UDK: 911.375.6(497.776)

NODAL MICROREGIONS IN THE DEMIR HISAR REGION

Vladimir ZLATANOSKI
Institute of Geography, Faculty of Natural Sciences and Mathematics
Arhimedova No. 3, 1000 Skopje, Republic of Macedonia
e-mail: v.zlatanoski@gmail.com

ABSTRACT

Regional geography, with its interdisciplinary approach and scientific methods, provides a realistic statement of a certain spatial unit, and aspects of better progress and functioning.

The state of a certain region primarily depends on the geographical features, but also on the opportunities that the society has appreciated for more rational utilization, and thus enabling further development. Most of the regions in the Republic of Macedonia, since its independence until nowadays, note negative economic development and depopulation.

This paper observes the physical-geographical, socio-economic and infrastructural issues facing this region. The boundaries of the corresponding nodal micro regions were tested implementing the Reilly`s method for gravitational power of populated places.

The reasons for the current state were determined by observing problems and challenges in the Demir Hisar region. Therefore, this paper offers suggestions on how to revitalize the region, that will restore its primary functional feature, which existed before the sixties of the last century.

Key words: Demir Hisar, regionalization, regional grow, Reilly method, problems, challenges

INTRODUCTION

Regionalization is one of the basic concepts in geography and some other spatial disciplines that distinguishes segments of the geographical space with functional integrity. Regions are defined according to a variety of criteria depending on the needs (administrative, political, economic, etc.). This methodology finds its application in research regarding three aspects: as geographical research tool, as subject for geographical research and as a tool for spatial arrangement and spatial planning (Dziewoński, K. 1967).

In general, regions differ in their character in two types: formal and functional or nodal regions (Claval, P. 1998). Formal regions are vertically organized, while functional regions form horizontal relationships in space and define their boundaries in terms of the interactions of the population. The self-sustainability of a region is based on strong internal cohesiveness and slight dependence on the neighboring regions.

According to the relations taking place in one nodal region, we may differ the following regions: 1) functional urban region, 2) daily urban area, 3) local area of the labor market, and 4) border area of ordinary trips (Klapka et al., 2013).

RESEARCH AREA

The Demir Hisar region is located in the western part of the Republic of Macedonia, covering parts of Pelagonia and the South-west planning region. The boundaries of the region in the north range are along the division of Busheva Mountain (1789*m*) and the Baba Sach Mountain (1695*m*); in general, the western border is in the north-south direction along the highest parts of Ilinska (1908*m*) and Plakenska Mountain (1998*m*), while the eastern boundary is on the divide of Mount Drevenik (1494*m*) and the southern part of the Busheva Mountain.

From an administrative aspect, the region is divided into three municipalities. The Municipality of Demir Hisar covers the largest area (77.2%), while the municipalities of Krushevo (10.4%) and Drugovo (12.4%) cover the northeastern and northwestern part. In the described boundaries, the area covers 626.4km^2, which accounts for 2.43% of the surface of the Republic of Macedonia.

According to the latest census of 2002, in 47 rural and one urban settlement there are 9,945 inhabitants, or 15.87 inhabitants per km^2. As main characteristic for the Municipality of Demir Hisar, as well as the entire region, is the high negative rate of population growth which is estimated of -9.3 ‰.

In general, the population is employed in the primary (agriculture) and tertiary (craft) sector. The small amount of capacities in the secondary sector reflects its low employment rate.

In terms of infrastructure, all settlements have asphalt roads, with exception of the rural settlements Zashle and Radovo.

METHODS AND DATA

In order achieve proper regionalization, it is primarily necessary to select an appropriate scientific method, which is going to result in precise boundaries of the regions with their specific characteristics, that means defining the spatial circulation of people, goods and services in one region and their comparison with the proportions of the neighboring regions.

The greatest influence in defining the regions is caused by natural- geographic factors. First of all, this refers to the orographic structure. Another factor is the traffic infrastructure and economic objects in the entire region. The determination of the gravitational power of a certain settlement included the following parameters: a school, a hospital, a post office, a shop, business facilities, distance from the nodal center and distance from the regional center. With this approach, seven micro regions are defined, and for each region the center of gravity is defined (Demir Hisar, vil. Smilevo, vil. Vardino, vil. Zhvan, vil. Zheleznets, vil. Tser and vil. Dolno Divjatsi). The initial boundaries of the micro nodal regions are outlined using this methodology.

One of the most implemented methods for testing the boundaries of the regions, is the Reilly`s gravitational model, that determines the boundary gravitational power of one center in accordance to another one. This test was performed using the following equation:

$$D_a = \frac{D_{ab}}{1 + \sqrt{(P_b/P_a)}}$$

where:

D_a - boundary of influence of the settlement
D_{ab} - distance between settlements
P_a - population number in settlement *a*
P_b - population number in settlement *b*

Each nodal region in the nodal system is studied as a subsystem in the bigger nodal system, that is, as a system for itself (Hagget, P. 1965).



