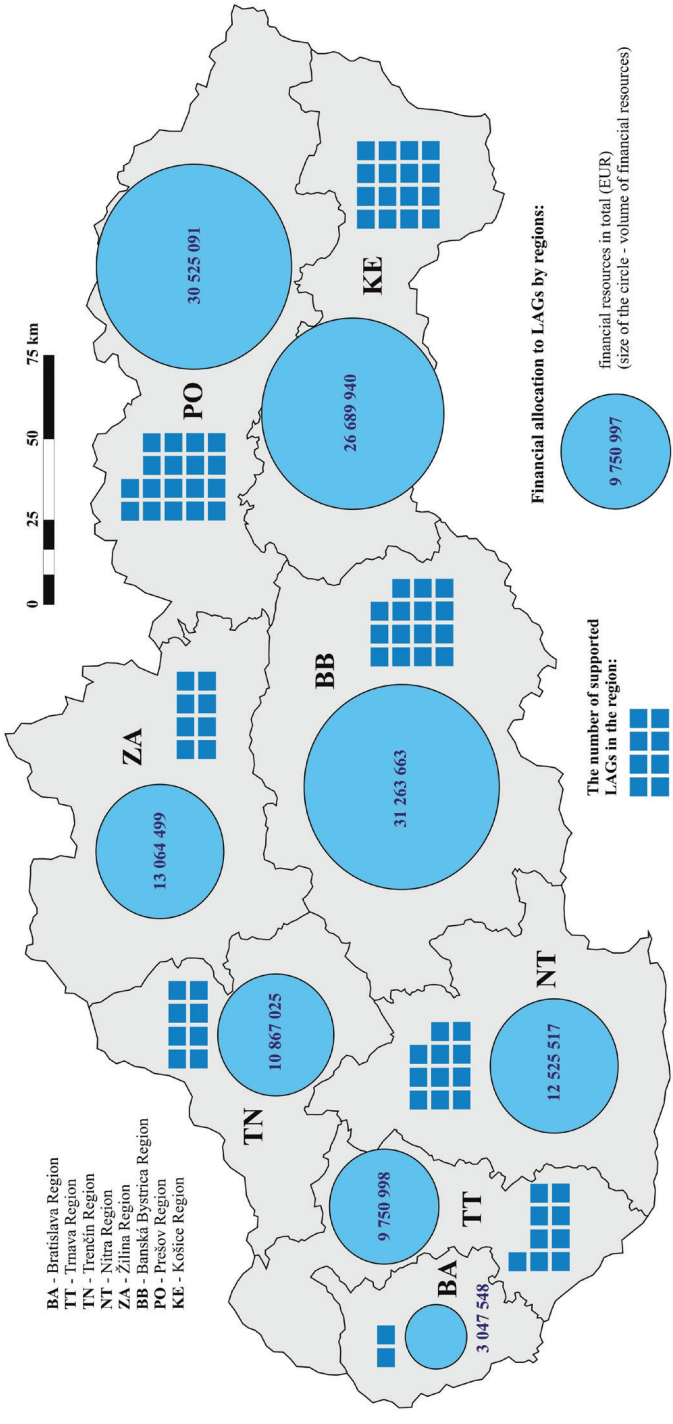

Figure 3
Financial allocation (EUR) to LAGs concerning the regions of the Slovak Republic in 2017
Source: "Call for proposals 21/PRV/2017, own elaboration

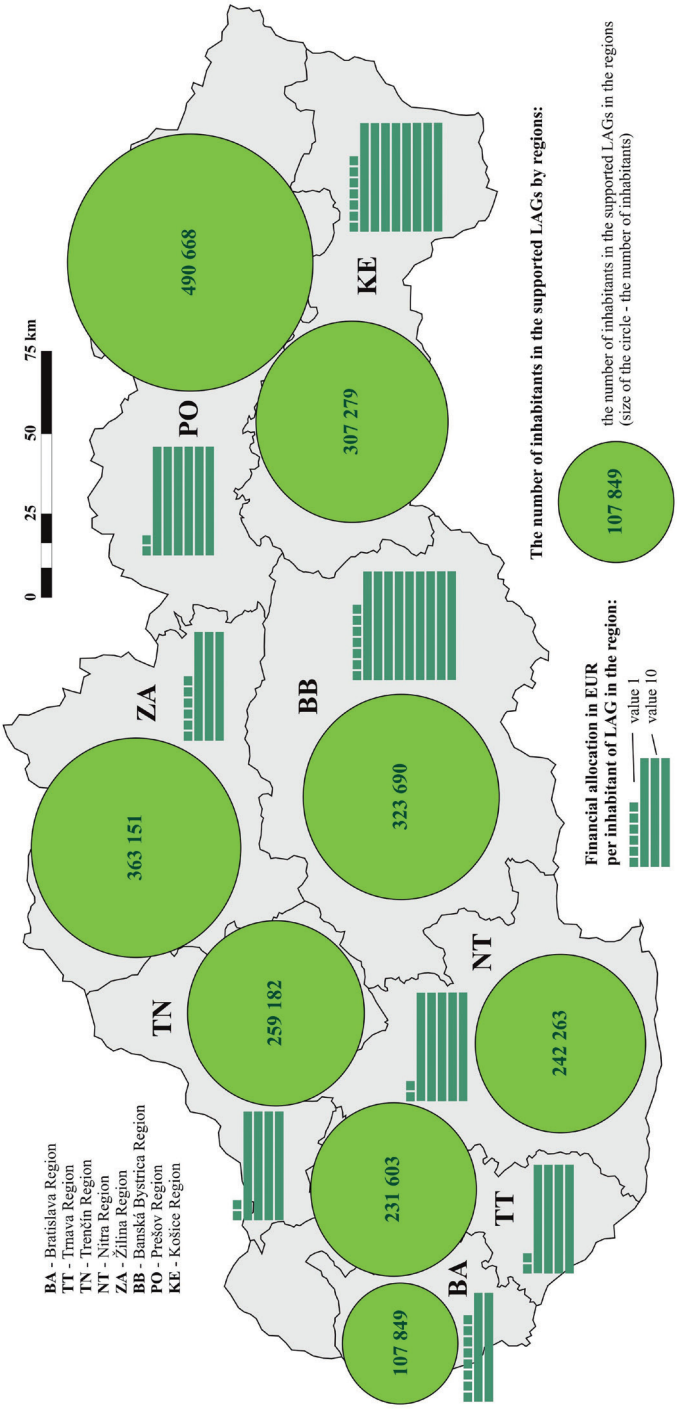

Figure 4

Financial allocation (EUR) per inhabitant of the LAG concerning the regions of the Slovak Republic in 2017

Source: "Call for proposals 21/PRV/2017, own elaboration

A total value of € 88.5 million (64.2% of all finances) for 1.12 million of inhabitants (48.2% of all inhabitants of the supported LAGs in the Slovak Republic) was sent into the backward south-eastern part of the Slovak Republic (Banská Bystrica, Prešov and Košice Regions). In this area of Slovakia, most LAGs were supported (49 in total, the Banská Bystrica Region – 15, the Košice Region – 16, the Prešov Region – 18, Figure 3). From a more detailed perspective, the total support for individual regions varied from € 26.7 million in the Košice Region, which is one of the three economically strongest regions, to € 30.5 million in the Prešov Region and € 31.3 million in the Banská Bystrica Region (Figure 5). In the last two mentioned regions there were 8 LAGs from the top ten most supported LAGs in the Slovak Republic (the Banská Bystrica Region – LAG Malohont € 3.45 million, VSP Stredný Gemer – € 3.24 million, LAG Cerovina, o.z. – € 3.05 million, VSP Južný Gemer – € 2.54 million, Partnership Muránska Planina–Čierny Hron – € 2.54 million; the Prešov Region – Pro Tatry, o.z. – € 2.66 million, OZ Dukla – € 2.55 million, OZ pre rozvoj regiónu Spiš – € 2.47 million, Figure 2, Table 2 in the Annex).

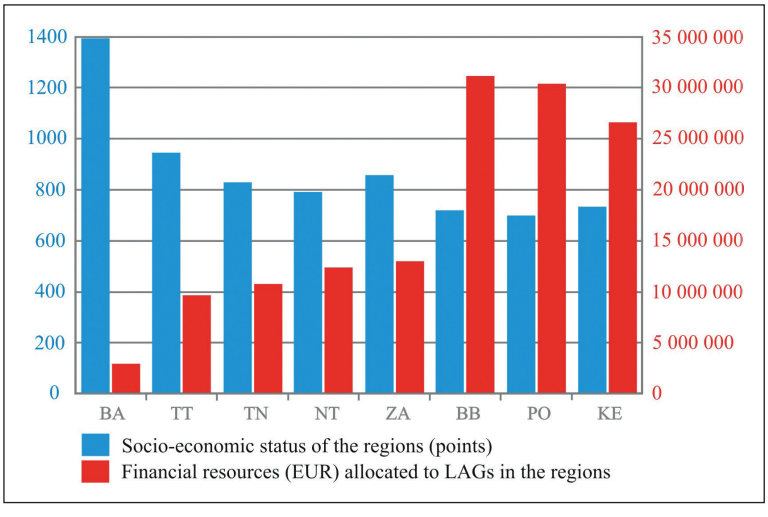

Figure 5
Socio-economic status of the regions (points) in 2016 and financial means (EUR) allocated to LAGs in the regions
Source: "Call for proposals 21/PRV/2017", own elaboration of the Slovak Republic

In terms of per inhabitant, the economically weakest region, the Prešov Region, was awarded only € 62.2 per inhabitant compared to € 86.9 per inhabitant in the Košice Region and € 96.6 per inhabitant in the Banská Bystrica Region (Figures 4, 6).

The final analysis of the relationship between the level of socio-economic status of all regions of the Slovak Republic and the amount of financial means allocated

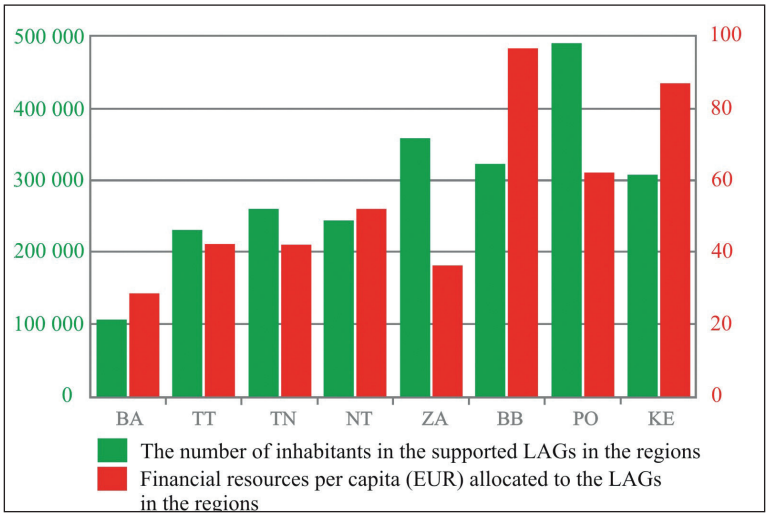

Figure 6
The number of inhabitants in the supported LAGs in the region and financial means per inhabitant (EUR) in these LAGs in the region of the Slovak Republic
Source: "Call for proposals 21/PRV/2017", own elaboration

to LAGs in these regions under the "Call for proposals 21/PRV/2017" was the last step. In order to express this relationship, the regression and correlation analysis method was used in which socio-economic status of the region represented an independent variable and the allocated financial means to LAGs in the region was a dependent variable. The Pearson correlation coefficient was a measure of the strength of a linear relationship between paired data, while the financial allocation to LAGs was assessed globally and the financial allocation per capita of the LAGs was assessed in two combinations – for all regions of the Slovak Republic and the regions of the Slovak Republic excluding the Bratislava Region (Table 1).

Table 1 The relationship between the socio-economic status of the regions in 2016 and financial resources allocated to LAGs in these regions

	All regions of the Slovak Republic			Regions of the Slovak Republic excluding the Bratislava Region		
	R	R^2	p	R	R^2	p
Financial allocation to LAGs in total	-0.7697	0.5924	0.0255	-0.8836	0.7807	0.0083
Financial allocation to LAGs per inhabitant	-0.6658	0.4433	0.0715	-0.7577	0.5741	0.0485

Note: dark grey colour – model fits, light grey colour – model does not fit (p-value >0.05)
Source: own calculations based on STATISTICA

The calculated values of the Person Correlation Coefficient (R) point to the high level of dependence of the financial allocation to LAGs in relation to the socio-economic status of the region (Table 1). Chajdiak (2009) considers the correlation to be strong, where R values are in the range from 0.8 to 1 or from -1 to -0.8. The weak correlation is the one with an absolute value R not exceeding 0.4. If the correlation is zero, it denotes the statistical independence of the phenomena.

It is evident from the calculated data that in three out of four monitored cases, values of the Pearson correlation coefficient were at a level of the strong correlation (Table 1, dark grey colour), in one case the values were at a level of the medium-strong correlation (Table 1, light grey colour). The negative values of the mentioned coefficient generally indicate the increasing volume of financial means allocated to LAGs, or the amount of financial resources per 1 inhabitant of the LAG with decreasing socio-economic status of the regions. The absolute value of the Pearson correlation coefficient R lower than 0.7 was recorded only in the case of the calculation of financial resources allocated per inhabitant of the LAG in all regions (Table 1, light grey colour). Also in this case, the overall aspect was confirmed by the indirect dependence between the growing socio-economic status of the region and the volume of allocated financial means.

Financial means allocated under the "Call for proposals 21/PRV/2017" are intended to support job creation, develop local economy and improve the quality of life within a particular LAGs. It is questionable whether the financial allocation to LAGs is set optimally. Looking at the Table 1, it is clear that it can be expected more suitable setting (assessed only in relation to the above-mentioned indicators) if the economically most powerful and at the same time, significantly different region – the Bratislava Region (a capital district and metropolitan area where 2/3 of the inhabitants of the region live) would have been excluded from the analysis of the financial allocation to LAGs and its allocation would have been under a special scheme. At the same time, one can note that if financial means allocated per capita had not been calculated, the linear regression model of the allocation of financial means would have been satisfactory.

In case the Bratislava Region is excluded from the analysis, the possible changes in the socio-economic status of the region will be reflected even more significantly in the distribution of financial means to LAGs ($R^2 = 0.7807$, Figure 7). The linear regression model is selected the best of all four cases (R = -0.8836, p-value = 0.0083, what is significantly below the value of 0.05). The smallest standard deviations are typical for the Žilina Region, followed by the Košice Region. In these two regions, financial means were almost optimally allocated regarding their socio-economic status. It is encouraging that in this case, more financial resources were allocated to LAGs in most regions that were less supported (Prešov and Banská Bystrica). On the contrary, we consider inappropriate if the LAGs in the Trnava Region, which

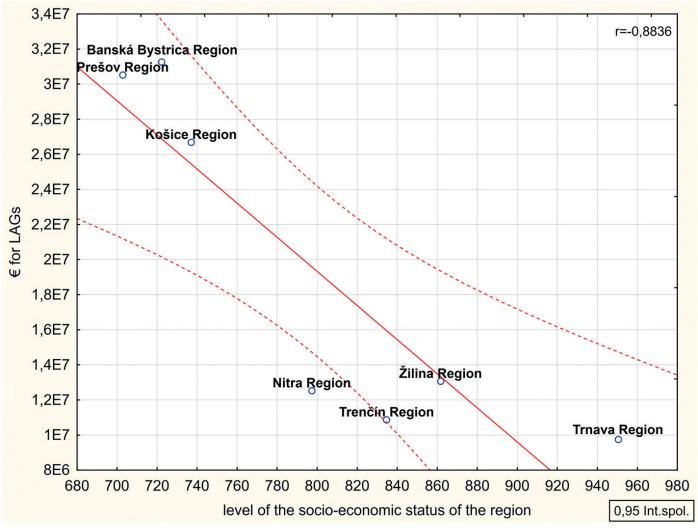

Figure 7

Relationship of the socio-economic status of the regions of the Slovak Republic (excluding the Bratislava Region) and financial allocation (EUR) to LAGs concerning the regions of the Slovak Republic (excluding the Bratislava Region)

Source: own calculations based on STATISTICA

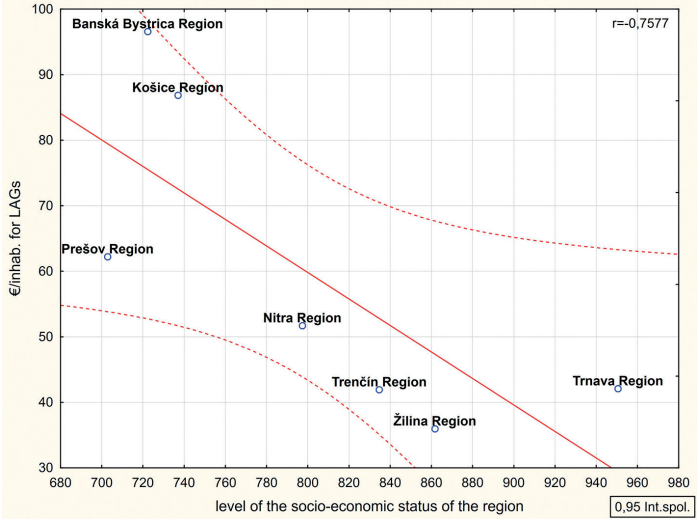

Figure 8

Relationship of the socio-economic status of the regions of the Slovak Republic (excluding the Bratislava Region) and financial allocation (EUR) per inhabitant of LAGs concerning the regions of the Slovak Republic (excluding the Bratislava Region)

Source: own calculations based on STATISTICA

took second place after the Bratislava Region in the assessment of socio-economic status in the years considered, are supported to the greatest extent. Regarding LAGs in the Nitra Region, due to its socio-economic status, the least amount of financial means was allocated and the support should have been more significant.

A more significant problem arises when assessing the financial allocation to LAG per inhabitant. If the Bratislava Region is excluded from this model, the linear regression model will be suitable for the selected data, but the correlation dependence will decrease (R = -0.7577, p = 0.0485, Figure 8). As in the preceding case, a higher amount of funding was distributed to the LAGs of the developed Trnava Region than it should have been according to the selected model. An increase of financial means to the LAGs of the Banská Bystrica Region as well as the Košice Region is perceived as positive. These regions have been long-term underfinanced and so their development can be supported at least by this form. In the sense of ensuring a more equitable distribution of financial resources, we would suggest a stronger support for the LAGs in the Prešov Region. Despite this region is, in terms of socio-economic status, the worst-rated region in the long-term perspective, it was allocated the lowest per inhabitant funding to its LAGs.

A linear regression analysis of the financial allocation assessment to LAGs could be also used in case we did not exclude the Bratislava Region from the statistical file (R = -0.7697, p = 0.0255, Figure 9). Financial resources allocated to the LAGs of the three largest underdeveloped regions (Banská Bystrica, Prešov and Košice Regions)

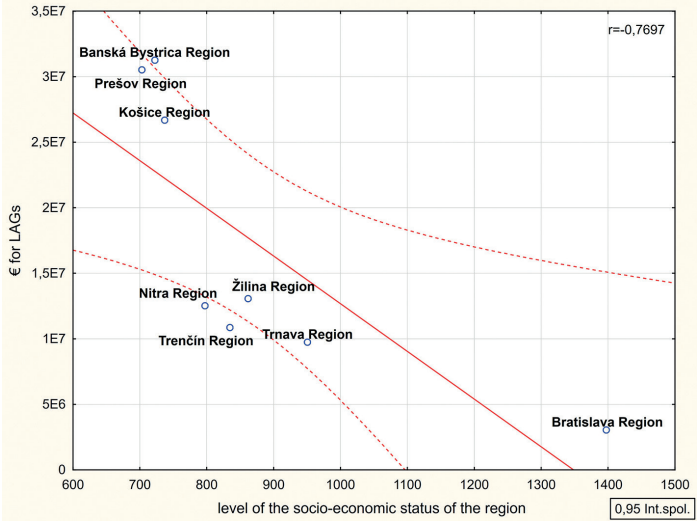

Figure 9
Relationship of socio-economic status of the Slovak regions and total financial allocation (EUR) to LAGs concerning the regions of the Slovak Republic
Source: own calculations based on STATISTICA

is satisfactory. More resources were distributed to LAGs than it is the optimum set by the regression model, what could contribute to their development. It is striking that considerable financial support provided for LAGs was reflected in the strongly developed Bratislava Region. On the contrary, in the Nitra Region, the financial means were lacking, although they would have been desirable, due to the level of socio-economic status of the region, and comparing with other regions of the developed north-western part of Slovakia.

Since the linear regression model for assessing the financial allocation to LAGs per inhabitant in all regions was not satisfactory ($p = 0.0715$, Table 1, light grey colour), its results cannot be considered as indicative. For this reason, we do not include them in the paper.

To sum up, considering the findings obtained, the hypothesis H3 has been confirmed only partially.

Acknowledgement

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CONCLUSION

Local action groups as one of the most perspective platforms of the inter-municipal cooperation represent, within the fragmented settlement structure of Slovakia, the possibility for the future consolidation of the local self-governments and support for the development of the regions. The success of their establishment in the Slovak conditions is also evidenced in the "Call for proposals 21/PRV/2017", under which € 137.7 million were allocated to 87 LAGs in all regions of the Slovak Republic in the year 2017. However, when allocating financial means, it is necessary to take into account the fact that different regions have a different level of socio-economic status and, therefore, it is necessary to approach them individually. This fact, in the form of the developed north-west of the Slovak Republic and the problematic south-east, as also reported in the research findings of various pieces of works (Korec 2005, Džupinová et al. 2008, Klamár 2011, Matlovič, Matlovičová 2011, Matlovičová et al. 2014, Matlovič et al. 2018) has been confirmed by the hypothesis H1. Moreover, this unfavourable situation is not only a temporary condition, but it is a result of the gradual deepening of the south-eastern backwardness of the country (the Banská Bystrica Region, the Košice Region and the Prešov Region) during the entire monitoring period (2001 – 2016) what has been confirmed by the hypothesis H2.

A higher support for the underdeveloped south-east regions, in the form of higher financial allocation to LAGs, should be at least partial compensation of

this unfavourable situation. Based on the analysis, it is obvious that the most resources in total, as well as per inhabitant of the LAGs concerned, were directed to these backward regions – the Banská Bystrica Region (€ 31.3 million, € 96.6 per inhabitant), the Prešov Region (€ 30.5 million, € 62.2 per inhabitant) and the Košice Region (€ 26.7 million, € 86.9 per inhabitant). This fact was also declared by the Pearson's correlation coefficient R. In three cases, with the level between -0.7577 and -0.8836, the high dependence between the level of socio-economic status and the amount of financial means allocated to LAGs were confirmed, and thus, negative R values point to the indirect correlation. It means that with the decline of socio-economic status, the amount of allocated financial means increased. At the same time, it is important to add that financial resources were not fairly allocated in either of the cases. Excluding the Bratislava Region, financial means allocated to the LAGs of the developed Trnava Region were overestimated. When calculating financial means allocated per capita, even the most underfinanced region – the Prešov Region, was the last one, whilst the LAGs in the Bratislava Region profited, considering the level of its socio-economic status. Therefore, it can be stated that the hypothesis H3 has been confirmed only partially.

The analysis and assessment have shown that the support under the "Call for proposals 21/PRV/2017", the Rural Development Programme of the Slovak Republic 2014 – 2020, aimed to strengthen the least developed regions (Banská Bystrica, Košice and Prešov) was set in general correctly, because the most financial means were directed to these problematic regions. However, in terms of the optimal calibration, it was even more necessary to take into account the level of socio-economic status of individual regions and the degree of regional inequalities (and their development) between the prosperous north-west of the country and the underdeveloped south-east.

ANNEX

Table 2 The list of LAGs with approved subsidy from the "Call for proposals 21/PRV/2017" concerning the regions of the Slovak Republic

No.	Name of the LAG	Financial allocation to LAG (€)	No.	Name of the LAG	Financial allocation to LAG (€)
	Bratislava Region	**3 047 547,5**		**Banská Bystrica Region**	**31 263 663,1**
1	Dolné Záhorie	1 753 117,0	92	LAG Malohont	3 450 437,6
4	OZ Malokarpatský región	1 294 430,5	94	VSP Stredný Gemer	3 238 903,2
	Trnava Region	**9 750 998,2**	93	LAG Cerovina, o.z.	3 053 194,0
5	OZ Podhoran	1 129 531,3	95	VSP Južný Gemer	2 543 488,7
9	LAG Záhorie, o.z.	1 603 324,0	83	Partnerstvo Muránska planina – Čierny Hron	2 540 823,5
17	Partnerstvo pre Horné Záhorie, o.z.	1 485 000,0	78	OZ Zlatá cesta	2 061 637,0
7	Malokarpatské partnerstvo, o.z.	1 351 361,0	89	LAG Hornadhrad	2 116 207,1
10	LAG 11 PLUS, o.z.	1 055 000,0	86	Hontianske Poiplie	1 941 366,8
11	LAG Dubváh	864 000,0	87	Ipeľská kotlina – Novohrad	1 872 902,0
16	OZ Poniklec – Váh	810 000,0	85	LAG Hontiansko – Novohradské partnerstvo	1 822 804,0
12	LAG Stará Čierna Voda	777 782,0	77	OZ Žiarska kotlina	1 772 840,8
15	OZ Naše Jadro	67 5000,0	84	LAG Podpoľanie	1 703 555,0
	Trenčín Region	**10 867 024,8**	82	LAG Chopok juh	1 285 027,6
26	Naše Považie	2 453 000,0	91	Verejno – súkromné partnerstvo Horehron	1 174 927,8
18	LAG Kopaničiarsky región	1 723 242,3	80	Naša Lieska, o.z.	685 548,0
28	Žiar	1 330 098,1		**Prešov Region**	**30 525 091,2**
25	LAG Vršatec	1 306 183,0	52	Pro Tatry, o.z.	2 661 124,4
27	LAG Rozvoj Hornej Nitry	1 185 060,0	45	OZ Dukla	2 549 348,0
20	LAG Stredné Ponitrie	1 165 720,8	50	OZ pre rozvoj regiónu Spiš	2 469 864,6
19	LAG Strážovské vrchy	1 002 615,5	32	LAG Horná Topľa	2 422 549,0
23	LAG Inovec	701 105,0	35	LAG Slanské vrchy – Topľa	2 136 173,0
	Nitra Region	**12 525 516,5**	33	LAG S Pod Vihorlatom, o.z.	2 115 008,7
116	OZ Tekov – Hont	1 925 666,0	54	Tatry – Pieniny LAG	1 982 409,6
110	LAG Cedron – Nitrava	1 449 206,9	40	LAG Laborec, o.z.	1 912 360,0
115	OZ Radošinka	1 337 590,0	46	OZ LAG Sabinovsko, o.z.	1 852 691,8
118	Mikroregión Tribečsko	1 166 296,5	47	OZ LAG LEV, o.z.	1 815 693,0
120	OZ Ipeľ – Hont	1 137 849,0	44	LAG Topoľa, o.z.	1 608 200,0

No.	Name of the LAG	Financial allocation to LAG (€)	No.	Name of the LAG	Financial allocation to LAG (€)
114	OZ pre rozvoj mikroreg. Požitavie – Širočina	1 080 000,0	**51**	Partnerstvo Bachureň	1 402 000,0
124	LAG Vitis	1 008 298,1	**36**	LAG Šafrán	1 157 905,6
123	Regionálne združenie Dolná Nitra, o.z.	891 531,5	**41**	LAG Ľubovniansko, o.z.	1 007 999,5
119	OZ Žibrica	874 232,9	**34**	LAG Skala, o.z.	949 676,0
122	LAG SOTDUM	863 697,0	**43**	LAG Stráže	883 000,0
121	Združenie mikroregiónu SVORNOSŤ	791 148,8	**30**	LAG Horný Šariš – Minčol	832 088,1
	Žilina region	**13 064 498,9**	**49**	OZ Partnerstvo pre región	767 000,0
105	LAG Orava, o.z.	2 613 000,0		**Košice Region**	**26 689 940,3**
103	OZ Partnerstvo pre MAS Turiec	2 108 644,0	**62**	LAG Gemer – Rožňava	2 313 893,3
106	LAG Biela Orava	1 945 884,2	**74**	OZ Kras	2 292 213,0
109	OZ Partnerstvo pre MAS Dolný Liptov	1 887 000,0	**60**	LAG Bodva	2 079 069,0
101	LAG Rajecká Dolina	1 360 358,5	**64**	LAG Hornád – Slanské vrchy, o.z.	2 030 526,4
100	OZ „Partnerstvo pre MAS Terchovská dolina“	1 255 201,0	**55**	LAG Hnilec, o.z.	1 990 028,5
99	LAG Bystrická dolina	1 017 227,8	**57**	LAG Rudohorie, o.z.	1 723 821,6
108	OZ Stredný Liptov	877 183,4	**58**	LAG Sečovský región, o.z.	1 700 245,1
			70	LAG Tokaj – Rovina, o.z.	1 686 500,2
			72	Miloj Spiš, o.z.	1 528 143,0
			65	LAG Olšava – Torysa, o.z.	1 517 611,2
			68	LAG Roňava, o.z.	1 487 707,1
			59	LAG Bodrog, o.z.	1 467 154,2
			61	LAG Duša, o.z.	1 307 492,8
			63	LAG Hornád – Čierna Hora, o.z.	1 224 196,4
			67	LAG Poondavie, o.z.	1 176 974,4
			69	LAG Sľubica, o.z.	1 164 364,1

Note: LAGs are marked in blue in the Figure 2 of the table; LAGs for which financial means were not approved (red colour, Figure 2) and LAGs, which did not submit the application under the "Call for proposals 21/PRV/2017" (grey colour, Figure 2) are not included in the table

Source: "Call for proposals 21/PRV/2017", own elaboration

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MODERN SENIOR TOURISM IN THE CONTEXT OF YOUNG PEOPLE TOURIST ACTIVITY IN POLAND

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Abstract
Owing to the world demographic situation, the phenomenon of senior tourism is dynamically developing. More and more retired people want to travel and get to know new places. Therefore, the paper aims to compare the tourist activity of retired people and that of mobile working age people. The results obtained in the performed analysis allow to conclude that the tourist activity of pensioners and of young people is not similar. On the basis of the analysis of the selected characteristics of tourist activity and the seniors' age with the use of the chi-squared test, the authors pointed at the relationships occurring among these characteristics. The comparative analysis showed that the tourist expectations of the studied groups are different. The results prove that the diversity of travel concerns many problems.

Key words
tourist activity of pensioners, senior tourism in Poland, chi-squared test

INTRODUCTION

The ageing of the societies in the developed countries has been observed for years, with a specific culmination point in Europe in the year of 2004, when the number of seniors exceeded the number of the youngest population (under 14 years of age). As Śniadek (2006) points, in 2020, 25% of the European Union inhabitants will belong to the 60+ group. This results mainly from the phenomenon of compensation for the losses from the period of World War II, observed in its strongest form in Europe and the United States in the years of 1946–1964.

The bigger and bigger number of the retired results in an increasing number of pensioners taking part in tourist journeys. Owing to the demographic situation,

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the phenomenon of senior tourism is dynamically developing. Senior tourism is included, among others, to social tourism, the term covering also any concepts and phenomena bound with the participation of low-income social groups in tourism. Among the main beneficiaries of social tourism, as Górska (2010) maintains, there are children and youth, the disabled, elderly people, families in specific situations. Senior tourism in often enumerated with reference to disabled people tourism. Buhalis and Darcy (2011) indicate the handicapped groups, pointing at elderly people as one of them. Also, according to Gonzalez (2008), the elderly remains one of the three groups of the research interest regarding the tourism of the disabled. Darcy and Dickson (2009) describe the potential of the whole group within tourism accessible in the context of demographic changes.

Research concerning senior tourism has been performed by many investigators all around the world, including Poland; therefore, it is possible to point at the main research streams. One of the most important refers to travelling motivation. In this field, the following references can be distinguished, among others: Alén et al. (2017), Boksberger and Laesser (2009), Carneiro et al. (2013), Fleischer and Pizam (2002), Hsu et al. (2007), Jang et al. (2009), Littrell et al. (2004), Lohmann and Danielsson (2001), Nikitina and Akimova (2017), Patterson (2002), Prayag (2012), Sangpikul (2008), Tikkanen (2007), Ward (2014), Zsarnóczky et al (2016).

Another stream focuses on the accommodation and gastronomical facilities for seniors. Here, the following works can be enumerated: Chen et al. (2013), Hjalager and Richards (2003), Huang and Tsai (2003), Lieux et al. (1994), Losada et al. (2017), Oliveira et al. (2018).

Research exploring the influence of tourism on seniors' health and quality of life has also been developed. These issues were described by the following authors, among others: Dann (2002), Hunter-Jones and Blackburn (2007), Milman (1998), Zambianchi (2017).

Senior tourism in Poland has been studied by a number of researchers, e.g. Grzelak-Kostulska et al. (2010, 2011), Grzelak-Kostulska and Hołowiecka (2012), Ociepka and Pytel (2016), Pytel, Rahmonov (2018), Pytel (2017, 2018), Oleśniewicz et al. (2015), Oleśniewicz and Widawski (2015), Straś-Romanowska (2005), Szatur-Jaworska (2010), Szukalski (2008), Śniadek (2006, 2007), Widawski (2010, 2011).

Among works comparing tourist travels of seniors and other social groups, a study by Moisey and Bichis (1999) is worth emphasizing. It focuses on the analysis of differences between senior tourists (50+) and non-senior ones with reference to their motivation to visit places bound with nature, as well as to the paradigm of their travelling and recreational activities. The main purpose of a study by Lehto et al. (2008) was the assessment of similarities and differences between the travellers of the baby boomer generation and of the silent generation (people born in years 1920–1940). The authors observed similarities and differences in the tourism types and the tourist activity of the studied groups. In turn, Shavanddasht (2018)

aimed at presenting the features of grandparents, determining who they were, and investigating the differences in their motivation to travel with spouses and grandchildren or without grandchildren; an approach based on market segmentation was applied. An article by Ishida et al. (2017) points at differences among five generations of tourists. The authors carried out a questionnaire among American tourists; the results proved that there were generation gaps with regard to factors influencing incoming tourism.

On the basis of the literature, one can conclude that studies of the relationships between seniors' journeys and those of people in other age groups have been quite scarce. Therefore, a research gap can be identified, and the authors will attempt to fill it. The gap refers to a comparison between the tourist travels of elderly people and those of their children.

The identification of the research gap allowed the authors to set a goal which consists in depicting the regularities occurring in the tourism of retired people and that of mobile working age people. These are presented on the basis of the analysis of relationships between variables depicting tourist activity and the tourists' age. The research area is Poland, since it is a good representative of the post-communist countries of central Europe, in which the processes studied look similar.

Tourist activity, developing in an exceptionally resilient way in the recent years, is not only a factor, but also a measure of the level of people's quality of life. It belongs to the phenomena most difficult to describe in the methodology of social studies. Tourist activity is an effect of the simultaneous impact of numerous conditions within the economic, social, and psychological spheres of societies.

As Alejziak (2011) indicates, tourist activity is most frequently understood as the entirety of people's occupations and actions related to their participation in tourism. With reference to specific journeys, it is a process beginning long before a given journey takes place and usually still lasting for a certain time after the return. Thus, the following four basic stages of tourist activity can be distinguished:

- the emergence and perception of specific needs, which, bound with the motives, transform into journey aims, generating tourist activity;
- gathering information and making decisions with regard to undertaking tourist activity;
- participation in tourism itself (departure – stay – return);
- behaviours related to the participation in tourism which occur after the return.

In the context of an attempt to assess senior tourism functioning, the group that the phenomenon refers to should be determined first. In fact, some discrepancies can be observed here. Oleśniewicz et al. (2015) point at a diversified approach towards senior age among various researchers. Hossain et al. (2003) use the term *senior* with regard to the age group of 55+. Moreover, they divide the senior group into elder seniors (aged 65+) and younger seniors (between 55 and 64 years of age).

For Alcaide Casado (2005), the senior age begins with 55 years of age. He considers this moment a significant turning point, as it is accompanied by the emergence of new, specific needs related to age. Condition changes also appear which are predictable and refer mainly to physical complaints. Lee and Tideswell (2005), as well as Garcia Sastre and Martorell Cunill (2007) point at the age of 60 years as an important time point of changes; in the majority of people, this is when the life rhythm is modified and needs different from those present so far arise. According to the World Health Organization, the elderly age can be divided into the following stages: the pre-elderly age (45–59 years), early old age (60–74 years), intermediate old age (75–89 years), and late old age or longevity (starting at the age of 90 years and lasting until death).

The criterion of the baseline age in the definition of a senior often refers to the beginning of retirement age. The authors realize that assuming the retirement criterion to define the specific age group is bound with several limitations; nevertheless, for the needs of the paper, the fact of retirement was accepted as the moment of entering the senior age.

MATERIAL AND METHODS

Statistical data concerning the outgoing tourism of pensioners were obtained from the questionnaire studies entitled 'Tourism and recreation in households,' performed by the Central Statistical Office in Poland (GUS, 2001, 2005, 2009, 2013). The questionnaire referred to information concerning, among others, the seniors' preferred ways of spending time intended for recreation, their participation in domestic and foreign journeys, specifying the motivation, directions, and seasonal character of the journeys, and – in the case of seniors who did not travel – explaining the reasons for not engaging in tourist journeys.

For the needs of the presented paper, only selected aspects of tourist activity were investigated, such as:

- the character of the planned journeys;
- the number of the journeys;
- the accommodation facilities;
- months in which the journey took place;
- the distance from the place of permanent residence;
- the form of the journey;
- the agents of the purchased services;
- the means of transportation used to reach the destination.

The material was elaborated with the use of the chi-squared test, an important nonparametric test, employed in determining the measurement error in the life, technical, and social science. It is among the most often applied tests of statistical significance in the field of social science. Its purpose is to study the relationships

between two nominal (categorical) variables on the basis of a comparison of observed values (i.e. those obtained in a research) with expected values. If the difference between the observed and expected values is big (statistically significant), one can conclude that a relationship occurs between the variables.

The formula for the independence chi-squared test is as follows:

$$\chi^2 = \sum_{j=1}^{k} \frac{(O_j - E_j)^2}{E_j}$$

where:
χ^2 – the chi-squared test;
O_j – the observed number for a given group;
E_j – the theoretical number for a given group.

It is a key issue to put forward the H0 and H1 alternative hypotheses:

- H0: age does not affect the selected elements of tourist activity;
- H1: age affects the selected elements of tourist activity.

To verify if the value of a chi-squared statistic points at a statistically significant relationship, we have to check, with the use of the chi-squared distribution table, if the given value indicates statistically significant differences. In order to do this, we need to know the chi-squared statistic value (the result of the chi-squared test), the number of the degrees of freedom (df), which depends on the number of the analysed groups of people, and the level of significance (p). The number of the degrees of freedom and the assumed level of significance will indicate the critical value of the chi-squared distribution in the table. If the calculated value of the chi-squared test in the study is bigger than the critical value in the table, we will reject the zero hypothesis H0 to the advantage of the alternative one.

RESULTS

The research by Oleśniewicz and Widawski (2015) proves that practising tourism by seniors is related with taking care of an appropriate level of physical activity, and wish to experience something new, to develop passions. In turn, obstacles in undertaking tourist activity are neither financial problems nor physical condition (as many as 78% of respondents are satisfied with it), but mainly lack of original, stereotype-breaking offers, such as topical trips, regional cycles, or offers bound with actively spending leisure time for single seniors.

In 2013, as many as 84.7% of Polish seniors did not plan any journey. The rest took part mainly in independent (9.5%) and organized (4.1%) domestic journeys. The smallest group of seniors (merely 1.2%) enjoyed organized foreign journeys (Table 1).

Table 1 Participation in planned holiday journeys including at least 4-night accommodation in 2013 in Poland (%)

Tourists' age	People planning holiday journeys				People not planning holiday journeys	Not applicable
	domestic		foreign			
	organized	individual	organized	individual		
65 years or more	4.1	9.5	1.2	1.4	84.7	0.4

Source: own elaboration based on Central Statistical Office data (GUS)

On observing that so few seniors travel, one can ask how they spend their free time intended for recreation. In 2013, the favourite way of spending free time for 26% of seniors was listening to music or to the radio, and watching television. Over 13% relaxed reading, and 12% sunbathing or resting in a deckchair. Wandering, walking, and cycling were the perfect way of spending leisure time intended for recreation for 9% of seniors, and resting in the open for almost 9%; ca. 7% visited their allotments or practised religious services. The remaining forms of tourist activity were chosen by few seniors (1%).

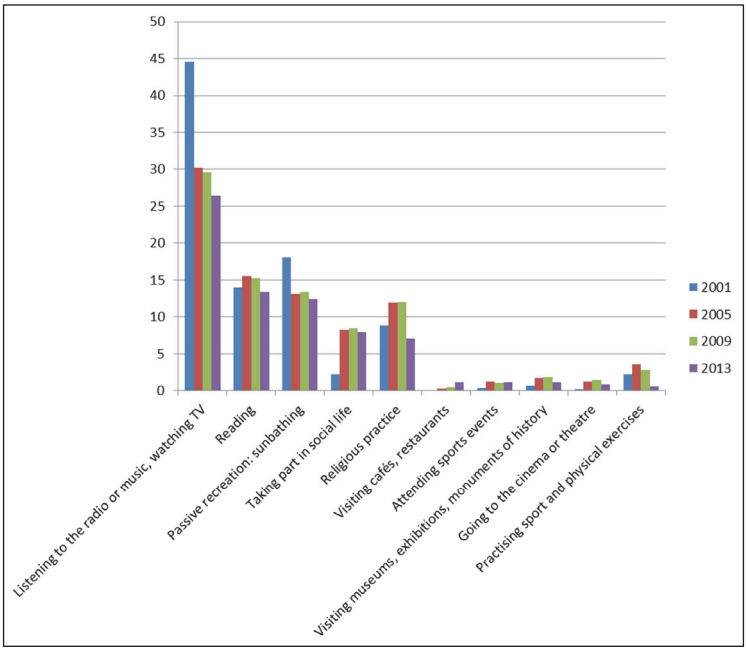

Figure 1
Favourite ways of spending leisure time intended for recreation among seniors in 2001, 2005, 2009, and 2013 in Poland (%)
Source: own elaboration based on Central Statistical Office data (GUS)

The analysis of the changes in the ways of spending leisure time shows that the share of the most favourite occupation, i.e. listening to music or to the radio, and watching television, decreased substantially from 44.6% in 2001 to 26.4% in 2013. Considerable modifications were also observed in passive recreation: in 2001, it was practised by as many as 18%, and in 2013 only 12.4%. One could hypothesize that a change in the way of spending free time is taking place among 21st century seniors. Contemporary seniors are better educated and more conscious that spending leisure time in front of a TV-set is not beneficial, and passive recreation is not, either (Figure 1).

The new senior society spend their time following their hobbies, attending religious services, going to the cinema or to the theatre, and visiting museums, exhibitions or monuments of history. In all these realms, a rising trend is observed. The changes are very advantageous, and they reflect the increasing consciousness of the Polish 21st century pensioners. What could be less satisfying is the sole fact that the modifications are still slight.

Relationship analysis

In order to identify the factors indicating the occurrence of relationships between the tourists' age and the characteristics describing the tourist activity, the independence χ^2 test was applied. The conditioning of seniors' journeys was compared with those of young people aged 25–44 years, i.e. in their mobile working age. In the presented tables, the rows, apart from the last ones, show the partial and general numbers of the variable categories whose relationships were investigated. The last rows inform about the values of the χ^2 statistics, the number of the degrees of freedom (df), and the critical level of significance (p).

The first of the analysed factors was the character of the planned holiday journeys (Table 2). The calculated value of the chi-squared statistic (3813.4) is bigger than the critical value provided in the distribution table (24.32). Therefore, we reject the zero hypothesis to the advantage of the alternative one and conclude that age influences the character of the planned journeys. The character of the planned journeys is different among seniors and among young people. Although both the majority of the young (76%) and of seniors (40%) choose a relaxation stay, there are considerable discrepancies. The situation turns out similar in the case of meetings with relatives and acquaintances: they are important for 10% of the young but for as many as 32% of pensioners.

Table 2 The character of the planned holiday journeys in 2013 in Poland

Character of the planned journeys	Tourists' age	
	25–44 years	65 years or more
Relaxation stay	8894	2181
Therapy course	47	890
Sightseeing tour	995	298
Practising sport, hobby	281	16
Developing competences, education	59	16
Meetings with relatives and acquaintances	1276	1769
Visiting own allotment	59	174
Others	82	76
Total	**11,691**	**5420.6**
Chi-squared test = 3813.4	**df = 7**	**p < 0.001**

Source: own elaboration based on Central Statistical Office data (GUS)

The investigation of the relationships between the number of the journeys among young people and the retired resulted in similar outcomes (Table 3). The calculated value of the chi-squared statistic (21) is bigger than the critical value provided in the distribution table (18.46). Therefore, we reject the zero hypothesis to the advantage of the alternative one and conclude that age influences the number of the journeys. In both age groups, over 80% travel up to five times a year; however, more than 10% of young people travel up to 10 times, and 3% up to 20 times, whereas among pensioners these values turn out much lower.

Table 3 Participants of short-term domestic journeys by the number of journeys in 2013 in Poland

Number of the journeys	Tourists' age	
	25–44 years	65 years or more
1	1158	251
2–5	1277	259
6–10	299	29
11–20	86	8
Over 20	50	7
Total	**2870**	**554**
Chi-squared test = 21	**df = 4**	**p < 0.001**

Source: own elaboration based on Central Statistical Office data (GUS)

The comparative analysis of the accommodation facilities and the tourists' age proves that, as in the above mentioned cases, there is a relationship between these elements (Table 4). This arises from the fact that the calculated value of the chi-squared statistic (232.3) is bigger than the critical value provided in the distribution table (31.26). Therefore, we reject the zero hypothesis to the advantage of the alternative one and conclude that age influences the accommodation facilities. Most young people (64%) choose staying with relatives, but this share increases to 76% among seniors. The remaining forms of accommodation for short-term domestic journeys have not much appeal among the studied age groups.

Table 4 Short-term domestic journeys by the type of the accommodation facilities in 2013 in Poland

Accommodation facilities	Tourists' age	
	25–44 years	65 years or more
Hotel, motel	1047	77
Excursion house, shelter	139	15
Holiday recreational centre	131	11
Private accommodation	724	58
Agritourist accommodation	163	8
Camping site	121	5
Bungalow	73	4
Sanatorium	2	0
Means of transportation (cruise ship, train, car, bus)	26	0
Other rented accommodation	22	10
Staying with relatives	4907	983
Own summer house	271	115
Others	68	3
Total	**7694**	**1289**
Chi-squared test = 232.3	**df = 11**	**p < 0.001**

Source: own elaboration based on Central Statistical Office data (GUS)

The calculated value of the chi-squared statistic (77) when comparing the months in which the journey took place and the tourists' age is bigger than the critical value provided in the distribution table (31.26). Therefore, we reject the zero hypothesis to the advantage of the alternative one and conclude that age influences the months in which the journey took place (Table 5). Above 10% of seniors travel between April and September; in the case of young people, more than 10% travel between May and August. Young people also turn out more inclined than pensioners to travel in winter.

Table 5 Short-term domestic journeys by the months in which the journey took place in 2013 in Poland

Months in which the journey took place	Tourists' age	
	25–44 years	65 years or more
January	291	43
February	404	35
March	388	68
April	467	127
May	953	164
June	865	155
July	1331	164
August	1127	186
September	520	130
October	430	87
November	281	39
December	636	89
Total	**7693**	**1287**
Chi-squared test = 77	**df = 11**	**p < 0.001**

Source: own elaboration based on Central Statistical Office data (GUS)

When analysing the relationship between the tourists' age and the distance from the place of permanent residence, we can similarly presume that it is statistically significant (Table 6). The calculated value of the chi-squared statistic (225.1) is

Table 6 Short-term domestic journeys by the distance from the place of permanent residence in 2013 in Poland

Distance from the place of permanent residence	Tourists' age	
	25–44 years	65 years or more
Up to 50	1316	439
51–100	2147	296
101–200	2008	250
201–300	1031	157
301–500	908	86
501–700	223	44
701–1000	46	14
Over 1000	23	0
Total	**7702**	**1287**
Chi-squared test = 225.1	**df = 6**	**p < 0.001**

Source: own elaboration based on Central Statistical Office data (GUS)

bigger than the critical value provided in the distribution table (20.51). Therefore, we reject the zero hypothesis to the advantage of the alternative one and conclude that the tourists' age influences the distance of the travel destination from the place of permanent residence. The majority of pensioners (34%) travel up to 50 km away, whereas the destinations among youngest people (28%) turn out 51–100 km away from their permanent residence. A considerable prevalence of the young occurs for journeys at the distance of 101–200 km: there are 26% of young people and 19% of the retired travelling in this distance range. Young people are more willing to travel far: as many as 12% choose destinations 301–500 km away from their place of permanent residence as compared with 7% of seniors.

The comparison of different ranges of tourists' age and the forms of the journey proved this relationship to be statistically significant (Table 7). This arises from the fact that the calculated value of the chi-squared statistic (746.6) is bigger than the critical value provided in the distribution table (22.45). Therefore, we reject the zero hypothesis to the advantage of the alternative one and conclude that age influences the forms of the journey. Almost 70% of young people as compared with only 43% of seniors choose weekend recreation. Pensioners prefer other forms of journeys (42%) or visiting the allotment (11%). Among young people, only 2% visit the allotment.

Table 7 Short-term domestic journeys by the forms of the journey in 2013 in Poland

Form of the journey	Tourists' age	
	25–44 years	65 years or more
Weekend recreation	5340	553
Camp	77	0
Excursion, sightseeing event	254	30
Pilgrimage	15	22
Course, training	331	3
Visiting allotment	146	137
Others	1539	545
Total	**7702**	**1288**
Chi-squared test = 746.6	**df = 6**	**p < 0.001**

Source: own elaboration based on Central Statistical Office data (GUS)

The analysis of the tourists' age and the agents of the purchased services also proved the relationship significant (Table 8). The calculated value of the chi-squared statistic (320.9) is bigger than the critical value provided in the distribution

table (24.32). Therefore, we can conclude that age influences the agents of the purchased services. Young people and seniors purchase tourist services in a different way, as indicated by the calculated χ^2 test as related to the chi-squared distribution table. More than 90% of pensioners' state that they did not use agents and booking was not necessary. A similar answer was indicated by 80% of young people. Seniors use church organizations (1.7%) and social organizations (2.4%) as agents. In the case of young people, this share is only 0.2%. In turn, they cooperate with their employing institutions (4.2%) as agents.

Table 8 Short-term domestic journeys by the agents of the purchased services in 2013 in Poland

Agents of the purchased services	Tourists' age	
	25–44 years	65 years or more
Tour operator	46.2	0.0
Employing institution	323.1	0.0
Social organization	15.4	30.9
Church organization	15.4	21.9
Other organization	30.8	0.0
Services independently booked with the supplier	961.8	64.4
Own organization; booking was not necessary	6155.2	1166.9
No indication	153.9	2.6
Total	**7701.7**	**1286.7**
Chi-squared test = 320.9	**df = 7**	**p < 0.001**

Source: own elaboration based on Central Statistical Office data (GUS)

The comparison of the tourists' age and the means of transportation used to reach the destination (Table 9) brought similar results. The calculated value of the chi-squared statistic (313.1) is bigger than the critical value provided in the distribution table (26.12). Thus, we conclude that age influences the means of transportation. Over 81% of young people choose a car, as compared with only 64% of pensioners. Seniors prefer motor coaches (10%) or trains (11%). A motor coach was indicated by only 4% of young people.

Table 9 Long-term domestic journeys including at least 4-night accommodation by the means of transportation used to reach the destination in 2013 in Poland

Means of transportation used to reach the destination	Tourists' age	
	25–44 years	65 years or more
Train	777	144
Bus	285	151
Motor coach	315	130
Car	6232	828
Minibus	46	26
City transportation	15	0
Bicycle	0	3
On foot	8	3
Others	8	3
Total	**7686**	**1287**
Chi-squared test = 313.1	**df = 8**	**p < 0.001**

Source: own elaboration based on Central Statistical Office data (GUS)

DISCUSSION

When analysing the tourist mobility of seniors with reference to people at their mobile working age, one should univocally state that these groups are characterized by different travelling styles. In the case of seniors, this results from a few accumulated factors, such as age, health-related limitations, often difficult economic status; these were accompanied by reduced motivation and ability to overcome barriers arising from a lower level of education. However, for new seniors of the 21st century, these restrictions cease to be significant. Pensioners are more and more willing to face challenges and travel. The results obtained in the study have a practical application, indicating actions that should be taken by tour operators in order to develop tourism among seniors.

The performed investigation allows to state that seniors differ from young people in the following aspects of travelling:

- the character of the planned journeys;
- the number of the journeys;
- the accommodation facilities;
- months in which the journeys take place;
- the distance from the place of permanent residence;
- the form of the journey;
- the agents of the purchased services;
- the means of transportation.

The result remains in line with numerous studies by Polish researchers. Prószyńska-Bordas (2013) indicates that tourist activity is specifically a domain of city-dwellers. Suchecki (2016), in the context of staying with relatives as a form of accommodation, adds that the expenses for tourist activity constitute nearly 2% of the total Polish household expenses and have remained stable for the few recent years. In turn, Stefaniak-Hrycko (2013) maintains that the unaided character of the planned journeys can result from the fact that the age group of 65+ includes 11% of Internet users, who can look for offers on their own. Górna (2015) confirms the low share of pensioners in tourism, proving that among those aged over 65 years ca. every fifth person travelled with tourist or recreational purposes.

Similar research conclusions were reached by Westen European investigators. Among the most important aspects regarding the character of the planned journeys enumerated in the subject literature, there is the need to rest and relax (Horneman et al., 2002; Lee and Tideswell, 2005). The need to meet other people and to make new acquaintances is emphasized by Acevedo (2003) or Huang and Tsai (2003). The reasons for tourist trips in the group of seniors also include the simple need to discover new destinations, with their cultural and natural attractions that the seniors have always planned to visit (Horneman et al., 2002); visiting relatives plays an important part, too. Moreover, the number of health-related stays in resorts and spa & wellness centres is rising (Alén et al., 2012; Garcia Sastre and Martorell Cunill, 2007; Kim et al., 2015; Walker, 2004).

CONCLUSIONS

In the context of the post-war baby boomer generation entering their retirement age, one should expect a gradual rise in the group activity (Szukalski, 2008). The decisive factors in this field will include the more advantageous educational structure (increased share of people with higher education), the higher professional activity of women (decreased share of women who have never worked), the rising availability of modern technology, and, more importantly, the ability to use it obtained before retirement. Additionally, the consciousness of the role of physical and social activity in the human life is of great significance for shaping the lifestyle. Therefore, it should be presumed that the conviction about the benefits of active tourism and recreation in the 21st century seniors will translate into the popularization of healthy, active lifestyle.

The performed comparative analysis clearly indicates that the tourist expectations of the studied groups are different. The results prove that the travelling diversities refer to numerous issues. The literature studies presented above concern only one group of tourists, most often seniors; however, these are comparative studies that can provide a complete answer with regard to the regularities occurring in the tourism of seniors and that of mobile working age people, which was the purpose

of the paper. In fact, a common holiday travel of seniors and their children may end up in dissatisfaction of both groups because of their different expectations. When travelling with their children or grandchildren, seniors will present dissimilar expectations and behaviours than their sons or daughters. They will purchase tourist services in a different way, travel in different months and at different distances. The accommodation facilities and the character of the planned travels are also diverse. Therefore, the main research implications have a considerable application significance, suggesting to touroperators the appropriate actions that they should take with regard to seniors in order to develop tourism among them. Elderly people, to derive full satisfaction from travelling, should travel with people of similar age; only then will their expectations be fulfilled.

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RUSSIAN SALINE LAKES ELTON AND BASKUNCHAK AS CHALLENGERS TO THE UNESCO WORLD HERITAGE LIST

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Abstract
The article considers the main aspects of the nature of the saline lakes of the southeastern part of Europe, located on the Caspian lowland: Elton and Baskunchak, the genesis of their basins, landscapes and economic loads. A brief analysis of the nature and geo-ecology of saline lakes is carried out in a comparative aspect. The conclusion is made about the need for further protection, both of zonal vegetation, and especially of salt deposits of the lakes. It is stated that in this aspect the "Bogdo-Baskunchak" State Reserve and the Elton Nature Park have been created. The idea of creating the "Elton-Baskunchak" cluster biosphere reserve is proposed. We believe that their landscape may be of interest to European readers and scientists.
The main methods are: expeditionary method: automobile and walking routes; paper method, including processing of the collected field material, as well as decoding of space and aerial photographs, and analysis of published sources.
In practical terms, the creation of a cluster reserve allows resolving the geo-environmental and economic problems and preservation of the unique landscapes for future generations.

Key words
Semi-desert, azonal landscapes, comprehensive soil, salt mining, spa resort, mud baths, brine

INTRODUCTION

The so-called "All-Russian Salt Cellar" is located on the Caspian lowland. Two neighboring salt lakes Elton and Baskunchak are similar in occupied area but rather different in the genesis of the depressions and the salts that fill them, mainly potash salt (sylvinites) on Elton and common salt (halites) on Baskunchak. They are especially attractive for people. That is why we have formulated a number of tasks the solution of which will allow perceiving the nature of the unique "lakes without water" more consciously. These tasks are: brief information on the nature of the phenomena; coverage of similarities and differences; possibility of combining the reserve and Natural Park in the "Elton-Baskunchak" cluster biosphere reserve challenging for the UNESCO World Heritage List.

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RESEARCH METHODOLOGY AND TECHNIQUES

This paper is based on the concept of the nature reserve creation for unique natural objects of different content, size and location in the natural area, which is enshrined in the Federal Law of the Russian Federation of March 14, 1995 No. 33-FZ "On Specially Protected Natural Territories "(with amendments and additions), as well as international criteria allowing to classify the objects of study to the required level.

To accomplish the tasks outlined, published scientific sources of recent years, as well as of previous decades and centuries, were collected and analyzed. The data of regional geo-ecological and ecological committees and of field (expeditionary) studies, which were carried out intermittently since the late 60s of the 20th century, were required. At the first stage, the author of the paper worked in the geomorphology laboratory of Volgograd Scientific Research Institute of Oil and Gas, later he became a lecturer at the Volgograd State Pedagogical Institute (nowadays University) where he currently works. At this large stage, it was necessary to pedagogize the accumulated material of both domestic (Isachenko and others, 2013) and foreign authors, for example, Rene Matlovich and co-authors.

Circular routes around saline lakes Elton and Baskunchak and radial ascents to the highest points of the salt dome relief structures were accomplished: to Mount Bolshoye Bogdo and Mount Bolshoy Ulagan, Fresh Liman hill and others. Hiking routes to the karst craters, caves, local rivers and springs (Vaucluses) were carried out. Geobotanical transects were also studied with geobotanist V. Sagalaev.

During the office period, space photographs and detailed aerial photographs were reviewed and interpreted. Topographic maps of medium and detailed scales were used.

At all stages of the study, there was interaction with scientists and practitioners, such as staff of the All-Russian Research Institute of Agroforestry and employees of the Environmental Committee, and intermediate results were presented at scientific conferences at various levels.

The surroundings of Lake Baskunchak in different times were visited by natural scientists – English geologist F.I. Murchinson (1841), German naturalist A. Humboldt (1829), Russian scientists - K.M. Rem (1853), I.B. Auerbach (1854), I.V. Musketov (1895) and others (e.g. Matlovič, Matlovičová 2015).

Famous writer Alexandre Dumas père also visited Mount Bolshoye Bogdo and left his impressions about it in the book "From Paris to Astrakhan."

In the Soviet times, lakes and the surrounding territories were studied by scientists from Moscow, Volgograd, Kazan, Saratov and other cities.

THE RESULTS OF THE STUDY

The territory of the Caspian lowland amazes with its surprisingly smooth surface, monotonous at first glance relief and scarcity of vegetation cover. An almost ideal plain spreads around. It is livened up only by the souslikovinas of ground squirrels, gullies and estuaries covered with rare semi-desert vegetation. In hot summer days mirages appear on the horizon, so one can see buildings, lakes, and hills. And suddenly the mirage disappears, the hills turn into mountains, lakes into a snow-white plain. Such a landscape is characteristic of the saline lakes Elton and Baskunchak well known in Russia (Brylev 1984).

Europe's largest saline lake, Elton, with an area of 180 km^2, has a rounded, slightly elliptical outline; its surface is located at -16 m above sea level (Atlas 1993). Actually, there is no lake in the usual sense of the word, there is a basin filled with salt, covered with a thin layer of concentrated brine. The banks of Elton are low, only in some places they are rather steep, with relative heights of up to 10 m. Between the coast and the salt deposit there is usually a viscous, sometimes almost impassable belt of mud several tens of meters wide.

The surface of Elton acquires a very peculiar golden-pink shade at sunset and sunrise. This feature explains the origin of the name of the lake. Kazakhs call it *Altyn* which means "golden"; Kalmyks who used to live here earlier called it *Altyn-Nur*, or *Altyn-Nor*, which means "Golden Lake". The red colour of the brine of the lake and the streams flowing into it was also noticed by P. S. Pallas (1788). The reason for the reddish colour of the surface of Elton is the presence of a special unicellular alga, called dunaliella (*Dunaliella salina*), which, in addition to the green chlorophyll, contains red carotene pigment, which gives it a characteristic pink-red colour. It is the presence of dunaliella in the water of Lake Elton that determines the distinctive crimson-pink colour of its brine. After the death of the algae, the red pigment gets into the brine and concentrates on the surface of salt crystals. And mineral of sylvinite which is potash salt is itself of a pink color.

In the past, the so-called "raspberry" or "royal" pink salt with a special odor, vaguely reminiscent of the smell of violet or raspberry, was mined at Lake Elton. Such salt was supplied to the imperial court of Catherine II in the amount of up to one hundred pounds per year, and no one else was allowed to mine it.

The concentration of salts in the brine of the lake, depending on the season, varies from 19 to 37%, but averages 270 grams per liter. The chemical composition of salts is diverse – sodium chloride prevails, there are also salts of magnesium, potassium and calcium. It is quite remarkable that such chemical element as bromine was also found in Elton's brine.

The unique combination of the chemical composition of brine with microorganisms largely explains the characteristic feature of the lake itself which is the unique colour palette of its surface (Fig. 1).

Figure 1
Lake Elton.

Figure 2
Photo of karst landscapes of Lake Baskunchak

The lake basin is considered as a compensatory mould located between salt dome structures.

On the eastern bank of Lake Elton, there is "Mount Ulagan" with a mark of +67 meters, and on the west side there is the low Fresh Liman hill, whose plane was cut by the Khvalyn Sea transgression, while "Mount Ulagan" rose above its level by 17-25 meters. These "mountains" are formed by salt domes and geomorphologically they are cuestas on the slopes of domes. Cuestas from the surface are composed of Paleogene (Bolshoy Ulagan) and Jurassic-Cretaceous sediments (Fresh Liman). In the depths of the salt domes, the Triassic-Permian salts are deposited: halite with layers of carnallite, polyhalite, sylvite. In the Soviet era of planned economy, it was supposed to mine potash salt with a shaft method in the area of the Mount Bolshoy Ulagan. Today, potash salt is mined in the mine of the Gremyachinskoe deposit 200 km from Elton Lake.

The basin of the lake Baskunchak is composed similarly, but tectonically it is more complex. It is surrounded by five salt domes. If we look at them from the Southern Gypsum field which is most elevated by Mount Bolshoye Bogdo, clockwise will be seen the following: domes of the West and North fields and the Vak-Tau and Kuba-Tau elevations.

The gypsum fields are composed of an anhydrite-gypsum cap - "caprock" and they are heavily karsted: thousands of karst craters are scattered across the surface like pockmarks, creating a unique "lunar" landscape (Fig. 2)

Some craters lead to underground passages and caves. Especially popular are the caves of the Northern gypsum field.

During the newest transgressions of the Caspian Sea, Mount Bolshoye Bogdo, which is up to 150 m high, was a large island in the sea. It is composed from the surface by sandstones of yellowish cream colour and Triassic limestones with petrified pelecypods (*Mitilus sp.*), Ammonites (*Zeratites sp.*). The redbeds of the Permian system, lying below, encolour brightly the base of the mountain. The geological

section of Mount Bolshoye Bogdo is considered to be the classic one in the south of European Russia – it has been studied since the time of I.B. Auerbach (Auerbach 1871).

The lake basin itself, with a geophysical depth of 600–800 meters, is filled with common salt, which is of a redeposited origin, partly from saline Caspian sediments. In addition, 14 springs flow into the lake, probably coming from the salt domes. The total surface area of Baskunchak is estimated at 130 km^2. (Atlas 1968) dimensions 13 × 10 km. The salt concentration in brine reaches 300 grams per liter.

HYDROGRAPHY

Let us return to the Elton Lake area. 7 rivers flow into its basin. The largest of them are Bolshaya Smorogda, Khara, Chernavka, Lantsug. The Smorogdinsky mineral spring, located 4 km from the resort, pours out into Bolshaya Smorogda. The spring with mineralization of 8 grams per liter has the local name of "Narzan", its flow rate is 1.6 liters per second, its water is used to treat gastrointestinal diseases.

The waters of the Khara and Lantsug rivers are of sodium chloride type with salt content from 5 to 12 grams per liter. The water of the Chernavka River belongs to the sodium chloride type with salt content up to 26 grams per liter.

The mud of the mouths of the Lantsug, Khara, Chernavka, and Bolshaya Smorogda occupy an area of up to 6 km^2. But the main mud deposit is located in the gulf of the lake, near the "Old resort". The thickness of the mud layer here reaches 0.2-0.5 meters, and the reserves of mud exceed 600 thousand m^3. Elton's mud is a homogeneous, black (due to iron sulphide) oily mass with a consistency of thick sour cream, and with the smell of hydrogen sulfide. It is exceptional in its purity. Contamination by particles with a diameter of more than 0.25 mm is minimal, so the mud feels soft and velvety to the touch. While storing, due to oxidation of sulfur iron, it becomes covered with a gray crust. Sulfur iron and aluminum, humic acids, hydroxides of iron and aluminum, mixed with thin clay, represent the colloidal complex. Besides the Elton spa resort, the mud is also supplied to the Volgograd health resort and it does not lose its healing properties.

Thus, judging from the above, the uniqueness of the natural complexes of the Elton-Baskunchak region is largely determined by geological and geomorphological conditions, that is, lithology of rocks and relief, which leads to the redistribution of precipitation on heterogeneous soils. There is no doubt that these differences are primarily seen between the basin of Elton and Mount Bolshoy Ulagan, which have already been mentioned. The salt-domed hills of the Ulagan and the Fresh Liman are composed of fragile aleuritic sandstones of the gray colour of the Triassic system with magnificent imprints of ammonites. Up the section, they are replaced by Jurassic, Cretaceous and Paleogene quartz sandstones, clays, aleurites with fossil fauna.

The base of the "mountains" and the surface of the Pre-Caspian lowland itself are covered with Lower Khvalyn sediments – chocolate-coloured clay, fawn loam, and sandy loam, and the banks of lake basins – with modern silt and salty mud.

The territory under consideration is climatically formed in the region of a sharply continental climate. Despite the fact that the region is almost equidistant from the equator and the pole, it is characterized by frosty winters with average multi-year temperatures of January minus 10.5° C (Elton) and minus 8.5,5 C° (Baskunchak). The Caspian Sea does not have a significant impact on the temperature regime of the region, causing its extreme aridity and continentality. This is expressed in an insignificant annual amount of precipitation – 292 mm (Elton) and 260 mm (Baskunchak), while evaporation reaches 900 - 950 mm per year.

The Elton meteorological station apparently holds the absolute record of Russia in the summer temperature maximum, reaching plus 45° C (Baskunchak – plus 44° C). The high total amount of active temperatures, increasing from north to south from 3380° C to 3500° C (table 1), is also impressive.

Table 1 Climatic indicators of the Elton-Baskunchak macro-region

Meteorological station	Average temperature of the year in °C	Average January temperature in °C	Average July temperature in °C	Absolute min in °C	Absolute max in °C	Evaporation mm per year	Annual precipitation in mm	Annual amount of temperatures in °C
Elton	+7	-10,8	+25	-36	+45	900	292	3380
Baskunchak	+8,5	-8.5	+25	-36	+44	950	260	3500

Source: (Atlas of Volgograd Oblast (1993), Atlas of Astrakhan Oblast (1968))

The alternation of frosty weather in winter with thaws, when the snow melts completely, and the subsequent deep freezing of soils, and in summer their strong warming, draining, cracking, is characteristic. The biotic and landscape features of the salt-dome region under consideration are largely predetermined by the extremums indicated above.

The non-leaching regime of soils causes the accumulation of easily and moderately soluble salts, primarily gypsum and carbonates, as well as Na ions, which accounts for zonal soil types – light chestnut and solonetz on Elton, brown semi-desert with solonetz on Baskunchak. Along the shores of the lakes, both basins are covered with salt marshes. As for the zonal soils, the number of solonetz in them usually approaches 50%.

The solonetz developed on salted heavy loams, in the depth of water-soluble salts, are mostly moderately saline, while the solonetz formed on chocolate clays are mostly highly saline.

The gully-estuary micro- and meso-relief causes the redistribution of surface runoff and the formation of dark-coloured meadow-chestnut soils, which, according to the depth of groundwater, are hydromorphic. Seasonality is characteristic of moistening, i.e.: in spring washing out to groundwater, while in the second half of summer and in autumn, ascending currents from groundwater predominate.

The nature of the vegetation cover in the outskirts of Lake Elton and the entire Elton-Baskunchak region is determined by its geographical location. The zonal type of vegetation here is fescue-feather-grass and desert (wormwood-fescue-feather grass) steppe belonging to the Trans-Volga-Kazakhstan steppe province of the Eurasian steppe region. The most important feature of the near-Elton and near-Baskunchak semi-desert steppes is the complexity of the vegetation cover due to the drainless depressions of the micro, meso-relief and macro-relief.

The vegetation of the shores of the lake is determined by the presence of solonetz and salt marshes. Therefore, the shores of Elton and Baskunchak are the "kingdoms" of saltworts, which have the ability to change their colour depending on the season (Fig. 3).

Bright green in spring, dark green in summer and yellow-orange in autumn, they picturesquely border the outskirts of salt marshes, contrasting with a white crust of dried salt. Often one can find salicornia here. Only in early spring, when the lakeside plain is saturated with the moisture of the desalinated waters, the domination of

Figure 3
Saltworts

Figure 4
Didier's tulip (*Tulipa gesneriana*), Schrenck's tulip (*Tulipa schrenkii*)

saltwort and wormwood recedes into the background, short-living annual ephemeral plants appear on the shores of the lake and rivers, as well as short-vegetative ephemeroid perennials: tulips, alliums, irises and gageas. Some of them are found in the Volgograd region only on Elton. Some representatives of the Elton flora are included in the lists of protected plants of our region. Among them there is a remarkable early-flowering two-flowered tulip (*Tulipa biflora*), Schrenck's tulip (*Tulipa schrenkii*) (Fig. 4), Taliyev's cornflower (*Centaurea taliewíi*), and some other species.

Of particular interest and value to botanists are plant species, first described from the vicinity of Elton and having their classic location here (Lavrenko 1980, Ilyin 1927). It is important to emphasize that the floristic complexes of Elton and Baskunchak can serve as a natural standard of arid ecosystems within the South-East of European Russia.

The fauna of these places is diverse and interesting. Animals are sensitive to human activities. Saiga antelopes, graceful pink flamingos, common in these places in the last century disappeared. The great bustard, little bustards, swans, sociable lapwings have become rare. But still, in the Trans-Volga steppes, there are still quite untouched habitats and the anthropogenic pressure is still not very large. Human "civilization" with its chemistry, intensive agriculture, industrialization and urbanization has not reached here yet. Therefore, there are such rare animal species in need of protection, such as the semi-desert marbled polecat, the steppe eagle, the long-legged buzzard, the demoiselle crane (Fig. 5).

For about a century in the village of Elton there has been a health resort based on the therapeutic mud of the lake, which in 1985 was recognized as a balneological monument of nature, as well as the Smorogdinsky mineral spring. Mud and brine from Elton are used in "Gornaya Polyana" mud bath in Volgograd. A well-equipped modern building of the health resort "Elton" has been built recently. For the purpose of rehabilitation of the population and the improvement of tourism,

Figure 5
Demoiselle crane *(Anthropoides virgo)*

the development of therapeutic and recreational areas and natural healing resources is carried out. Balneological resources are the most important component of the Elton region.

Years passed and in 1997, in accordance with a decree of the Government of the Russian Federation, the Bogdinsko-Baskunchaksky Reserve was founded, and the territory of Lake Elton was declared a state natural park in 2000.

Elton and Baskunchak are the most important natural attractions of the southeast of European Russia. How to combine their economic use and the need to preserve the unique arid natural complex of the Lower Volga region? We offer for the benefit of people a compromise environmental solution to this problem of the region (Brylev, Sagalaev 2000, Matlovičová, Husárová 2017, Amosov, Alexandrova, Safronov 2012).

CONCLUSION

The Elton-Baskunchak region claims to be included on the World Heritage List on at least two criteria:

1. On the one hand, it is a unique geological formation with the presence of a powerful Permian-Triassic salt complex and active salt tectonics, which can no longer be traced in any existing World Heritage site. On the other hand, the

Mount Bolshoye Bogdo is an important stratigraphic and paleontological object, illustrating the paleogeography of the Triassic period in the south of European Russia.

2. The Elton-Baskunchak Ecoregion is the especially valuable landscape of the semi-desert of the south-west of the Caspian lowland, that is unique not only within the Russian Federation, but in Europe also. It is also a natural industrial landscape which is rare for Europe. Here one can trace the stages of salt mining beginning from the 20-30s of the XX century from primitive salt processing to industrial production. Such modern objects are not yet on the list of the World Cultural Heritage.

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PHYSICAL AND CHEMICAL PROPERTIES OF SOILS IN POTENTIAL APPROACHES OF VOLYNIC POLISSE, VIOLATED BY ROOT SPONGE

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Abstract
Peculiarities of growth, productivity and health condition of pine stands affected by annosum root rot were investigated in conditions of Volyn Polissya of Ukraine. The research was conducted in the forests of the State Enterprise «Gorodotsky FH» and SE «Manevitsky LH», which are subordinated to the State Agency of Ukraine for Natural Resources of Ukraine and located in the Manevytsky-Volodymyrets Physical-Geographic District of the Volyn Polissya of Ukraine. The purpose of the research is to detect differences in physical and chemical properties of soils in the center of drying out of the plumage and in the interfacial space (control) affected by the root sponge of pine plantations. It was revealed that the soil in the root of the root spider's lesion is poorer than organic soil (humus) compared with the soil of the interfacial space. At the same time, these soils are richer in the content of nutrients (NPK). The granulometric composition and specific gravity in soils in the center of drying out of the crumbling and in the interfacial space practically do not change. Humidity in all experimental soils in the center of drying out of the drooping to a depth of 50 cm is higher on average by 28%, and in deeper horizons - by 6% less than in the intercostal space. The hardness of the soil in the foaming areas throughout the depth of the profile is greater (especially at the depth of the arable layer) than in the interfacial space. It was discovered that the damage by the root sponge of pine stands established on the ancient lands depends on a complex of factors limiting the toppling of the soil layer due to its consolidation, especially at a depth of 50 cm. This contributed to the

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concentration of root systems in the upper layers of the soil, which in conditions abrupt changes in the hydrological regime can lead to a decrease in the stability of plantings, in particular to the root sponge.

Key words
Root sponge, center of drying out, interfacial space, soils, humidity, hardness, site between disease centers

INTRODUCTION

Scots pine (Pinus sylvestris L.) is the main forest forming species in Polissya; it occupies about 60 % of the areas covered with forest vegetation. One of the strategic issues of the forestry sector with regard to the cultivation of high-yielding pine plantations is the problem of root rot, which does not lose its relevance in the world, since there are no radical methods of combating disease in any of the countries. The greatest damage to the pine (Polus sylvestris L.) is caused by root rot, the causative agent of which is the fungus - root sponge (Heterobasidion annosum (Fr.) Bref.).

The root sponge affects the productivity of the stands, causes their premature decay, provokes the massive proliferation of endoscopes, increases the fire danger, causes continuous sanitary cutting, worsens the soil protection, water protection and sanitary and hygienic functions of the forest. In addition, they are affected by root rot of the tree, susceptible to damage to the winds (Vollbrecht 1994, Brandtberg 1996, Bendz-Hellgren 1999, Volchenkova 2012, Lyamtsev 2015, Hronec et al. 2012).

The geography of the spread of the disease has gained in recent decades of global character and encompasses all parts of Europe (Vasiliauskas et al. 2002, Wang 2012, Mead 2013), North America(Harrington et al. 1989), Central America (Lewis 2002; Mead 2013) some areas of Australia (Mead 2013), Asia (Parmasto 1986; Dai et al. 2003; Koco et al. 2014) and Africa (Morocco) (Mead 2013).

The problem of the emergence and spread of the disease in Ukraine arose in the middle of the twentieth century after large plots began to create forest crops of pine forests in interfacial space, pastures, wildernesss, where the soils lost their forest properties. The study of the confinement of the centers of the disease to the plantings in the old lands (Sirota 1996, Kuznetsov 2005, Bilous 2009, Ustsky 2011). The emergence and spread of this disease in these lands, most researchers associate with the presence of the upper arable layer of soil, the depth of which is limited to a densified layer, often called the "umbrella sole".

The presence of such a layer prevents the roots from going deep into the lower horizons of the ground, which causes the growth of the above-ground part of the tree to decrease and significantly weakens it (Vasilyuskas 1989, Negrozky 1986). The risk of defeat of crops by the root sponge is substantially increased when they are created in areas where continuous sanitary felling of plantations affected by this disease has been carried out. (Negrutsky 1986, Kuznetsov 2005, Bilous 2009, Volchenkova 2012).

A number of researchers (Artyukhovsky 1998, Vorontsov 1978) play an important role in spreading the root sponge to the stem pests that are carriers of fungal infection. The high density of pure crops of young pine trees created in the ancient lands leads to a decrease in their resistance to defeat of the root sponge and curtin erosion (Vasiliauskas 1989, Volchenkova 2012). Scientists of URIFFM who conducted research in Eastern Polissya on sod-podzolic soils of the ancient lands, the appearance and distribution of root sponge associated with the water-physical properties of soils (Ladeyshchikova 1974, Tkachuk 2002, Ustsky 2011). Studies carried out in the Chernihiv Polissya indicate that turf-podzolic soils in plantations in the old lands are characterized by low fertility, densified horizons and layers, as well as unstable water regime (Ladeyshchikova 1974). The spread of the disease in pine forests of Kazakhstan's «belt» forests in indigenous forest soils is also explained by the unstable water regime of soils (Shatyayev 1987**)**. In the Byelorussian Polissya, the disease became widespread in pine plantations, created on fresh sod-podzolic soils, amplified by loose sands and moraine loams, starting at a depth of 1 m (Raptunovich 1981). At present, the causes of the origin of the center of drying out of the root sponge have not been sufficiently studied and there are no effective measures to limit the mass distribution of the disease (Alekseev 1974, Negrutsky 1986, Vasiliauskas 1989, Zvyagintsev, 2013).

Therefore, the study of physical and chemical properties of soils will make it possible to determine the directions of economic intervention in the course of the pathological process reduction in the size of the fall.

To increase the stability of the planting to the root sponge in the ancient lands should create mixed forest cultures with the participation of hardwoods. For mixing with pine in a fresh sub-tree, you can use the following tree species: birch hanging (Betula pendula Roth.), Northern oak (Quercus borealis Michx.), Oak (Quercus robur L.), alder (Alnus incana (L.) Moench) Their share in these conditions should be at least 30% (Alekseev 1974, Negrutsky 1986, Bilous 2009).

When restoring infected root sponge of pine plantations the best way to avoid losses in the next generation of the forest is to use resistant to root sponge rocks. According to the data (Alekseev 1974, Ladeyshchikova et al. 2001, Lygis et al. 2004), on structures affected by the root sponge plantings, it is proposed to create in fresh and wet sub-cultures birch cedar cultures as predecessors of pine cultures in order to reduce the infectious background of the root sponge and to promote the formation of the natural composition soil microcenosis. However, this provision needs to be confirmed, as there is not enough data on the growth, condition, productivity and product-assortment structure of birch cultures in the old land. Usually, in Ukraine, on planks affected by the root sponge, newly created mostly pure pine plantations.

The purpose of the work is to detect differences in the physical and chemical properties of soils in the center of drying out and in the interfacial spaces in the pine plantations affected by the root sponge.

METHODOLOGY DESCRIPTION

The research was carried out in pine forests according to the basic principles of soil science (Arinushkina 1970, Zhigunov 1980, SSTU 4289: 2004, SSTU 4730: 2007, SSTU ISO 10390: 2007, Tikhonenko 2010, Berezhnyak 2012, Lisnyak 2015) on the old land of two forest enterprises: State Enterprise «Gorodotsky FH» and SE «Manevitsky FH», which are confined to Volyn Polissya. Pine common in these enterprises is the main forest species and occupies about 68% of the area of forest areas covered with forest vegetation.

The climate of the region is moderate continental with mild winters and warm summers. The average temperature in January is from -4,4 ° to -5,1 ° C, July -18,5 ° C. Absolute minimum temperature - 39 ° C, absolute maximum + 39 ° C. The period with a temperature of + 10 ° C is 150-160 days. The sum of these temperatures is 2495-2580 °. Precipitation is 550-640 mm per year, most of them fall in the summer, and the least - in winter.

Volyn Polissya is characterized by a significant flow of field and card forms of relief, valley landscapes, excessive moistening, the development of repossessed lands and swamps, numerous (more than 200) lakes, and large forested areas. Here, the present landscape zones of mixed forests (45%), meadow-bog landscapes (about 10%) and moraine-zandrovy plain, Volyn region predominate. Among the fourth percent is the distribution of breeds of Cretaceous age, which condition the development of map forms of relief - lake basins, reservoirs, formation of sod-carbonate soils (Marinich 1985).

Wet climate and washing type of water regime, the predominance of non-carbonate rocks of light granulometric composition (glacial and water-glacial genesis), as well as forest vegetation, which covered the territory of Volyn Polissya everywhere, contributed to the development of the podzolic soil formation process and caused the formation of sod soils of podzolic type.

The surface of the surveyed sections of the state enterprise «Gorodotsky FH» and the state enterprise «Manevitsky FH» is represented by the turf-weakly podzolic and soddy-medium podzolic soils orientation. Forest lands, on which the test sites were laid (P 2, P 6, P 9), are referred to the ancient lands. On most of the examined sites, the morphological signs of plowing have not been preserved, but sometimes, they are clearly expressed.

In order to study the physical and chemical properties of soils in pine plantations affected by the root sponge, 30 soil sections were laid: 15 in the center

of drying out; 15 in interfacial spaces (controls). On these sections, every 10 cm hardness of the soil is determined by a Golubev gauge and the moisture content of the soil is wetted with Walcom PMC-710. The soil cover was described in 3 soil cuts in foam center of drying out and 3 in intercostal spaces, and analyzed 36 soil samples, which were analyzed in laboratory conditions. The specimens were determined: the granulometric composition by the pipette method (SSTU 4730: 2007); Humus content according to Tyurin (SSTU 4289: 2004); The content of the general forms of N, P, K (in concentrated sulfuric acid extraction by the Ginzburg method) (Tikhonenko 2010); The level of acidity is potentiometrically (SSTU ISO 10390: 2007). The research results were processed using Microsoft Excel software.

The study of water, physico-mechanical and physical and chemical properties of the soils of the old lands as a habitat and feeding medium of the root system of trees is very important for the identification of the causes of the origin of the center of drying out of the root sponge, the consequences of its influence on the growth, condition and formation of forest plantations, as well as the development measures to combat this disease.

RESULTS OF THE RESEARCH

The analysis of the given data of the granulometric composition of soils showed that the composition of the studied soils is dominated by the fraction of fine sand (0.25 - 0.05 mm). The total content of mechanical elements of large and medium sand is smaller than fine sand, but compared to other fractions, its share is quite substantial. The content of physical sand (> 0.01 mm) on average in all soils is 92.2%, the physical clay content (< 0.01 mm) is 7.8%, the amount of colloidal particles (<0.001 mm) is 5.9% , which is a very low indicator (Table 1).

There were no significant differences between the variants in the center of drying out (CDO) and in the interfacial space (IS), but only 9% in interdimensional spaces had less colloidal particles (< 0.001 mm) and physical clay (< 0.01 mm) and physical sand more than 1% (Fig. 1).

The fractional composition of the mechanical elements of the humus horizon reflects the quantitative parameters of the granulometric composition of the parent rock, but some of its features are noted. The main difference between the upper and lower parts of the profile of the studied sod-podzolic soils is the gradual reduction of the contents of the silt particles in the upper part of the profile and their accumulation in the lower horizons.

In general, the granulometric composition of individual soil horizons on the experimental sites varies from the late assembly and changes from the genesis and subtraction of elementary processors.

The specific gravity of the investigated soils depends on the amount of physical clay and organic matter in it and varies between 2.51 and 2.68 g / cm^3 (Table 2),

Table 1 Granulometric composition of the studied soils

№ planting	Horizon	Depth, cm	The content of particles of different sizes, %			The name of the granulometric composition of the soil
			< 0,01 мм	> 0,01 мм	< 0,001 мм	
P 2– center of drying out (CDO)	$He_{(1)}$	0-18см	6,38	93,62	5,12	Sand is bonded
	$He_{(2)}$	19-28	6,1	93,9	4,54	Sand is bonded
	Pe(h)	29-51	5,24	94,76	4,04	Sand is bonded
	Pei	52-84	3,6	96,4	3,58	The sand is loose
	Pi(gl)	85-118	43,15	56,85	31,93	Loam is heavy
	P	119-160	12,93	87,07	7,1	Sue
P 2– interfacial space (IS)	He	0-32	7,3	92,7	5,09	Sand is bonded
	Pe	33-59	7,75	92,25	4,8	Sand is bonded
	Pi(e)	60-102	27,06	72,94	19,21	Loam is light
	P(i)	103-140	4,92	95,08	3,75	The sand is loose
	P	140-160	7,54	92,46	6,78	Sand is bonded
P 6– center of drying out	HE(п)	0-22	4,69	95,31	3,7	
	Ep(h)	23-43	4,99	95,01	4,53	The sand is loose
	Pe(i)	44-68	4,09	95,91	3,94	The sand is loose
	Pi(e)	69-96	3,71	96,29	3,47	The sand is loose
	P(i)	97-135	4,18	95,82	3,56	The sand is loose
	P	136-160	3,17	96,83	2,85	The sand is loose
P 6– interfacial space	HE(п)	0-24см	4,5	95,5	3,64	The sand is loose
	Ep(h)	25-32	3,4	96,6	2,85	The sand is loose
	PI(e)	33-49	5,4	94,61	4,19	Sand is bonded
	Pi	50-82	3,28	96,72	3,01	The sand is loose
	P	83-140	2,88	97,12	2,28	The sand is loose
P 9– center of drying out	HE	0-24	8,95	91,05	4,88	Sand is bonded
	Ep	25-68	7	93,0	4,18	Sand is bonded
	Ip(e)	69-95	4,15	95,85	3,33	The sand is loose
	PI	96-135	7,5	92,5	7,3	Sand is bonded
	P(i)	136-160	6,2	93,8	6,33	Sand is bonded
	P	161-170	9,78	90,22	6,5	Sand is bonded
P 9– interfacial space	HE	0-32	5,28	94,72	5,23	Sand is bonded
	Eph	33-64	3,93	96,07	6,33	The sand is loose
	Pe	65-82	10,03	89,97	4,6	Sand is bonded
	PI	83-105	9,73	90,27	5,33	Sand is bonded
	P(i)	106-130	7,1	92,9	6,98	Sand is bonded

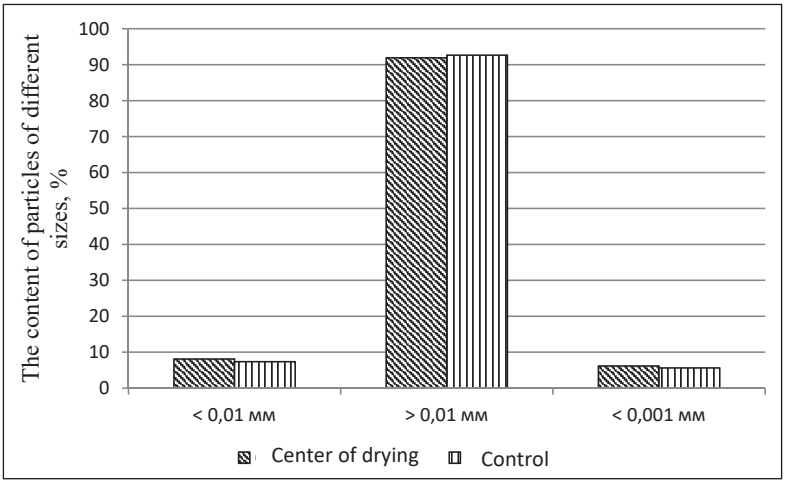

Figure 1
The content of particles of different sizes in the center of drying out and on the control

which is logical for this type of soil, since these soils are depleted with organic matter and more or less uniformly in profile provided with colloidal particles.

After analyzing our experimental data, we found that the differences between variants with root sponge and control were not detected, there are only very weak tendencies for increasing the specific gravity in the control variants (Figure 2).

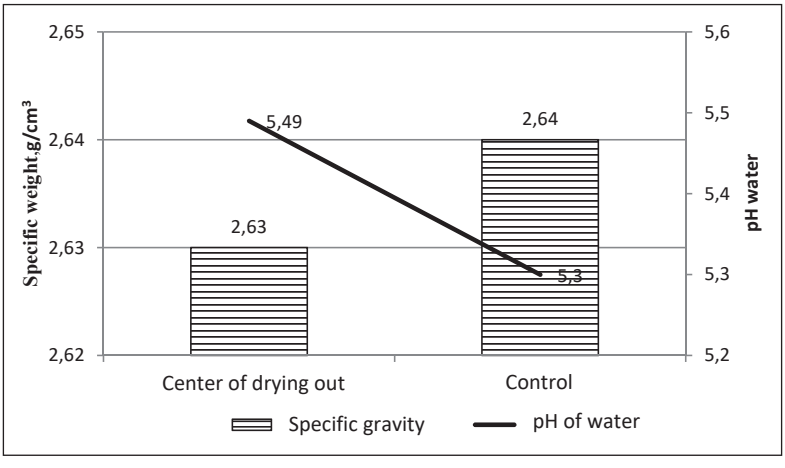

Figure 2
Specific gravity and pH of water in the root of the root sponge and control.

Table 2 Physico-chemical and agrochemical properties of investigated soils

№ planting	Horizon	Depth, cm	Specific weight, g/cm³	pH water	Humus content, %	N	P_2O_5	K_2O
P 2– center of drying out	$He_{(1)}$	0-18см	2,65	4,8	0,48	0,067	0,025	0,036
	$He_{(2)}$	19-28	2,68	4,76	0,42	0,597	0,021	0,041
	Pe(h)	29-51	2,66	5,1	0,24	0,065	0,022	0,037
	Pei	52-84	2,67	5,22	0,06	0,039	0,012	0,041
	Pi(gl)	85-118	2,51	4,97	0,24	0,054	0,045	0,341
	P	119-160	2,65	5,52	0,12	0,053	0,020	0,150
P 2– interfacial space	He	0-32	2,65	4,95	0,54	0,065	0,019	0,046
	Pe	33-59	2,63	4,95	0,72	0,053	0,016	0,060
	Pi(e)	60-102	2,61	4,9	0,54	0,067	0,025	0,264
	P(i)	103-140	2,62	5,4	0,24	0,038	0,004	0,040
	P	140-160	2,66	5,67	0,42	0,039	0,010	0,068
P 6– center of drying out	HE(п)	0-22	2,64	4,95	0,84	0,078	0,014	0,028
	Ep(h)	23-43	2,65	5,42	0,54	0,026	0,049	0,042
	Pe(i)	44-68	2,65	5,36	0,18	0,081	0,020	0,033
	Pi(e)	69-96	2,65	5,22	0,24	0,064	0,014	0,030
	P(i)	97-135	2,61	5,1	0,3	0,079	0,012	0,036
	P	136-160	2,60	5,8	0,36	0,078	0,005	0,032
P 6– interfacial space	HE(п)	0-24см	2,65	4,9	0,96	0,040	0,017	0,023
	Ep(h)	25-32	2,68	5,35	0,24	0,064	0,012	0,022
	Pl(e)	33-49	2,65	4,98	0,54	0,013	0,067	0,044
	Pi	50-82	2,65	5,59	0,48	0,065	0,012	0,025
	P	83-140	2,65	5,52	0,30	0,080	0,005	0,029
P 9– center of drying out	HE	0-24	2,58	4,9	1,02	0,039	0,036	0,031
	Ep	25-68	2,64	5,69	0,39	0,052	0,015	0,034
	Ip(e)	69-95	2,62	6,14	0,18	0,025	0,011	0,031
	Pl	96-135	2,62	6,85	0,08	0,053	0,012	0,045
	P(i)	136-160	2,63	6,4	0,18	0,025	0,011	0,034
	P	161-170	2,63	6,61	0,13	0,109	0,010	0,042
P 9– interfacial space	HE	0-32	2,62	4,55	1,12	0,013	0,029	0,036
	Eph	33-64	2,63	5,16	0,29	0,064	0,023	0,043
	Pe	65-82	2,65	5,89	0,13	0,064	0,007	0,027
	Pl	83-105	2,62	5,8	0,08	0,013	0,010	0,030
	P(i)	106-130	2,62	5,95	0,18	0,026	0,010	0,034

Humidity of these or other layers of soil depends on many factors, in particular from forest conditions, tent closeness, as well as the limitation and precipitation intensity. The distribution of moisture in the thickness of the soil primarily affects the mechanical composition of certain layers and their density. Soil sections were laid by us in the absence of precipitation.

The relative humidity of the soil, both in the centers of drying and in interfacial space, varies with depth (Table 3). In the centers of drying, the maximum moisture content of 9.71% was observed in the soil layer at a depth of 30 cm and the minimum - 6.75% at a depth of 70 cm. In the interfacial space, the moisture content of the soil layers ranged from 6.18% (10 cm) to 8.10% (80 cm).

Table 3 Humidity of soil at different depths in the center of drying out and interfacial space of pine plantations in conditions of Volyn Polissya

Statistical Indicators	Depth of occurrence, cm										
	10	20	30	40	50	60	80	100	120	140	160
Center of drying out											
M – middle, %	9,31	9,49	9,71	9,19	7,79	7,19	7,41	7,08	7,05	7,18	7,63
± m – standard error	0,31	0,37	0,45	0,41	0,33	0,30	0,35	0,33	0,23	0,23	0,22
S – standard deviation	1,21	1,42	1,73	1,59	1,30	1,15	1,35	1,29	0,87	0,88	0,84
S^2 – sample variance	1,47	2,03	2,99	2,53	1,68	1,33	1,82	1,65	0,76	0,78	0,71
Excess	0,46	-0,40	-0,41	-0,67	-0,70	-0,82	1,25	0,07	0,01	-0,93	-0,58
Asymmetry	1,01	0,67	0,73	0,45	0,02	0,13	1,32	0,53	0,56	0,55	0,66
Minimum	7,8	7,5	7,6	7,2	5,6	5,5	5,8	5,2	5,7	6,2	6,6
Maximum	12,1	12,0	12,9	12,4	10,2	9,2	10,6	9,5	8,9	8,8	9,2
n – number of options	15	15	15	15	15	15	15	15	15	15	15
Interfacial space											
M – middle, %	6,18	6,41	6,53	6,65	7,16	7,62	8,10	7,99	7,25	7,28	7,61
± m – standard error	0,27	0,34	0,42	0,44	0,44	0,38	0,48	0,48	0,35	0,34	0,33
S – standard deviation	1,06	1,31	1,61	1,69	1,69	1,47	1,84	1,85	1,35	1,32	1,27
S^2 – sample variance	1,12	1,72	2,60	2,85	2,86	2,17	3,40	3,43	1,82	1,75	1,62
Excess	-0,73	-0,56	-0,19	-0,38	-0,98	-1,05	-1,11	-0,11	-1,19	-0,51	-0,25
Asymmetry	0,41	0,53	0,81	0,74	0,05	0,31	0,31	0,70	0,09	-0,02	0,26
Minimum	4,6	4,5	4,4	4,5	4,1	5,2	5,6	5,8	5,0	4,8	5,4
Maximum	8,2	8,6	9,7	9,8	9,8	10,1	11,2	11,7	9,2	9,3	9,7
n – number of options	15	15	15	15	15	15	15	15	15	15	15
$t_{fact,05}$	7,61	6,13	5,17	4,22	1,15	0,89	1,16	1,56	0,48	0,24	0,05

Note: $t_{the\ theor.} = 2{,}048; P = 0.05$

The dynamics of the distribution of moisture in the soil of the centers of drying and interfacial spaces is described by polynomial equations of the 3rd degree (Fig. 3) with accuracy ($R^2 = 0.83$) in the cores and ($R^2 = 0.80$) in interfacial spaces. Relative humidity in the center of drying out of the root sponge gradually increases to 9.71% at a depth of 30 cm, then decreases to 6.75% at a depth of 70 cm, and then again increases unevenly to 7.63% at the end of the soil profile. In the interfacial space, relative humidity gradually increases unevenly from 6.18% (10 cm) to 8.10% at a depth of 80 cm and then decreases to 7.25% at a depth of 120 cm and gradually increases to 7.61% . Humidity in all experimental soils in the center of drying out to a depth of 50 cm is higher by 28%, and in deeper horizons, by 6% less than in the interfacial space. Significant difference in moisture content in the center of drying out and in the interfacial space was noted in the upper 40 cm layer of soil ($t_{\text{the theor.0,05}} = 7,61–4,22$, $t_{\text{the theor.}} = 2,048$).

In deeper layers, this difference is not significant, and at a depth of 110-160 cm, the moisture content of the soil in the center of drying out and control is almost unchanged (see Fig. 3).

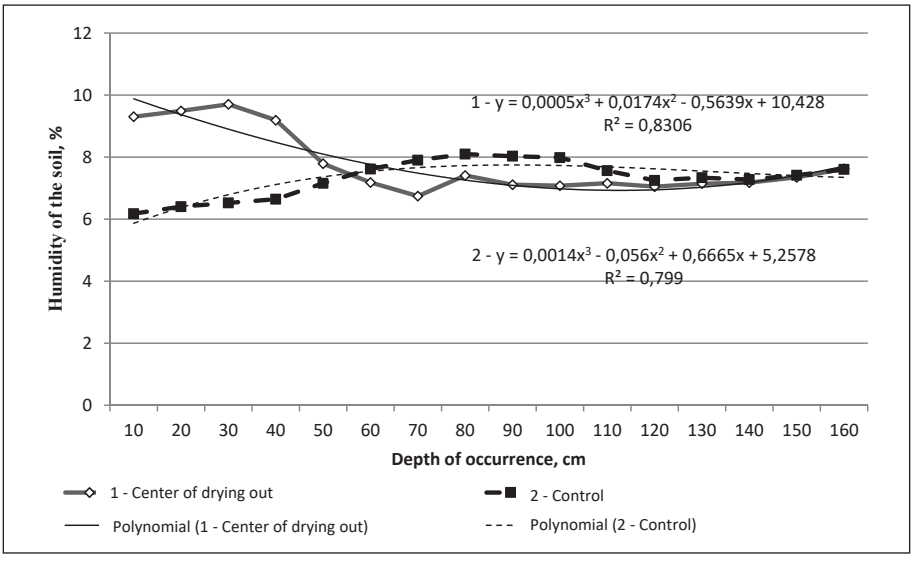

Figure 3
Humidity of the soil at different depths in sod-medium podzolic soils in medieval pine plantations affected by the root sponge.

The hardness of the soil layers depends on their moisture and mechanical composition, in particular, the contents of the muddy parts. The different hardness of the soil layers and the depth of the layers with the highest hardness values indicate, first of all, the water regime of one or another planting.

According to our research, the hardness of soil layers, both in the center of drying out of the crumbling, and in the interfacial spaces with depth increases. In the center of drying out of the root sponge, the hardness of the soil sharply increases to a depth of 50 cm in 2.4 times compared with the upper layer of soil (Table 4, Fig. 4). An increase in the hardness of the soil at this depth indicates the presence of a sealed layer. After a depth of 50 cm, the soil hardness gradually decreases from 12.5 kg / cm^2 to 11.5 kg / cm^2 at a depth of 80 cm, and then increases to 16.2 kg / cm^2 unevenly to the end of the profile. It should be noted that the hardness of the soil in the center of drying out of the root sponge throughout the profile is greater than that of the intermediate profile. Perhaps the reason for more hardness in the center of drying out of the root sponge in the conduct of selective sanitary felling, chipping sick and dry trees and their trailing from the area. In the interfacial space, the hardness of the soil increases uniformly from 3.4 kg / cm^2 (10 cm) to 16.0 kg / cm^2 (160 cm). At a depth of 140-160 cm, the hardness of the soil in the interocentric spaces is almost the same as the hardness in the center of drying out.

Significant difference in the hardness between the soil layers in the center of drying out of the damping and in the in interfacial spaces is noted in the upper 60 cm of the soil layer (tfact 0.05 = 6.70-2.25, $t_{theor.}$ = 2,048) and at a depth of 1 m (tfact 0 , 05 = 2.39, $t_{theor.}$ = 2.048) (see Table 4).

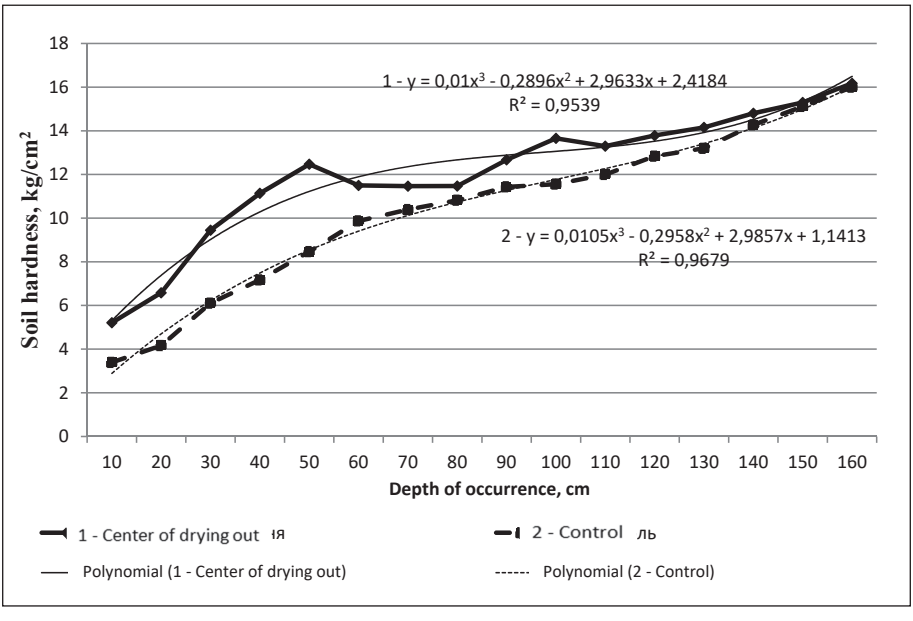

Figure 4
Hardness of soil at different depths in sod-medium podzolist soil in medieval pine plantations affected by root sponge.

Table 4 The soil hardness at different depths in the center of drying out and interfacial space of pine plantations in conditions of Volyn Polissya

Statistical Indicators	Depth of occurrence, cm										
	10	20	30	40	50	60	80	100	120	140	160
Center of drying out											
M –middle, %	5,2	6,6	9,5	11,1	12,5	11,5	11,5	13,7	13,8	14,8	16,2
± m – standard error	0,33	0,29	0,40	0,57	0,66	0,44	0,47	0,66	0,59	0,72	0,74
S – standard deviation	1,26	1,11	1,54	2,20	2,56	1,70	1,81	2,57	2,29	2,81	2,86
S^2 – sample variance	1,60	1,23	2,36	4,83	6,53	2,87	3,26	6,59	5,24	7,88	8,15
Excess	-1,24	-1,29	2,78	1,24	0,44	3,22	2,43	-0,38	-0,46	0,41	0,42
Asymmetry	0,40	-0,28	-1,73	-1,27	-0,69	-1,67	-1,68	-0,76	-0,79	-1,18	-1,06
Minimum	3,7	4,8	5,3	5,7	6,7	6,8	6,7	8,7	9,3	8,6	9,9
Maximum	7,3	8,1	10,9	13,3	16,0	13,2	13,1	17,4	16,5	17,6	19,3
n – number of options	15	15	15	15	15	15	15	15	15	15	15
Interfacial space											
M –middle , %	3,4	4,2	6,1	7,2	8,5	9,9	10,8	11,6	12,8	14,3	16,0
± m – standard error	0,18	0,21	0,36	0,39	0,58	0,56	0,54	0,58	0,51	0,64	0,59
S – standard deviation	0,69	0,81	1,41	1,50	2,25	2,16	2,08	2,26	1,98	2,46	2,29
S^2 – sample variance	0,48	0,65	1,98	2,26	5,06	4,65	4,34	5,13	3,94	6,07	5,24
Excess	-1,34	-0,34	0,53	1,46	-0,78	-0,70	-0,24	-0,37	-0,50	-0,39	-0,69
Asymmetry	0,43	0,04	-1,05	-1,23	0,18	-0,60	-0,52	-0,53	-0,61	-0,83	-0,63
Minimum	2,5	2,7	3,1	3,5	4,9	5,8	7,0	7,1	9,2	9,5	11,9
Maximum	4,5	5,5	7,8	9,1	12,5	12,9	14,1	14,9	15,7	17,1	18,8
n – number of options	15	15	15	15	15	15	15	15	15	15	15
$t_{fact\ 0,05}$	4,79	6,70	6,32	5,65	4,55	2,25	0,98	2,39	1,28	0,52	0,21

Note: $t_{the\ theor}$.. = 2.048; P = 0.05

A clearer idea of the possible influence of the water-physical properties of the soil on the condition of the plantations is given by the dynamics of the indexes of moisture and hardness, the magnitude of which is the proportion of these indices in the center of drying out of the loss of their size in the interfacial space (Fig. 5).

The dynamics of humidity indexes indicates a higher accumulation of moisture in the soil of the center of drying out, in layers of soil at a depth of 10-40 cm, in 1,4-1,5 times more than in the interfacial space.

The accumulation of moisture in the center of drying out in the upper layers of the soil (10-40 cm) is associated with a rarefied tent, where rainfall of any intensity enters the soil, is not retained by crowns and trunks of trees and is not used for

physiological processes, and also by more hardness of soil layers at a depth of 40-50 cm.

These compacted layers of soil delay the infiltration of moisture in the lower layers of the soil and contribute to the accumulation of moisture and concentration of root systems in the upper layers of the soil, which, in the conditions of abrupt changes in the hydrological regime, can reduce the stability of plantations, in particular to the root sponge.

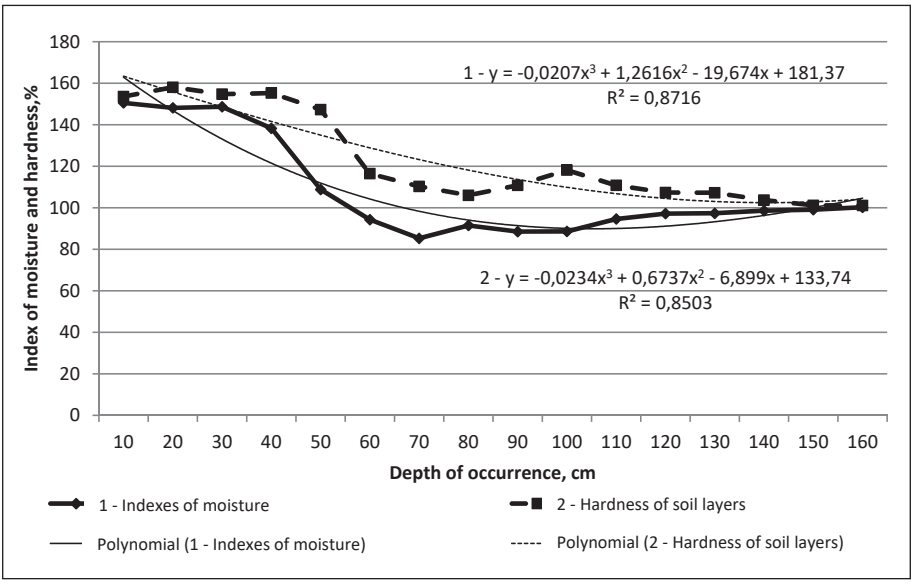

Figure 5
Dynamics of the indexes of moisture and hardness of soil layers (% in the center of drying out from the value in the interfacial space), depending on the depth of their occurrence

The dynamics of the indexes of hardness with depth indicates that in the centers of drying in comparison with the interfacial space in the upper layers of the soil (10-50 cm), the index of hardness is 1.5 and 1.6 times higher, which prevents the development of the roots in depth. Thus, the soils of the fouling centers differ significantly from the soils in the intercostal space with the increased accumulation of moisture in the upper layers of the soil (10-40 cm) and an elevated index of hardness, which undoubtedly affects the metabolism of trees that grow in these conditions. The increased hardness in the upper layers of the soil affects the migration of soil moisture to the ground and its distribution in the soil layers.

Analyzing the level of acid-base properties of the studied soils in the humus-eluvial horizons, it can be noted that in all investigated variants the acidic reaction prevails. However, in control variants, the degree of acidity is slightly higher than in

variants with root sponge. Thus, in variations with the root sponge it was 4.8 - 4.95, whereas in the control variants it was 4.55 - 4.95 (see Table 1). The maximum acidity values for the studied sod-podzolic soils are recorded in the upper horizons of the soil, which gradually decrease with the approach to the parent rock. The average values of acidity throughout the profile for all soil cuts in the center of drying out are 5.49 and 5.30, respectively (see Figure 2).

The results of the analysis in the row of soils studied showed that the humus content is very low (see Table 2). Thus, the average content of humus in them is 0.40% at a variation of values from 1.12 to 0.06%. The content of humus in the upper humus-eluvial horizons is the highest and is 0.48 - 1.12%.Down the profile there is a decrease in its content and an increase in elements of inorganic nature (mineral), which is associated with a fairly high level of water availability of soils and the genesis of soil-forming rocks. The soils in the foci of the root spider lesion are poorer in organic matter (humus) compared to soils in the intercostal space in P2 by 47%, P6-18%, and P9 - 8% (Fig. 6). Thus, in the humus-eluvial horizon in the soils of the Horodoksky forestry, the state enterprise «Gorodots'ke FH» in the Typological forest-based conditions (TFC) B2 in the center of defeat of the root sponge (P2-CDO) humus content is 0.48%, and in the intercostal space (P2-IS) - 0,54%; on P6-CDO the content of humus is 0.84%, and on P6-IS - 0.96%. In the humus and eluvial horizon in the soils of the Okunsky forestry, «Manevitsky FH» in the Typological forest-based conditions (TFC) B2-C2 in the center of defeat of the root sponge (P9-CDO) the content of humus is 1,02%, and in the inter-medial space variant (P9-IS) - 1.12%.

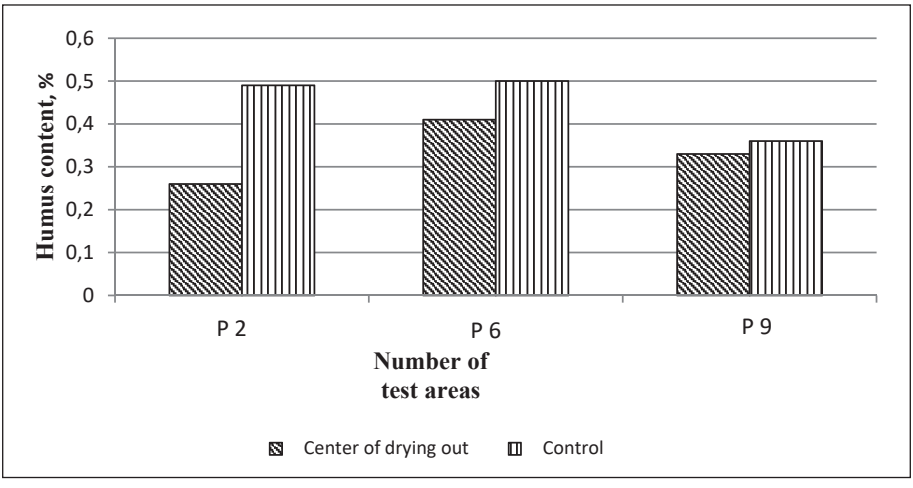

Figure 6
The content of humus in soils of pine plantations, affected and unaffected by the root sponge.

Comparing the soils with the index of the content of gross forms of the NPK, it can be stated that the content of nutrients in variants with root sponge is higher than in variants in the interfacial space, especially nitrogen (N) (Fig. 7). Thus, the content of total N on the average in Typological forest-based conditions (TFC) B2 in the center of drying out (P2-CDO) is 0.146%, P_2O_5 - 0.024%, K_2O - 0.108%, while the interfacial space (P2-IS) - N - 0.052%, P_2O_5 - 0.015%, K_2O - 0.096%.

At the P6-CDO the total N content is - 0,067%, P_2O_5 - 0,019%, K_2O - 0,034%, and the P6-IS – N - 0,052%, P_2O_5 - 0,023%, K_2O - 0,029%. In the Typological forest-based conditions (TFC) B2-C2 in the center of drying out of the root sponge (P9-CDO) the content of total N is - 0,051%, P_2O_5 - 0,016%, K_2O - 0,036%, whereas in the interfacial space (P9-IS) - N - 0.036%, P_2O_5 - 0.016%, K_2O - 0.034%.

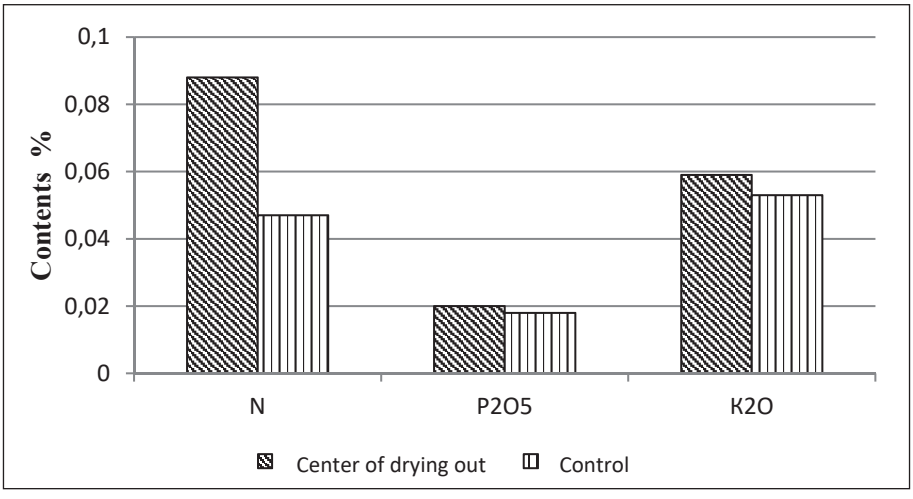

Figure 7
The content of common forms of NPK in soils of pine plantations, affected and unaffected by the root sponge.

DISCUSSION

The results of a number of authors suggest that in high-density pure plantations without timely tending felling, favorable conditions were created for the spread of the root rot due to the root splicing of closely-spaced trees (Ladeyschikova 2001, Vasiliauskas 2002, Ustsky 2011). Granulometric composition is an important genetic and agronomic characteristic of the soil, which is closely related to the properties of soil-forming rocks. The general physical and water-physical properties of soils depend on the granulometric composition: spatiality, moisture content, permeability, as well as air and thermal regimes, etc. Granulometric composition also determines the parameters of physical, chemical and agrochemical properties

of soils. (Kovalev 1998). According to the results of our studies of granulometric composition, there were no significant differences between the variants in the center of drying out and in the interfacial space - only 9% of interfacial spaces had less colloidal particles (< 0.001 mm) and physical clay (< 0.01 mm), and the physical content The sand is more than 1% (see Figure 1). Researches conducted in East Polissya Raspadin and others (2013), there were also no significant differences in the granulometric composition in the center of drying out and in the intercostal space.

Specific gravity (solid phase density) of the soil - the ratio of soil volume to the weight of solid particles, dried at a temperature of 100-105 degrees Celsius. Depending on the specific gravity of the soil, the presence of organic matter and mineralogical composition. According to (Sheina 2007), the proportion for most sandy soils is close to the density of quartz (2.65 g / cm^3). In the upper soils of the soil, it decreases due to organic matter - up to 2.50 - 2.60 g / cm^3. In iron ileuvial horizons it rises to 2.70 g / cm^3. In general, in the lungs, with granulometric composition of soils, the density of the solid phase is relatively small, varies in profile from 2.50 to 2.70 g / cm^3. According to the results of our research, this indicator varies from 2.51 to 2.68 g / cm^3. There were no significant differences between variants with root sponge and control (see Figure 2)

Our studies of water-physical properties of the soil in Volyn Polissya revealed a significant difference in the hardness between the ground layers in the center of drying out of the crust and in the interfacial spaces in the upper 60 cm of the soil layer and at a depth of 1 m. The increase in the hardening of the c center of drying out at this depth contributed to a significant accumulation Moisture in the upper layers of the soil (10-40 cm). Also, the accumulation of moisture in the center of drying out of the crust in the upper layers of the soil is associated with a rarefied tent where rainfall of any intensity enters the soil, is not retained by crowns and trunks of trees and is not used for physiological processes.

Studies conducted in Novgorod-Seversky Polissya by Ustsky I. M. (2011) show that the soils of the fouling centers differ significantly from the soils in the interfacial space with the increased accumulation of moisture in the upper layers of the soil (10-40 cm) and the hardness of the soil at depths of 80 and 150 -180 cm. It was concluded that center of drying out occur in pure monolayer crops of pine, created on agricultural land. In places where layers of soil at depths up to 1 m, have a much higher density and delay more moisture, which, after abrupt changes in water regime (intensive felling, drought, drainage), can cause root canal disease.

Tkachuk (2002) in studies in Zhytomyr Polissya, an increase in moisture in the surface layers of the soil, also binds to the presence of layers with a greater volume mass and hardness. They also mark a significant link between humidity and the number of healthy trees. The higher the moisture content of the soil at a depth of 25-75 cm, the smaller the number of healthy trees in the planting.

The accumulation in the soil of organic matter in the form of humus is of great importance, since humus serves as a reserve of nutrients, the gradual release of which in its process of decomposition is considered as one of the important factors of soil fertility sustainability (Kovalets 2007).

According to our results, soddy podzolic soils of light granulometric composition are characterized by very low humus content, which is also reflected in its reserves, which, according to the system of indicators developed by S.D. Orlov and L.O. Grishina (1981) is rated as very low. Low values of humus can be explained by washing type water regime and low saturation with clay particles, which resulted in significant loss of humus. Thus, the average content of humus in them is 0.40%. Thus, in conditions of a sufficient level of humidification, which is a zone of the Volyn Polissya, the reduction of the stability of plantations to their defeat by the root sponge may be due to the extremely limited level of trophy of the location, especially the low content of organic matter (humus).

CONCLUSIONS

The soils in the centers of annosum root rot disease are deficient in organic matter (humus) compared to the soils of the sites between the centers. At the same time, these soils are richer in nutrients (NPK). The particle-size distribution and specific gravity are almost identical for soils in the disease centers and between the centers.

Humidity in all experimental soils in the center of drying out to a depth of 50 cm is higher by 28%, and in deeper horizons, by 6% less than in the intercostal space. The hardness of the soil in the foaming areas throughout the depth of the profile is greater (especially at a depth of 50 cm) than in the intercostal space. Compacted layers on 0,5 m thick soil contribute to the accumulation of moisture and concentration of root systems in the upper layers of the soil, which, in the conditions of abrupt changes in the hydrological regime, can reduce the stability of plantations, in particular to the root sponge.

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CITY BRAND IMAGE: SEMIOTIC PERSPECTIVE A CASE STUDY OF PRAGUE

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Abstract
The article focuses on the analysis of the Prague brand image from the point of signs (symbols) that make it up and also of their links in relation to the recipients, as well as to the creators of their meaning. By means of the particular example of Prague we point at the fact that the "language" of symbols communicated by the city with its real and potential users is read and deciphered differently. The study shows the existing semantic differentiation between the three monitored groups of experts on tourism and branding: domestic (Czech) experts and two groups of foreign experts: from Slovakia (as a country with the strong mutual links based on the common history and persistent intensive contacts until now) and other countries of the world. Three groups of signs are analyzed in particular: (1) iconic signs - representing the territory as a whole, respectively reflecting the real form of the territory or its elements; they are its identical reflection, (2) indexical signs – in comparison to the previous ones they only indicate a causal relationship with the territory or its elements that refer to it (it is so called the derived relation) and (3) symbolic signs – a decryption of their meanings is the result of the convention because these signs usually do not indicate any direct causal link between the city and the symbol that represents it.

Key words
Iconic signs, Indexical signs, Symbolic signs, Semiotics, Brand Image, Prague

INTRODUCTION

A rapid increase of the product diversity not only in the retail but also in the previously non-commercial fields have led to the greater attention paid to the image and the brand of the products. Their undeniable importance in the sale has been demonstrated in many studies (for example Kotler, Keller 2007; Keller 2007; Smith 2005; Kotler, Armstrong 2004). In the 60's of the last century, the idea that the product image is even more important than the product itself appeared in the debates about the concept of branding and image. As for example Gardner and Levy claimed in their study from 1955, the higher attention should be paid to the

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product brand image than to the improvement of the product technical qualities, because the feelings about the products have in many cases the determing impact on the process of decision in the product choice process. Therefore, Hankinson (2015) assumes that the brands strategies should focus more on the emotional than the functional associations. These should be considered as the main competitive attributes of the differentiation.

The indicated shift of the marketing managers' attention from the product to its image and the brand building has also the impact on the territorial planning practice (Matlovičová 2015). The territory brand building and the attempts to influence its brand are the common part of the local government activities practically all around the world. Their work is supported by the number of expert studies that examine the process of the territory image creation and their brands in the target population. We had mentioned about it in the previous works (e.g. Matlovičová 2011; Matlovičová, Sovičová 2010; Matlovičová, Matlovič 2017; Matlovičová, Husárová 2017; Matlovičová, Matlovičová 2016; Matlovičová, Kolesárová, Matlovič 2016; Matlovičová, Kormaníková 2014; Matesičová, Kolesárová 2012b; Matlovičová 2011a; Matlovičová 2011b; Matlovičová, Sovičová 2010; Matlovičová 2009; Matlovičová 2008). The less attention of academics is devoted to the marketing communication research from the point of the signs (symbols) and their interconnection in relation to the recipients as the creators of their meaning. The indicated semiotic perspective is the main focus of this study. On the particular example of the Prague city, we point out that the "language" of the signs by means of which the city communicates with its real and potential users is deciphered differently.

DATA AND METHODS

In the case study, we relied on the results of the international expert interview performed on the sample of 59 experts from the Czech Republic, Slovakia, the Netherlands, the United Kingdom, the USA, New Zealand, Germany, Belgium, Finland, Greece, Poland, Austria, Russia, Sweden, Australia and Turkey in 2015. We interviewed 19 domestic (Czech experts), 17 Slovak, 16 from the other EU countries and 7 from the non-European countries. The reasons for the special definition of the Slovak experts were the strong mutual relations based on the common history and the persistent intense contacts until now. The assumption based on the above mentioned facts is that the Slovaks have the higher level of the interest in Prague and the Czech Republic as such, so their way of the city perception will differ from the other addressed experts.

In the interview, we used the open questions in which more than one sign could be mentioned by the respondents. For this reason, the mentioned percentages were converted to the appropriate number of the responses (not respondents).

THEORETICAL FRAMEWORK

The French philosopher Roland Barthes (1915-1980) contributed to the development of the semiotics as the scientific discipline, although the roots of some of its concepts date back to the ancient philosophy of Hippocrates, Plato and Aristotle (Matlovič, Matlovičová 2015). However, the most frequently cited author whose work is considered to be the basis of the structuralism is the Swiss linguist Ferdinand de Saussure (1857-1913), who pointed in the canonical work *"Cours de lin-guistique générale"* (1916) at the possibility to analyze the language as the formal system (Giddens 1999; Matlovič, Matlovičová 2015). He claimed that the meaning of the words is derived from the structures of its own language and not from the things to which the words relate. According to him, the language consists of the grammatical rules and meanings that are hidden behind the words (Matlovič, Matlovičová 2015). Saussure therefore supported the analysis of the language structures, i.e. the rules regulating them. Most of these rules are known implicitly and we cannot name them (Giddens 1999; Gallo 2004, Matlovičová 2015).

Semiotics is the theoretical scientific discipline that formed in the field of the linguistics. The subject of its interest is the variety of signs, symbols, signals, etc., i.e. everything that serves to the information exchange, understanding, communication (symbols, icons, indexes, symptoms, language signs, etc.). The main focus is put on the exploration of the origin, the significance and the way of the the sign systems application (Gallo 2004). The sign as the basic element of the system is not only the material object, but also its attributes (properties) or the material event (Gallo 2004). At the same time, it distinguishes the natural signs understood by everyone without the previous convention, and the artificial signs whose unified understanding of the meaning is the result of the consensus (Gallo 2004).

The main of the semiotic approach application in the city branding is the perception of the target groups of the city's customers as the active creators of the meaning. In other words, the "consumers" of the territory are perceived as the active recipients of the important information messages (Matlovičová 2015). The emphasis is shifted to the content, the context as well as to the way by means of which the symbol is "read" (Fiske 1990 in Smith 2005). The content of the information consciously or unconsciously transmitted or the messages of the significance of the city brand are projected by menas of the set of the cultural codes and then transmitted via the various channels and transformed into the image of the territory brand image (Matlovičová 2015). The recipient acquires them on the base of the process of decoding, selection, respectively addition (e.g. prejudices) of the originally transmitted message content (Matlovičová 2015). According to Ashworth and Voogd (1990), the stages of the coding and decoding are related to the semiological systems by means of which the more important attributes of the brand are associated with the specific feelings or states of mind.

Burgess and Wood (1988), for example, has deciphered the advertising messages promoting the territory of the London Docklands by the identification of the three types of signs (symbols) contained in the ads:

- Iconic Signs that can be considered as the representative, respectively the reference or the reference to the territory as a whole (Ashworth, Voogd 1990; Bignell 2002). In other words, there is a real similarity between the symbol and the reality because they represent exactly what we see (e.g. the photo of the city or the silhouette of Bratislava Castle as the reference to the capital of Slovakia, the Eiffel Tower as the symbol of Paris);
- Indexical Signs that indicate the causal relationship or the context to the recipient. The sender is not arbitrarily designated but he is directly (physically or causally) associated with the recipient. By means of this connection, the causal relationship or association is either observed or implied (Ashworth, Voogd 1990; Bignell 2002). The city's registration signs are not the identical image of the city, but their display preserves in some way the connection to the territory they refer to (the derived context). For example, the silhouette of the crown as the reference to the Buckingham Palace, respectively to London as the seat of the sovereign;
- Symbolic Signs - by means of which the objects can indicate the association of a wide range of activities, mind states or lifestyles. (Ashworth, Voogd 1990; Bignell 2002) There is no similarity or hint between the city and the symbol that represents it. The fact that we associate some sign with the particular territory is the result of the convention. We cannot decipher the symbolic sign intuitively but we must learn them. For example, we have learned that a red square divided by the white cross into four parts refers to Switzerland.

The socio-psychological mechanisms by means of which they occur are in this case outside the scope of interest. From the point of view of the city promotion, it is essential that senders and recipients have the same semiotic responses to the given sign or signs (Ashworth, Voogd 1990). The symbolic signs depend primarily on their successful transfer to the set of the shared cultural values. Therefore, when designing the brand of the territorial subproducts, the caution by the sign selection is neccessary. There is the danger of a decryption process blocking, of a possible misunderstanding of the message caused by the improperly chosen codes (Ashworth, Voogd 1990). The misunderstanding may stem from the difference between the recipient culture and the sender, where the message sender implicitly assumes that the recipient uses his cultural reference framework to decrypt the message (Ashworth, Voogd 1990). For example in China, the number 8 is the symbol of happiness, wealth and success, while for example most of the Czechs and Slovaks consider the number 7 to be happy. Conversely, while the Chinese will consider the number 4 as the symbol of the misfortune, in the Czech Republic and Slovakia

the number 13 is considered to be such a numeric symbol. In the theory of the marketing, the risk of the communication message misunderstanding by means of the advertising symbols is described in the definition of the so-called external marketing macroenvironment. It is more conceptualized in the factors of the cultural environment whose differences are considered to be relatively hiddenly affecting traps influencing the business activities in the different environment (Matlovičová 2015). Besides the cultural differences at the global level, the differences present also in the areas of the lower hierarchical levels are mentioned. For example, there are so-called subcultures in one culture for which the different semiotic responses can be expected in relation to the chosen signs (Matlovičová 2015).

The above-mentioned classification can be also applied in relation to the logo used as the visual abbreviation referring to the relevant territory. In this case we think about the logo in the narrower sense, referring to the territories of different scales and we abstract it from the text that in many cases complements the graphic and it is not the basis of it. Each logo is the specific semiological system by means of which its creators (the representatives of the territory) communicate the chosen message of the meaning in relation to the target audience. The character of the encoding and decoding process depends on the type of used signs:

- Iconic Logos consist of the signs (of a graphics sometimes completed by the textual part) that somehow reflect the existing elements of the territory or eventually its real form. For example, the logos of Paris depicting the Eiffel Tower or the French logos using the landscape map as the basis.
- Indexical Logos are graphically processed by the system of signs that indicate the causal relationships and connections. They do not contain any graphic elements that represent the real form of the existing elements of the territory, but the recipient decodes them on the base of the derived connection. To this group, we can also include the logos in which the text referring to the territory is graphically processed. For example, the Prague logo (Figure 1)
- Symbolic Logos are based on the semiotic systems, the features of which have no visual or causal link to the territories they refer to. The decoding of their content is the result of the convention. The message they represent cannot be deciphered intuitively. For example country logos based on their flags (e.g. Switzerland, Czech Republic, etc.).

Figure 1
Prague logo
Source: Praha (2017)

If we approach the brand from the semiotic perspective, then its perception can also be seen from the point of view of the function and meaning as

- a differentiation tool enabling to distinguish the product from the other generic products;
- a sign of the specific function (e.g. control, notification);
- a symbolic designation (e.g. for some values, like the Swiss flag as the quality symbol or heart as the symbol of love);
- a sign of area control where the symbols can coordinate the activity (e.g. to guide the movement in the area by means of the prohibiting and commanding traffic, tourist and other traffic signs; Siwek 2011, p. 87) or define a certain area (e.g. the minority language, bilingual signs and other; Matlovičová 2015);
- a risk reduction sign where the brand can symbolize the less extent of the uncertainty by selection (e.g. if the experience is linked to it, i.e. it refers to the product whose purchase reduces the risk and uncertainty of the reduced efficiency, financial, timing, social or psychological risk (de Chernatony 2009);
- a means that shortens the writing and used because of the time savings in the communication (e.g. various abbreviations, characters, stenographic symbols, etc.; Matlovičová 2015);
- a juristic abbreviation, respectively a trademark referring to the protected designation® registered at the appropriate industrial or intellectual property office;
- finally as a strategic tool understood in the context of the consciously created and formed complex entity that is the subject of the planning (de Chernatony, McDonald 2003).

The semiotic view on the image of the territory's brand interprets its formation on the basis of its so-called iconic elements that carry the associative properties. The icon as the general reference can be related to the person or to the thing that we perceive as the symbol of something, but in the semiotic perspective its meaning in the sense of the diminished and simplified form of what it represents, imitates or copies, is emphasized (Kotler et al. 1999). In the marketing of territories, the icons are received as the certain visual symbols of the territory and they refer to the well known locations or significant landmarks in the country (Kotler et al. 1999). In many cases, however, the symbol is similar to what it represents only in some significant features. Therefore, it is not the perfect copy of the displayed object, but merely the symbolic expression of its most important features on which the strategy of creating the associations with the territory is based.

Perhaps the most important symbol used in the branding is the logo. This is the distinctive visual feature that works in the context of the environment to evoke the brand's vision in the mind of the observer, to stimulate the observer's personal experience, and to enhance this experience in the preparation for the next meeting (Healey 2008). However, the logo is not the brand, but only the abbreviation of the

brand (Matlovičová 2015). First of all, the essence of the brand is created before the logo - although in practice, it is, unfortunately, often vice versa. The logo itself is only the sign that gets its meaning only during its existence, thanks to the stories and experiences that are created in connection with it (Healey 2008). The logo as the very simplified visual symbol of the selected territorial identity attributes can fulfill three functions: it can create the territory awareness, it can initiate the recognition and it can activate the already stored image in the mind. (Dowling 2002) Its design can therefore be approached from the semiotic perspective as the communication symbol representing the meaning (e.g. it can be formed by the word(s), by the symbol or by their combination in the different color combinations). Its graphic design has usually the character of the very simplified abstraction, drawing or graphic (Warnaby, Medway 2010) that may have the form of the iconic, the registration or even the symbolic sign. Whatever the logo is, it is always important that the result effect has an intended influence on the customers (Matlovičová 2015).

The city image in relation to the objectively existing reality in the cities can be generally described as its partially simplified, distinctive and distorted image (Matlovičová 2015; Matlovičová, Husárová 2017; Matlovičová, Mihál' 2017). As reported by Ashworth and Voogd (1990), the consensus of the image with the objective reality can be on the spectrum from the over-simplification in the form of stereotypes, through the systemized images reproduced as the myths, and to the changes in the insensitive and the relatively stable notions - prejudices. In the process of the building of the city brand image, it is important to pay attention to the process of the generalization and the distribution of such specific ideas in the target audiences of the territory and, if possible, to influence the extent of this distortion (Ashworth, Voogd 1990; Walmesley 1988; Allport 1979).

RESULTS AND DISCUSSION

The iconic signs perception of the Prague brand

The most commonly perceived iconic signs of the city brand are in some way the specific and significant elements of the region, such as buildings, bridges, buildings, rivers, lakes etc. These so-called flagship regional brands gain the widespread attention and they help to differentiate the city from the other similar places. Regardless of the fact whether they are viewed in the isolation or as the part of the others, they are the important differentiation elements for the region and they are the holders of the associative characteristic (Warnaby, Medway 2010). In our expert survey, we focused on their identification and we submit them to the further exploration on the example of the Prague brand.

For the dominant iconic signs of the Prague brand, two signs were identified by the mentioned group of the experts: Charles Bridge, which was considered by 37% of experts as the flagship and the Prague Castle, together with the Castle

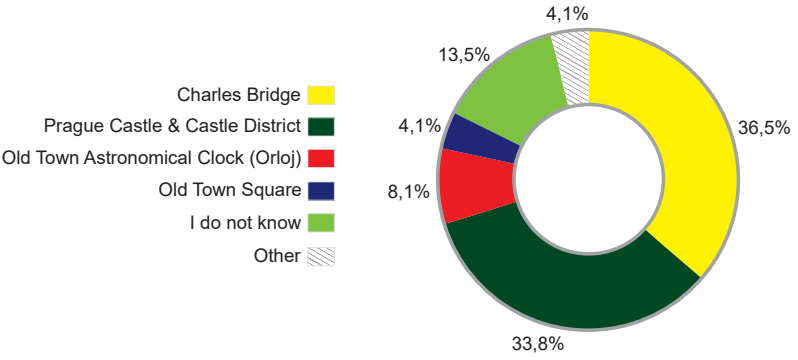

Figure 2a
Iconic signs perception of the Prague brand
Source: author's own research results (expert interview)

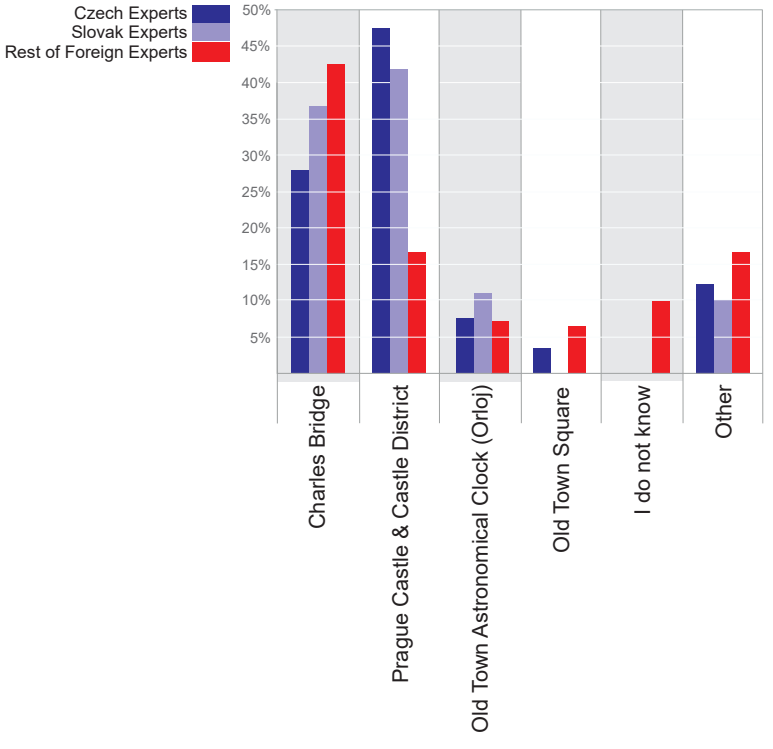

Figure 2b
Iconic signs perception of the Prague brand
according to the country of the origin of the expert interviewee
Source: author's own research results (expert interview)

District (Czech: Hradčany), which was marked by 34% of them (Figure 2a). Among the other icons of the city mentioned by the respondents, we can mention the Old Town Astronomical Clock (Czech: Orloj) (8%) and the Old Town Square (4%). (Tirpakova 2015)

However, the more detailed view on the semiotic response of the respondents reveals some differences (Figure 2b). While the domestic experts perceive the Prague Castle and the Castle District as the most intense (48%), Charles Bridge resonates as the dominant icon of the city (43.3% makes the connection with the city) for foreign experts. Slovak experts' answers were more balanced, with the slight predominance for the Castle District. It is also worth mentioning that the foreign experts perceived the Prague Castle as the separate visual element, while the Slovak and the domestic Czech experts perceived it primarily in the context of the wider region, as the whole complex of the historical town the Castle District. (Tirpakova 2015)

Other significant image-forming elements have been also mentioned, e.g. The Vysehrad, The Wenceslas Square, The Josefov Jewish Quarter, the historical city center, The National Theater, The Church of Saint Nicholas. (Tirpáková 2015)

The indexical signs perception of the Prague brand

Indexical signs in comparison to the previous group of signs make reference to the city indirectly, i.e. they preserves a certain derived correlation to the region. It is not the identical city image, but the link - the causal association to the city - is preserved.

In our survey we examined the intensity of the associations to the Prague brand by means of the set of the characters contained in the films. Beside the photography or other static forms of the graphic visuals, the full-length movie creates the set of frames and the most diverse images which are artistically designed into the form shifting out of the reality (sometimes to the larger extent). However, some movies represent the indexical signs to the higher extent. These are mainly the films that refer to the city only indirectly - they were filmed there. In some movies filmed in the artificially created interiors or exteriors located in the particular area, there can be only the symbolic connection with the city - by means of the place of the filming (otherwise it does not refer to the city). In this case, the viewer cannot intuitively decipher the connection with the city. The mentioned reflection shows that it is sometimes difficult to categorize the filmmaking from the point of view of the above mentioned typology because the individual works offer several interpretative perspectives and often also the overlaps between the above-mentioned categories of the signs.

However, the mentioned difficulties do not have the influence on the potential impact of the film production on the recipient. The film industry is one of the most

effective forms of the marketing communication what has led to the establishment of the entire film industry and consequently the numerous film production centers in the world.

Prague is considered to be the favorite place for the filmmakers. Several internationally famous personalities have worked here since the beginning of the film industry (e.g. actress Heda Lamarr). In the 1930s, Barrandov studios that belong to the oldest and the largest one in Europe were opened there (Tirpáková 2015). There also several famous directors have worked (e.g. Miloš Forman, Jiří Menzel). The film producers from Europe, Asia and America often use the Prague architecture for the movies making, but often also the cheaper compensations for the portrayal of the other cities, for example London, Paris, Rome, Vienna, Venice, Zürich or Miami (Tirpáková 2015). The most famous films of the last 40 years filmed or played in Prague include: *Amadeus (1984), Kolya (1996), Mission: Impossible (1996), Les Misérables (1998), From Hell (2001), The Bourne Identity (2002) , The League of Extraordinary Gentlemen (2003), Shanghai Knights (2003), The Prince & Me (2004), Lovers in Prague (2005), The Illusionist (2006), Casino Royale (2006), Hannibal Rising (2007), The Chronicles of Narnia: Prince Caspian (2008), Mission: Impossible - Ghost Protocol (2011), Somewhere Only We Know (2015)* or serial like *The Musketeers (2013)* and *Crossing Lines (2013*). The organization PCT (Prague City Tourism) and the Czech Film Commission edited the Prague Film Locations Map in 2015 where the most famous films were shot (Prague Film Location Map 2015; Tirpáková 2015).

Besides the positive impact on the city brand image, it is also necessary to mention the opposite - the negative impact in relation to the film industry. Specifically, it is the documentary film *Prague Scam City* by the National Geographic based on the pre-set situation which depicts the Czech capital city in the negative light. Despite the police findings that there were pre-paid figurants, enterprises and taxis, the document can be considered as the communication tool that used them as the certain registration signs in relation to the relationship viewer - Prague (Pravda 2013 in Tirpáková 2015).

In our group of experts, three films have reached the highest level of the association with the Prague: *Mission: Impossible (20%), Amadeus (16.9%)* and *Casino Royale (15.4%).* In addition to the above films, we identified the link to the city also with these films: *The Illusionist (6.2%),The Sinful People of Prague (4.6%), Lovers in Prague (4.6%), The Unbearable Lightness of Being (4.6%) , Les Misérables (3.1%)* and particularly also with the films such as: *Kolya, The Prince & Me, Pan Tau, DodgeBall: A True Underdog Story, Wanted, Casablanca*, that we included into the category Other (13.8%). 10.8% of the respondents were unable to mention any films associated with Prague (Figure 3a). (Tirpakova 2015)

The analysis of the expert opinions according to the country of their origin showed the following differences (Figure 4b). The domestic Czech experts pre-

sented most often the association connected to the biographical film by the Czech director Milos Forman *Amadeus* (26.3%), the Slovak experts *Mission: Impossible* (27.2%) starring Tom Cruise and foreign *Casino Royale*; Figure 3b). (Tirpakova 2015)

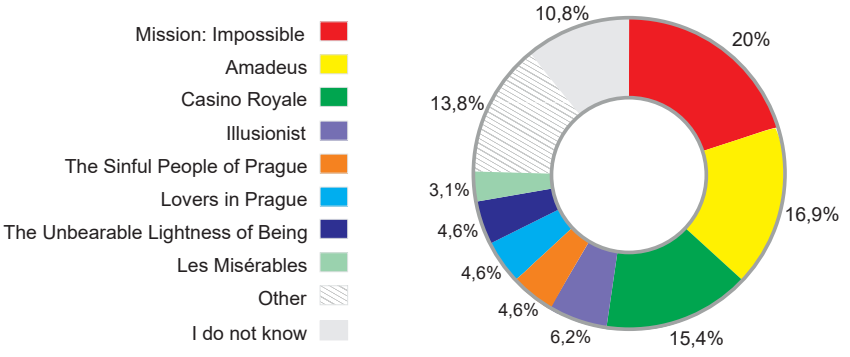

Figure 3a
Film production associated with the Prague brand
Source: author's own research results (expert interview)

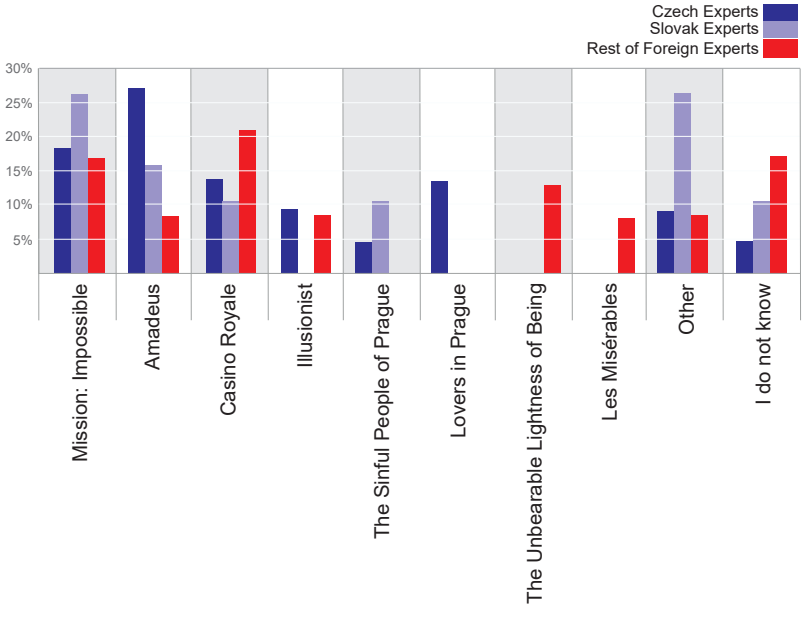

Figure 3a
Film production associated with the Prague brand
according to the country of the origin of the expert interviewee
Source: author's own research results (expert interview)

The symbolic signs perception of the Prague brand

The symbolic signs indicate the connection with the city only indirectly. The identification with the region is possible on the basis of the derived coherence. The intuitive decoding of the signs system is usually not possible. In our survey, we interviewed the experts on the personal associations with the Prague city. We divided the survey into two parts: the associations with the historical personalities and the associations with the famous personalities who are still alive.

In the first case, the most dominant association with the Prague city brand was absolutely the figure of the Czech King and Roman Emperor *Charles IV.,* for almost 40% of the respondents (Figure 4a). Among the most frequently mentioned personalities associated with Prague belong also the president *Václav Havel* (21.1%) and the writer *Franz Kafka* (15.8%). The other personalities we identified as much less significant symbolic signs of the city brand are: *Rudolf II.* (7.9%), the theologian *Ján Hus* (3.9%) and some other that we included into the category Other (9.2%). For example, there were mentioned: *Tomáš Garrigue Masaryk, St. Wenceslaus, St. Libuše, Albert Einstein*. (Tirpáková 2015)

We noted the less significant differences in the city associations to the historical personalities among the experts according to the country of their origin at *Franz Kafka* who was identified particularly by the foreign experts as the symbol of the city (29.7%) and *Rudolf II.* who was identified only by the Czech experts (Figure 4b). On the contrary, in the person of *Václav Havel*, the ratio of the responses was the most balanced. For the Slovak respondents, the top personal association with Prague was the person of the Czech King and Roman Emperor *Charles IV.* (Tirpáková 2015)

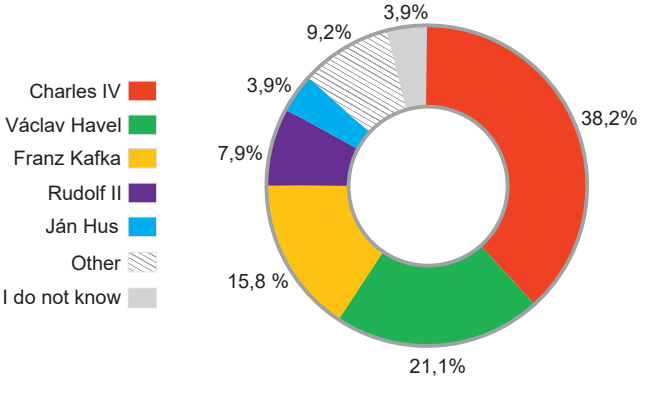

Figure 4a
Historical personalities associated with the Prague brand
Source: author's own research results (expert interview)

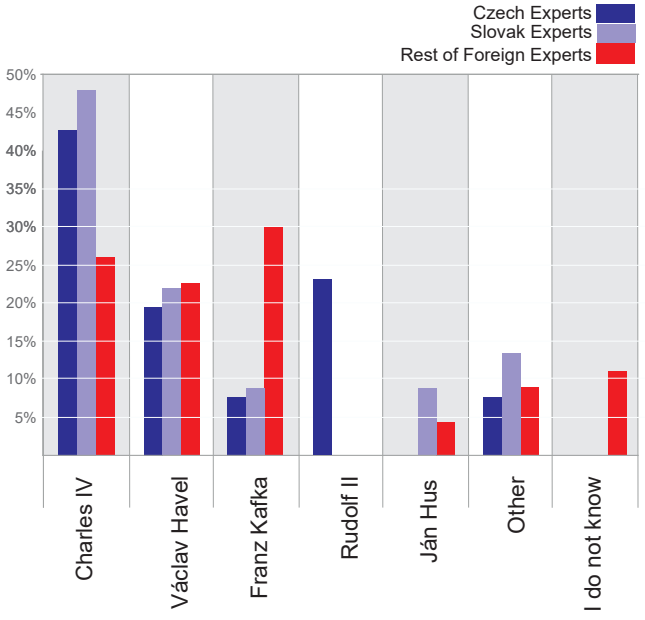

Figure 4b
Historical personalities associated with the Prague brand according to the country of the origin of the expert interviewee
Source: author's own research results (expert interview)

We have identified the lower degree of the the association explicitness within the contemporary personalities associated for the respondents with Prague (Figure 5a). Among the most frequently mentioned personalities with the high media publicity were the former president *Václav Klaus* (11.5%), the hockey player *Jaromír Jágr* (9.8%), the singer *Karel Gott* (9.8%), the mayor of Prague in 2014–2018 *Adriana Krnáčová* (8.2%), the current president *Miloš Zeman* (8.2%), the football goalkeeper *Petr Čech* (4.9%), the actor and moderator *Marek Eben* (4.9%), the photographer *Jan Saudek* (4.9%), the director *Zdeněk Svěrák*, the rector of the Charles University *Tomáš Zima*, the former mayor of Prague *Pavel Bém*, the tennis players *Petra Kvitová* and *Martina Navrátilová*, the writer *Milan Kundera* and others. 13% of the respondents did not mention any current personality associated with Prague, while all of these experts were from abroad (Figure 5b). The Slovak experts mentioned mainly politicians, specifically *Václav Klaus* (31.6%) and *Miloš Zeman* (21.1%). The mayor of Prague in 2014-2018 (when we realized the survey) *Adriána Krnáčová* was the most frequent response of the Czech experts (26.3%). If ever the other experts from abroad mentioned some personalities, the most of them were the athletes as *Jaromir Jagr* (26.1%), *Petr Cech* (13%) and *Petra Kvitova* (8.7%). (Tirpakova 2015)

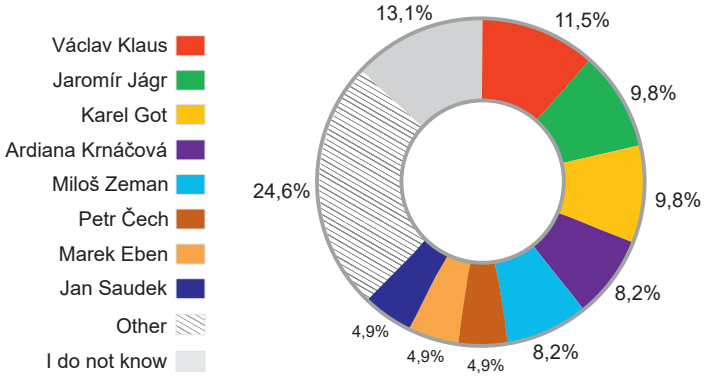

Figure 5a
Living well-known personalities associated with the Prague brand
Source: author's own research results (expert interview)

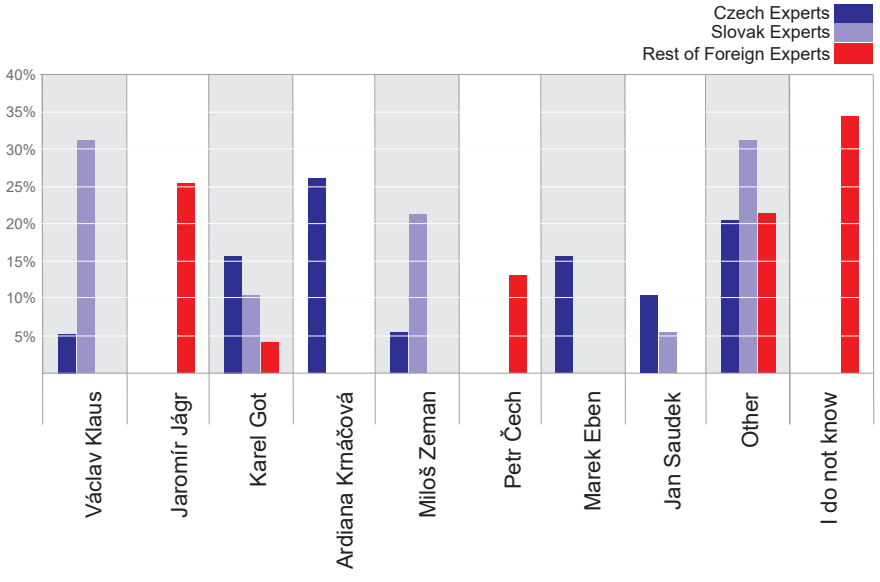

Figure 5b
Living well-known personalities associated with the Prague brand according to the country of the origin of the expert interviewee
Source: author's own research results (expert interview)

The other symbolic signs of the Prague brand that we identified in our survey included the set of the products that the interviewed experts associate with Prague. It were the so-called product associations belonging to the Prague brand. Some of the mentioned products (e.g. *Prague Ham, Bohemia Crystal*) indicated the higher degree of connection, respectively the causal relationship to the city area

by means of their branding explicitly referring to Prague or the Czech Republic and therefore their inclusion among the symbolic signs is to certain extent disputable. However, we mention them there because of their logical interaction to the product association category with the Prague brand.

On the base of the numerous studies devoting to the research of the impact of the declared place of the product origin on the customers, it is accepted currently that the brands of the country of the origin are affecting the image of the product labeled by means of the the "Made in" label. The intensity as well as the direction of the impact of the activity are different, but most often it is bilateral (more in Matlovičová 2016).

In our survey we found out that the spontaneous knowledge of at least one product that is associated with Prague by the respondents was successful in the two thirds of the respondents. Both of the mentioned by them - the beer and the *Prague ham* - had 17%. *The Bohemia crystal* was in the third place. A surprising finding was the connection of Prague with the Russian dolls - *Matrioška* - the set of the wooden dolls of the decreasing size placed one inside another, depicting a girl in the Russian national dress most often. It is the traditional symbol of Russia. Their considerable presence in the souvenir shops has created their unintended (and probably also undesirable from the point of view of the marketing managers of the Prague brand) link on Prague and the Czech Republic as such. Besides the stated products there were also mentioned: *Infant Jesus of Prague, trams, dolls, a large number of the tourist guides* that were - because of their low frequency - included into the graphical presentation into the category Other (6.8%). For the completeness, it is necessary to say that up to 34% of the asked experts did not know to name any product that would symbolize Prague (Figure 6a). (Tirpakova 2015)

The analysis according to the country of the origin of the respondents showed a significant difference. While the foreign experts mostly associate Prague with the

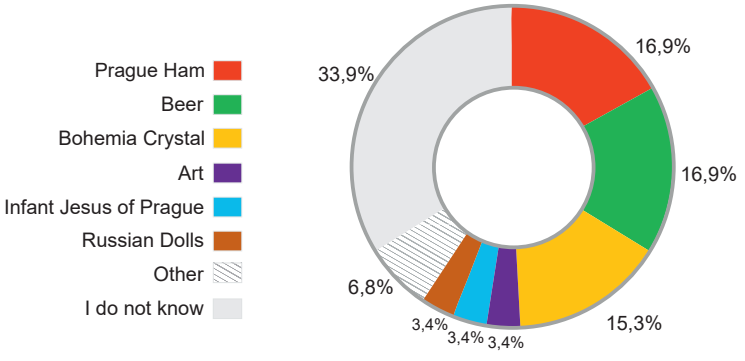

Figure 6a
Symbolical signs perception of the Prague brand
Source: author's own research results (expert interview)

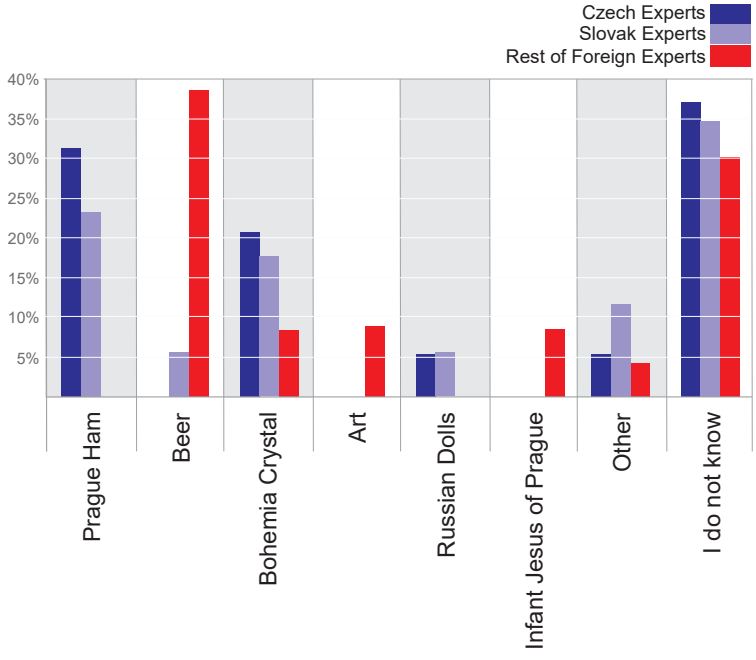

Figure 6b
Symbolical signs perception of the Prague brand
according to the country of the origin of the expert interviewee
Source: author's own research results (expert interview)

beer (39.1%), the domestic Czech experts mentioned especially the *Prague ham* (31.6%). The Slovak experts most frequently mentioned these answers - the *Prague ham* and the historical monuments (23.5%; Figure 6b). (Tirpakova 2015)

We paid the specific attention to the ability verification of the Prague logo - as the specific symbolic set of the signs created for the needs of the marketing communication - to communicate its openness intended by the creators towards the foreigners. The authors attempted to achieve this goal by the graphically processed visual with four language mutations of the Prague city brand using the Latin characters (Figure 1). In this context, it should be noted that 20.3% of the experts met the brand at the time of our interview for the first time (specifically only the foreign experts). The results of the survey showed that the graphic design of the logo achieved the stated aim - it is according to more than the two thirds of our experts (Figure 7a). In this case, the domestic (Czech) experts evaluate the chosen features of the semiotic system as the most favourable. Only 15% of them evaluate the logo in relation to the goals as unsuitable or rather unsuitably chosen. The foreign experts had the least favourable attitude, with the negative response rate of 48% (Figure 7b). (Tirpakova 2015)

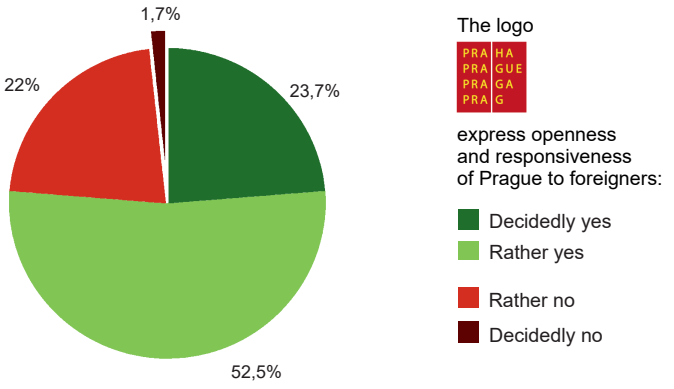

Figure 7a
Prague brand ability to communicate openness
and the responsiveness towards foreigners
Source: author's own research results (expert interview)

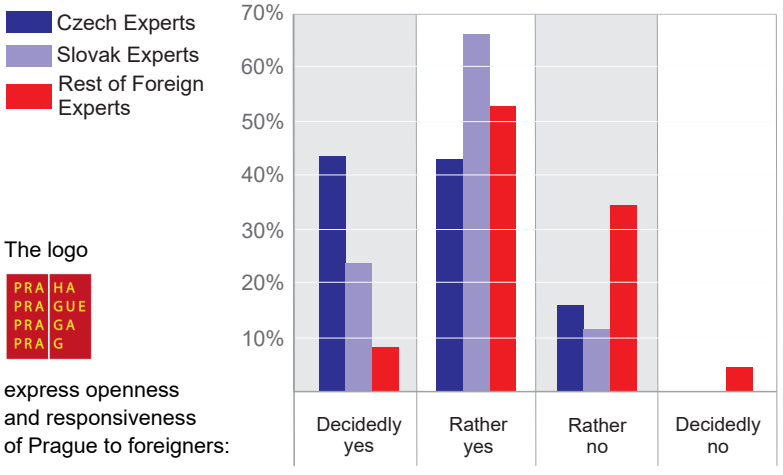

Figure 7b
Prague brand ability to communicate openness and responsiveness towards foreigners
according to the country of the origin of the expert interviewee
Source: author's own research results (expert interview)

CONCLUSIONS

The main aim of our survey was to identify the main elements of the semiotic system of the Prague brand. The realized survey has shown that there are differences in the perception of the city brand among the domestic and foreign experts. One of the ways how to identify them is to reveal the primary associations linked to the examined territory, the so-called top-of-mind associations that represent the

initiators of the spontaneous association with the city. In other words, these are the components of the city brand image that come to the mind in the confrontation with the Prague notion as the first.

In our survey, almost the quarter (23.2%) of the 59 asked experts on the tourism and the branding identified as the first association coming to their mind when confronting the Prague notion some of the iconic signs and they mentioned particularly the *historical monuments* (the Charles Bridge and the Prague Castle). Under certain circumstances, we could also add the dominant *elements of the architecture* to this group that were identified by 5.8% of the respondents. The most numerous primary associations included the symbolic designation - *The Capital City* (23.2%), referring to the city as such (Figure 8a). In the category Other (14.5%) associations like *Vltava*, *the city tourism, a city similar to Vienna, a royal city, an affordable destination, a city near Dresden* are included. (Tirpakova 2015)

We found out some differences when looking at the experts' opinions according to their country of origin (Figure 8b). The Slovak and the Czech experts stated the most frequently these answers - *The Capital City of the Czech Republic* (36% -37%) and the specific *historical monuments* (29.4% of all Slovak respondents' answers, 36.8% of the Czech respondents' answers). Some specificity was reported only by the Slovak and Czech respondents and it was the association on the attribute the *City of One Hundred Spires* (23.5% of the Slovak respondents' answers, 15.8% of the Czech respondents' answers). This three associations had dominant role for the domestic and the Slovak experts. We can not speak about the significantly dominating association at the foreign experts. Their responses showed the greater rate of the variance. For the top-of-mind associations of the foreign experts in our survey, we can indicate the following answers:*the history* in general (15.1%), the historical monuments, a beautiful city, the architecture in general and the beer (approximately 12.1% for each of them). (Tirpakova 2015)

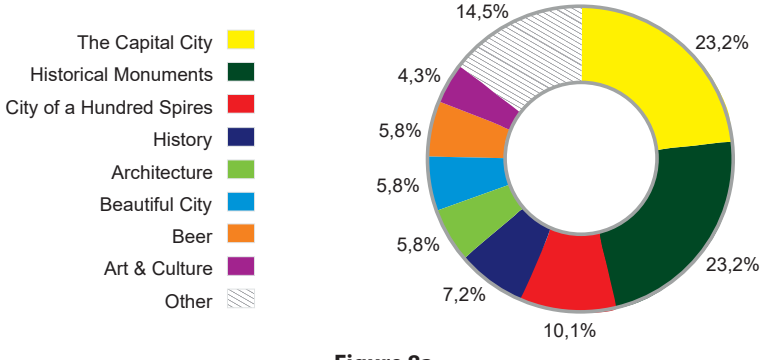

Figure 8a
Top-of-mind associations connected to Prague brand
Source: author's own research results (expert interview)

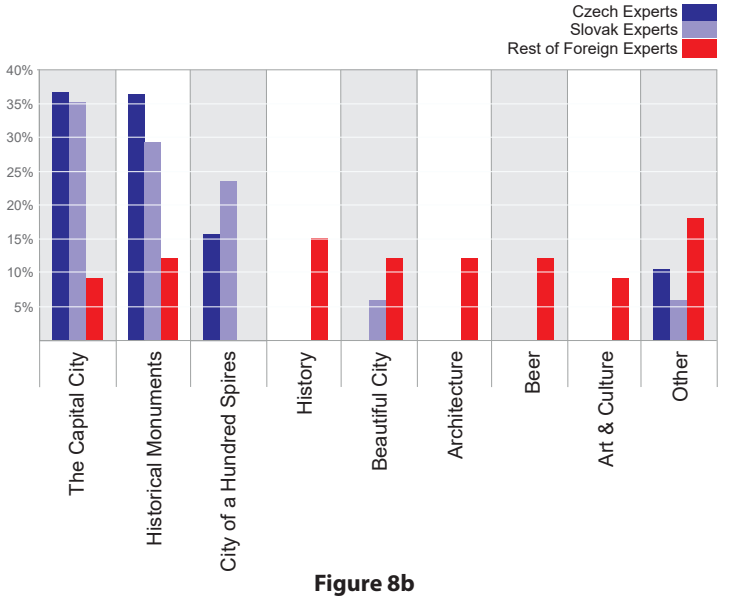

Figure 8b
Top-of-mind associations connected to Prague brand
according to the country of the origin of the expert interviewee
Source: author's own research results (expert interview)

In our survey, the iconic top-of-mind associations with Prague were already in the majority (39.1%; Figure 9). The asked experts mentioned specifically the historical monuments and the elements of architecture. Somewhat smaller group was represented by the group of the symbolic signs (34,8%) within which the Prague branding as *The Capital City* and also *the beer* strongly dominated. The least numerous group was the group of the indexical signs (11.5%) where the responses were significantly various. (Tirpakova 2015)

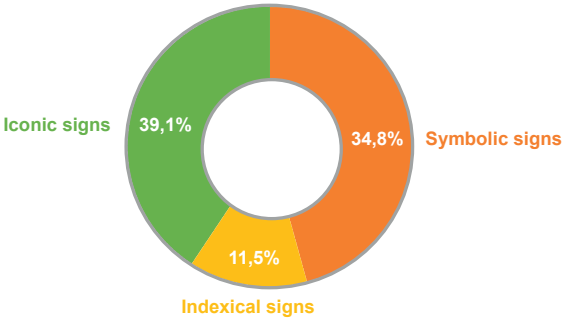

Figure 9
Top-of-mind associations connected to Prague brand
Source: author's own research results (expert interview)

Finally, we can state that the Prague brand has the significantly expressive iconic and symbolic whose potential for the use within the marketing activities is definitely not exhausted. Their subsequent semiotic analysis showed that there are the existing significant differences in the process of their decryptio among the asked domestic and foreign tourism and branding experts.

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NITROGEN AND PHOSPHORUS TRANSPORT IN THE SOIL FROM THE POINT OF VIEW OF WATER POLLUTION

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Abstract
Soil functions are very important parameters of soil quality. The transport soil function plays a dominant role in terms of transport and accumulation of substances in a vertical and horizontal direction in the soil. The aim of this paper is to evaluate the soil transport function on the base of present knowledge of nutrients (nitrogen and phosphorus) transport in the soil. The soil transport functions were classified in five categories: (1) very weak, (2) weak, (3) moderate, (4) strong and (5) very strong. By this way is known from which localities can come the possible risk for water pollution. Moreover, it is very important at observance of the Nitrate Directive. The farmers can harmonise the nitrogen fertilisation with the soil categories. The result of this paper is the creation of the areas of individual categories of soil transport function in agricultural soils in Slovakia according to the soil transport function information. In case of nitrogen, more than 88% of the area of agricultural soils belong to the categories with very weak, weak and moderate transport. To these categories belong the deep soils (more than 0.6 m depth) with neutral soil pH and sufficient content of high quality organic matter, without the gravel in their horizons, which are located on the plains especially on warm south-west and south-east parts of Slovakia. The strong and very strong nitrogen transport is detected only in 11.4% of the soils in Slovakia. In case of phosphorus, in 73% of agricultural soils was recorded very weak, weak and moderate transport. In almost 27 % was recorded strong and very strong phosphors transport. To these soils belong shallow soils (less than 0.3 m depth), acid soils with low quality humus and with high content of gravel, which are located in alpine region mainly in northern parts of the country. In these localities can come to increased content of phosphorus in the water bodies and thus also to a decrease in water quality. Generally, soil transport function has extraordinary

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importance in term of water resources protection. The more pollutants are transported from the soils, the bigger is the danger to pollute the water.

Key words
soil transport function, nitrogen, phosphorus, water pollution

INTRODUCTION

Soil and water belong to the main subsystems of environment. The soil is determining factor for both water and cycles of biogenic elements and satisfies the basic human requirements, e.g. both food and fibre production. Both soil and water is the substance of biosphere, which is the most wide-spread matter on the Earth. They have first-rate meaning for human nutrition ensuring. The soil can pollute the water and vice versa. The soil has an essential role of surface transport processes because it controls infiltration, redistribution and water accumulation. The water (both surface and underground) can be polluted by agricultural activities due to wrong application of chemical substances (fertilizers, pesticides, etc.) (Behera et al., 2003; Zhu et al., 2005; Garnier et al., 2010; Koco et al., 2016).

Transport soil function, which is one of the main ecological functions, plays a dominant role in water contamination. The contamination of water can result from nitrogen and phosphorus. Agriculture is seen as one of the main nitrogen pollution sources, inter alia, through nitrate leaching to the groundwater (Oenema et al., 2011; Gömöryová et al., 2013. Just nitrate leaching to ground waters represents a loss of soil fertility and also a threat to the environment and human health (Addiscott, 1996; Di et al., 2002; Sui et al., 2015; Hou et al., 2012; Ju et al., 2009 Timsina et al., 2001; Shen et al., 2013).

The aim of this paper is to evaluate the transport function of the soil on the base of present knowledge of the horizontal and vertical transport of nutrients. It does not matter which way are the nutrients lost from the soil, the final recipient is in most cases the water.

The maps of potential water sources pollution were created on the base of algorithm based on the soil and localities parameters.

MATERIAL AND METHODS

The soil categorisation results from the transport soil function which includes transport of nitrogen and phosphorus. Transport of potassium is more of an economic problem than environmental one. This is the reason why potassium was not considered. Partial evaluation of individual transport processes was realized on the base of suitable measurable indicators, which affects the above mentioned ecological soil function (Acton and Gregorich, 1995). The soil parameters which were needed for evaluation of partial transport are known as basic soil and locality properties and/or can be obtained from Soil monitoring database of Slovak Republic.

The basis for this paper was the possibility of nutrients transport from the soil in two directions, e.g. leaching into the depths outside the soil profile and nutrients overland flow by water erosion. Therefore, the climate (especially amount of precipitation) is one of the decisive factors for this type of research.

The climate of Slovakia lies between the continental and the oceanic (Vilček et al., 2016). The climate of Slovakia can be divided into 3 zones (Škvarenina et al., 2004): i) Lowlands - the average annual temperature is about 10 °C, ii) Valleys – the average annual temperature is from 5 to 8.5 °C, and iii) Mountains - the average annual temperature is below 5 °C. The average annual precipitation rate varies from less than 500 mm in the lowlands to about 2 000 mm in the mountains (Vido et al., 2016).

In the case of nitrogen transport, the problem is mainly related with leaching of nitrates due to their negative charge and thus the inability to chemically bind to soil particles. We assumed that the more nitrates are nitrified in the soil, the more nitrates should by leached from it.

Amount of nitrified nitrogen in the soil was defined by Bielek (1998). He determined the amount of nitrified nitrogen in the soil depending on its quality by the equation:

$$y = 0.33 \, . \, e^{0.0151x} \qquad (1)$$

where y is the mean intensity of pure nitrification (mg $N\text{-}NO_3^-$ kg soil per 14 days); and x is soil quality score (from 100-point scale)

All soils in Slovakia were divided up to 11 representative groups for which the amount of nitrified nitrogen was determined within the growing season (245 days). The least amount of nitrogen (16.4 kg $N\text{-}NO_3^-$) is nitrified in soil types Podzol, Solonchak and Solonetz (point value 3-10); on the other hand, the greatest amount of nitrogen (more than 80 kg $N\text{-}NO_3^-$) is nitrified in soil types Calcaric Haplic Chernozems and Mollic Fluvisols (point value 67-100).

The locality of the field plays an important role in terms of water erosion. The steeper the slope of the locality is, the more soil (include nitrogen) can be transported by water erosion. Therefore, the slope size was taken into the account at nitrogen transport on the soil surface. The coefficients for the slope category are presented in Table 1.

Five categories of the soil ability to transport nitrogen were created by a mutual combination of both mentioned factors (nitrified nitrogen in the soil and slope coefficients).

The **phosphorus** transport in the soil depends on "soil volume", e.g. it is dependent on the soil depth, gravel/fine earth contents in the soil and naturally on the locality slope, too. It means, the deeper the soil is, the less phosphorus should be transported from it and vice versa, the more gravel the soil content and the steeper is the slope of the locality, the more phosphorus should be transported

from the soil. The categorisation of soil ability to transport phosphorus is based on the combination of mentioned soil and locality parameters. All parameters can be taken from the database of Soil Monitoring System of Slovak soils. Detailed analyse of parameters and assignment coefficients to them was published by Torma (2003).

The coefficients for mentioned soil and locality parameter are presented in Table 1. On the base of three categories of soil depth, four categories of gravel contents in the soil and five categories of locality slope we obtained sixty combinations of mentioned parameters.

Table 1 Soil and locality parameters and assigned coefficients for transport calculation

Parameters					
Soil depth (m)	0.0-0.3	0.3-0.6	> 0.6		
Coefficient	0.8	0.5	0.2		
Gravel contents (%)	0-5	5-25	25-50	> 50	
Coefficient	0.4	0.6	0.8	1.0	
Locality slope (°)	0-3	3-7	7-12	12-17	> 17
Coefficient	0.2	0.4	0.6	0.58	1.0

The maps of nitrogen and phosphorus transport were created by software ArcGIS 10.3.

Spatial identification and quantification of soils were performed according to these parameters on the basis of the data layer on soil parameters in Slovakia using a geographic information system, i.e. the ArcGIS environment (Figure 1).

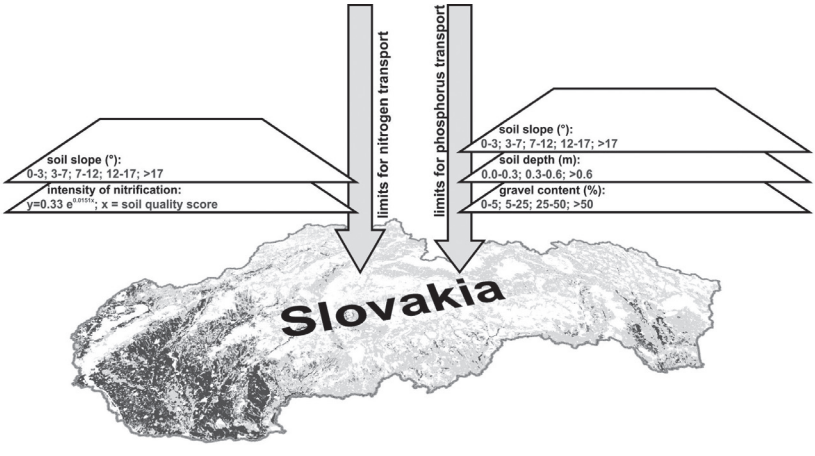

Figure 1
Soil and locality parameters taken into account for evaluation of nitrogen and phosphorus transport in the soil

For the purpose of this paper, the maps of nutrient transport within the soil (potential water sources pollution) for Prešov region (one of the eight self-governing regions in Slovakia) and for the whole Slovak Republic (Figure 2) were created on the base of mentioned method. But if we know the necessary soil and locality parameters, we can create the map of any area.

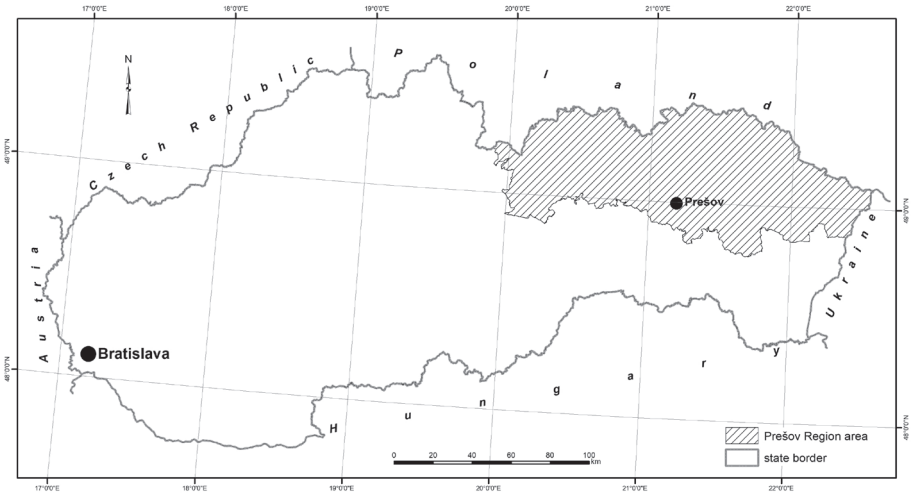

Figure 2
The study area for evaluation of nitrogen and phosphorus transport in the soil (Prešov region and whole Slovak Republic)

RESULTS AND DISCUSSION

Both water and wind soil erosion causes the loss of the most fertile soil layer together with nutrients, organic matter etc. and decrease of microbiological activity, too. The contamination of water bodies occurs, when the soils nearby content high contents of nitrogen and phosphorus (Carpenter et al., 1988; Ju et al., 2005; Kumazawa, 2002). This is caused by imbalance between the applied nutrients in agriculture in the form of artificial fertilizer or manure and the nutrients taken up by the crops (Mekonnen et al., 2016).

The mutual combination of the mentioned limits for nitrogen transport in the soil (Figure 1) and the assigned coefficients (Table 1) gives us five categories of intensity of nitrogen transport within the soil, as follows:

- very low ability of the soil to transport nitrogen – coefficient below 0.10
- low ability of the soil to transport nitrogen – coefficient 0.10-0.25
- moderate ability of the soil to transport nitrogen – coefficient 0.26-0.40
- strong ability of the soil to transport nitrogen – coefficient 0.40-0.50
- very strong ability of the soil to transport nitrogen – coefficient over 0.50

The same method was chosen at phosphorus transport. The combinations of soil depth, gravel content in the soil and locality slope result in five categories of intensity of phosphorus transport within the soil:

- very low ability of the soil to transport phosphorus – coefficient over 3.8
- low ability of the soil to transport phosphorus – coefficient 2.4-3.8
- moderate ability of the soil to transport phosphorus – coefficient 1.3-2.4
- strong ability of the soil to transport phosphorus – coefficient 0.5-1.3
- very strong ability of the soil to transport phosphorus – coefficient below 0.5

Soil categorisation from the point of view of water sources pollution in framework of chosen region of Slovak Republic

This region is located in north-east part of Slovakia. The terrain is relatively hilly and the most wide-spread soil types are Cambisols with relatively high content of gravel. It is an assumption that the transport of the nutrient should be strong. This was confirmed only in case of phosphorus. The soils are not very deep and on the other hand they content a great share of gravel. In combination whit hilly feature of the country the transport of phosphorus is strong (Figure 3).

It is remarkable that almost a half of the total area of agricultural soils in Prešov region belongs to the categories with strong and very strong transport of phosphorus and therefore to the possibility of higher risk of water sources pollution with phosphorus. This is caused not only by soil location on relatively steep slopes (more than 12°), but by soil parameters itself, too (low content of fine earth and/or shallow soils – less than 0.3 m depth).

The situation is different in nitrogen transport in the soil. The locality parameters are the same but the intensity of nitrification calculated using Equation (1) must be taken into account in this case. Not very much nitrates are nitrified in the soil in this region (cold region with low quality of soil). That is why the map of nitrogen transport within the soil looks a little different when compared with phosphorus transport. Just low intensity of nitrification limits the strong transport of nitrogen from the soil (Figure 4).

The greatest share of agricultural soils in framework of Prešov region belongs to the category with moderate transport of nitrogen (almost 44%). Together with weak transport of nitrogen their share reaches more than 85 % of total areal of agricultural soils in study area. It means that the pollution of water sources with nitrogen from the soil is on the sustainable level.

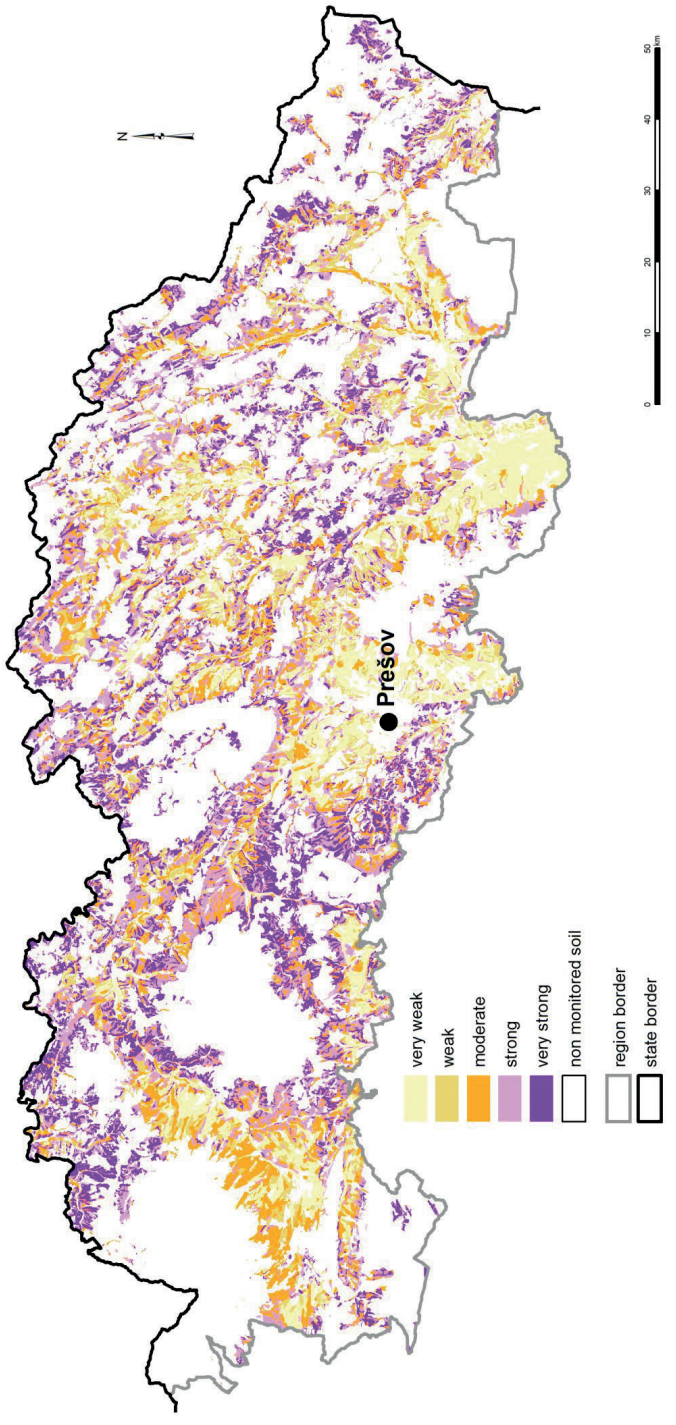

Figure 3
The soil categories of Prešov region from the point of view of phosphorus transport in the soil

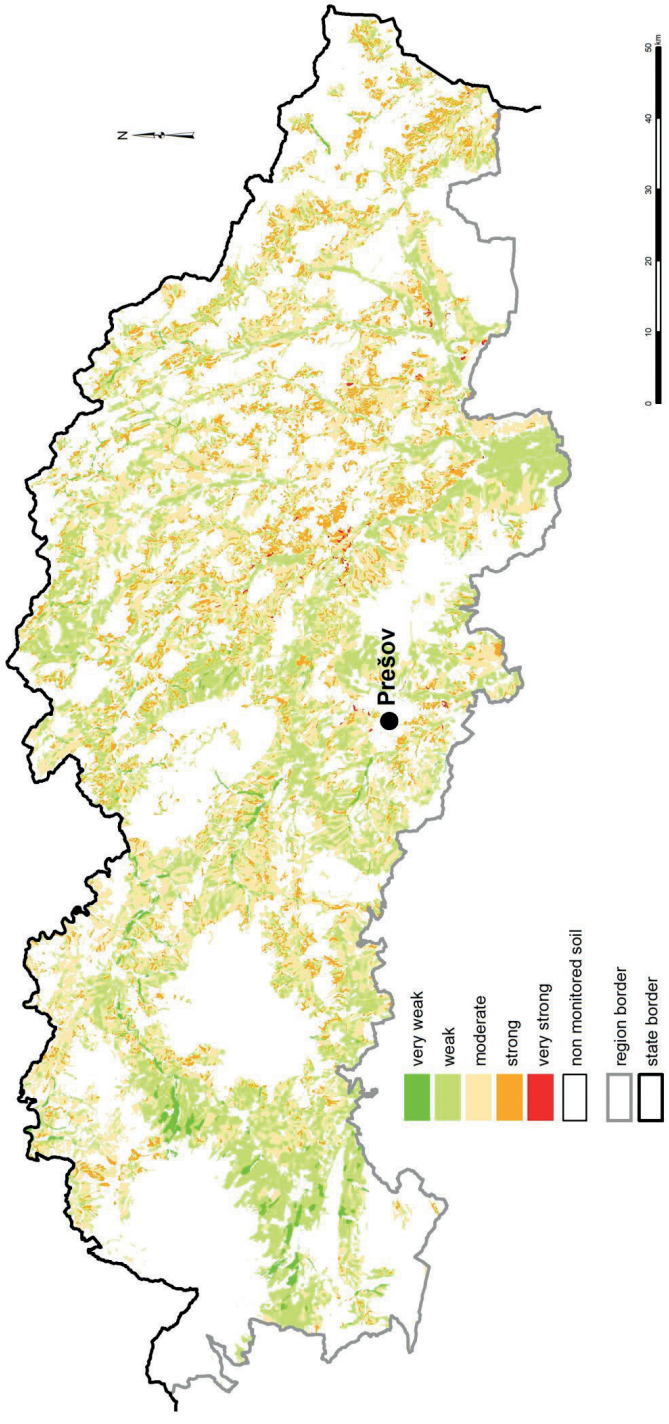

Figure 4
The soil categories of Prešov region from the point of view of nitrogen transport in the soil

Soil categorisation from the point of view of water sources pollution in framework of chosen region of Slovak Republic

As mentioned above, when the necessary soil and locality parameters are known, the maps of any area could be created. Figure 5 presents the transport intensity of nitrogen in the whole Slovak Republic and detailed view shows the spatial distribution of individual categories of nitrogen transport in the soil on the area of several hundred hectares.

Almost 90% from the total agricultural soils in Slovakia belong to the categories with very weak, weak and moderate nitrogen transport. This is a good precondition for the protection of water sources from nitrogen pollution. Only 11.4% of the soil does not provide the sufficient protection of water sources (Table 2). These are localities with relatively quality soils where sufficient amount on nitrates are nitrified along with steep slopes from which the soil is lost due to water erosion. At these places, an increased amount of nitrates in water can be detected.

The distribution of categories of phosphorus transport in the agricultural soils in Slovakia looks different compared to nitrogen (Figure 6). More than a half of total area of agricultural soils (54.66%) belongs to the category with very weak transport. These localities are in the first place on Danubian lowland (on the south-west part of the Slovakia) and particularly on East-Slovakian lowland. The deep soils (more than 0.6 m depth) with low content of gravel (less than 10%), e.g. Mollic Fluvisols Calcaric and Haplic Chernozems, are the main soil types in these places.

But on the other hand, more than a quarter of agricultural soil belongs to the categories with strong and very strong transport of phosphorus (Table 2). To these soils belong especially flat soils (less than 0.3 m depth), acid Eutric Cambisols with high content of gravel (more than 50%) which are located on the steep slopes mainly in alpine localities in middle and northern Slovakia. At these places, an increased amount of phosphorus in water can be detected.

Table 2 The area and share of individual soil categories with various intensity of nitrogen and phosphorus transport in the soil in framework of whole Slovak Republic

Category	Nitrogen transport		Phosphorus transport	
	Area (ha)	Share (%)	Area (ha)	Share (%)
1 – very weak	31,909	1.26	1,381,448	54.66
2 – weak	1,130,119	44.71	237,558	9.40
3 – moderate	1,076,639	42.60	237,509	9.40
4 – strong	250,436	9.91	312,826	12.38
5 – very strong	38,434	1.52	358,131	14.17

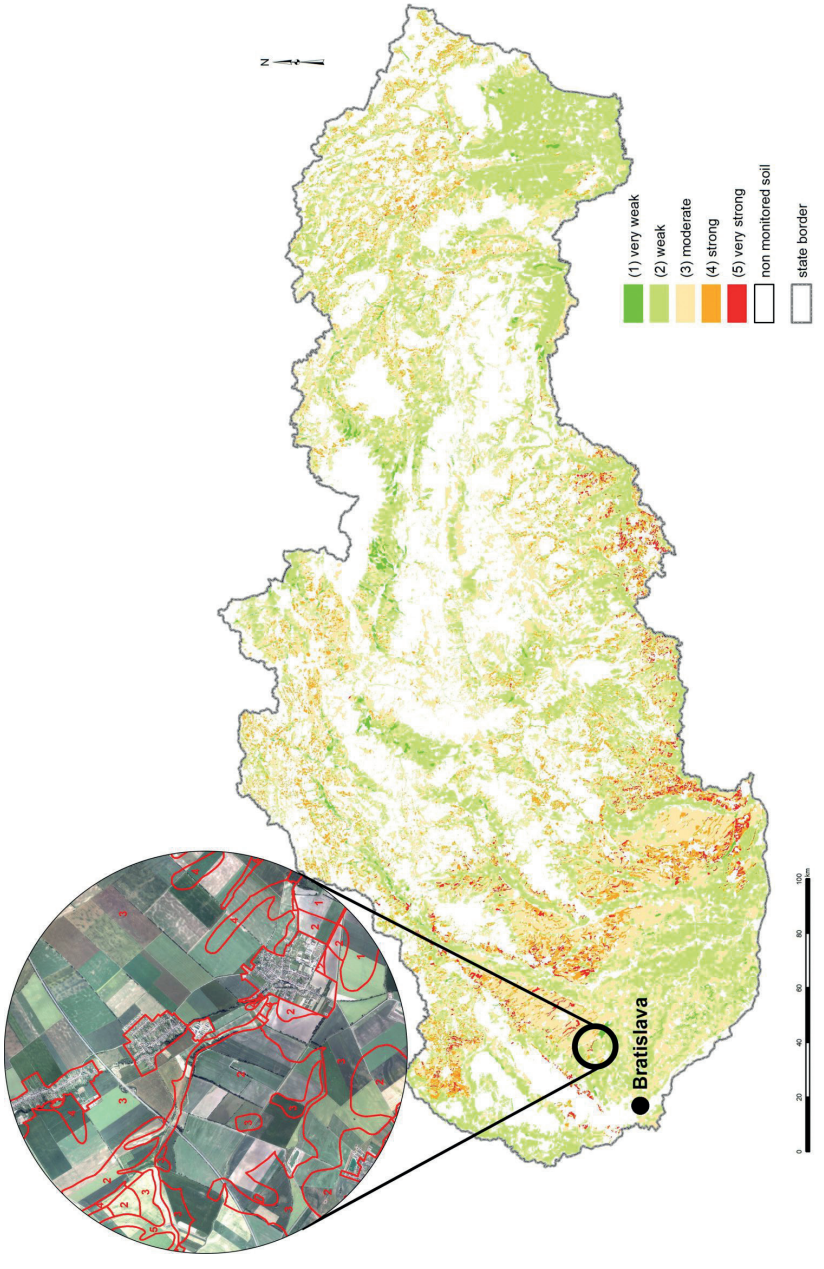

Figure 5
The soil categories of nitrogen transport in the agricultural soils in Slovakia and detailed view on the area of several hundred hectares.

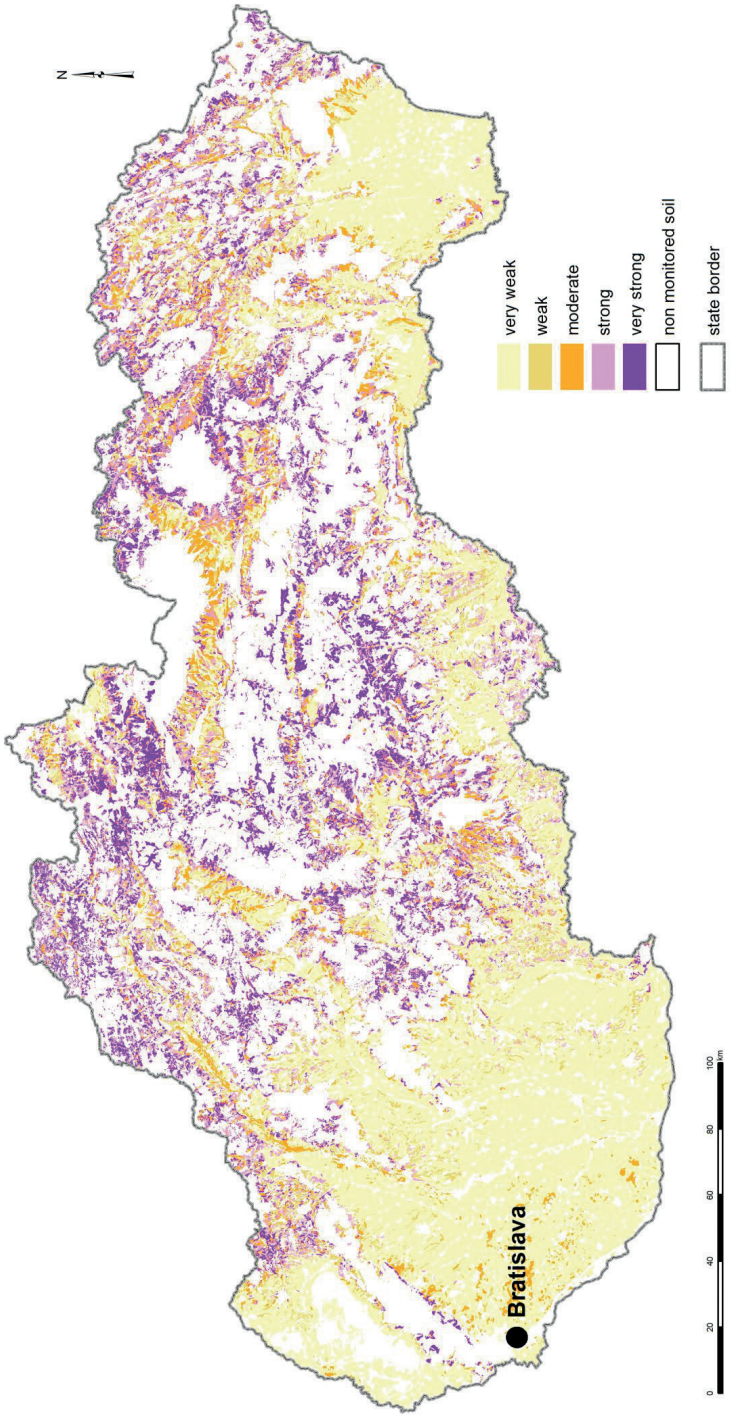

Figure 6
The soil categories of phosphorus transport in the agricultural soils in Slovakia

CONCLUSIONS

Generally, the potential pollution of water sources with nutrients (nitrogen and phosphorus) is related to an intensive and/or poor agricultural practice. The transport soil function gives the information about vertical and horizontal transport of nutrients. They can come to hydrosphere eutrophication and then the surplus of pollutants occurred in the soil can pollute the water sources.

Mentioned algorithm can on the base of known parameters classify each soil locality to the category of potential pollution water sources. In almost 90% of agricultural soils in Slovakia was detected very weak, weak and moderate nitrogen transport (e.g. very weak, weak and moderate potential of water sources pollution with nitrogen) and only 11.4% of the soils belong to the category with strong and very strong nitrogen transport. In case of phosphorus, more than a half of agricultural soils belong to the category with very weak transport. On the other hand, the strong and very strong phosphorus transport occurs on more than a quarter of agricultural soils in Slovakia. Especially in these localities (hilly landscape with shallow soils and/or with high content of gravel) can come to increased content of phosphorus in the water bodies and thus also to a decrease in water quality.

In the conclusion is necessary to mention that the presented results are calculated only in the theoretical level. So far we do not have exact results directly measured in the field. We assume that in the future we will also use lysimeters and/or quantify the amount of soil that is washed away by water erosion. We already use drones for these purposes.

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