Map 1: Administrative division of the Demir Hisar region

Table 1: Functional characteristics of the settlements in the Demir Hisar region

no.	settelment	micro region	1*	2*	3*	4*	5*	6	7	8**
1.	Belche	D. Hisar				+		2.8	2.8	245
2.	**Demir Hisar**	**D. Hisar**	**+**	**+**	**+**	**+**	**+**			**2593**
3.	Zhurche	D. Hisar	+			+		8.1	8.1	255
4.	Zahoriche	D. Hisar				+		5.5	5.5	115
5.	Kutretino	D. Hisar				+		2.4	2.4	301
6.	Novo Selo	D. Hisar						10.2	10.2	35
7.	Ostriltsi	D. Hisar						14	14	32
8.	Pribiltsi	D. Hisar	+			+		6.5	6.5	266
9.	Rakitnitsa	D. Hisar						12.3	12.3	37
10.	Rastojtsa	D. Hisar						13.1	131	19
11.	Slepche	D. Hisar	+			+	+	3.2	3.2	77
12.	Sleduevo	D. Hisar					+	4.4	4.4	321
13.	Strugovo	D. Hisar	+			+		4.1	4.1	286
14.	Suvodol	D. Hisar	+			+	+	2.4	2.4	415
15.	Utovo	D. Hisar						5.7	5.7	35
16.	Barakovo	Vardino						2	5.4	67
17.	**Vardino**	**Vardino**	+			+	+	**3.6**	**4.5**	**266**
18.	Graishte	Vardino				+		/	3.4	145
19.	Edinakovtsi	Vardino	+			+	+	4.9	8.3	338
10.	Sveta	Vardino	+			+		6.9	10.3	332
11.	Obednik	Smilevo	+			+		4.8	9.8	273
12.	**Smilevo**	**Smilevo**	**+**		**п**	**+**			**14.6**	**719**
13.	Babino	Zhvan					+	3.7	17.1	34
14.	Bazernik	Zhvan				+		7	20.4	52
15.	Boishte	Zhvan						10	26.3	7
16.	Virovo	Zhvan				+		8.3	21.7	151
17.	**Zhvan**	**Zhvan**	**+**	**п**	**+**	**+**			**13.2**	**428**
18.	Mrenoga	Zhvan						7.9	19.3	107
19.	Radovo	Zhvan						7.9	17.9	13
20.	Sloeshtitsa	Zhvan		п		+		4.8	18	221
21.	Sopotnitsa	Zhvan	+			+	+	3.1	10	929
22.	Suvo Grlo	Zhvan						5.9	105	8
23.	Tserovo	Zhvan						11.3	24.7	2
24.	Brezovo	Zheleznets				+		9	22.3	62
25.	Velmevtsi	Zheleznets						7.7	28	7
26.	Golemo Ilino	Zheleznets				+		6.8	27.1	52
27.	Dolentsi	Zheleznets						4.1	17.4	97
28.	**Zheleznets**	**Zheleznets**	**+**			**+**			**20.3**	**57**
29.	Zashle	Zheleznets						14.5	27.9	42
30.	Malo Ilino	Zheleznets						5.4	24.9	50
31.	Golemo Tsrsko	Tser						7.1	34.7	4
32.	Malo Tsrsko	Tser						6.9	34.7	1
33.	**Tser**	**Tser**				**+**			**37.2**	**159**
34.	Arilevo	D. Divjatsi						2	23.6	13
35.	Gorno Divjatsi	D. Divjatsi						4,5	26.1	46
36.	**Dolno Divjatsi**	D. Divjatsi				**+**			**21.6**	**59**
37.	Kochishta	D. Divjatsi						5,5	15.9	38
38.	Pusta Reka	D. Divjatsi				+		4,4	26	134

1- school; 2- ambulance; 3- post office; 4 store;
5-storey building; 6- distance from the nodal center (*km*);
7- distance from the regional center (*km*); 8- population in 2002.

Source: *Kalevski, T. 2013,
** State statistical office

RESULTS AND DISCUSSION

Testing the boundaries of two adjacent micro nodal regions was conducted by the previously established methodology in accordance with the collected data, thus obtaining the gravitational power of each micro regional center. The largest number of population and infrastructure objects is typical for the city of Demir Hisar, that with its gravitational power attracts the population of all settlements in the region. An exception are the settlements of the Tser and the Dolno Divjatsi micro region whose population gravitates toward the city of Kicevo or the city of Krusevo accordingly. In addition to the above-mentioned statements, the following micro regions are defined: Smilevo, Vardino, Zhvan and Zheleznets.

Table 2: Gravitational power of the nodal micro-regional centers according to the Reilly`s model

micro regions	distance (*km*)	gravity power (*km*)
Smilevo - Demir Hisar	10.7	3.7
Smilevo - Zhvan	14.7	8.3
Vardino - Demir Hisar	3.6	0.9
Zhvan - Demir Hisar	10.2	2.9
Zhvan - Zheleznets	6.2	4.5
Zhvan - Divjatsi	12.7	9.3
Zhvan - Smilevo	14.7	6.4
Zheleznets- Zhvan	6.2	1.7
Zheleznets - Divjatsi	12.5	6.2
Zheleznets - Tser	10.3	3.9
Zheleznets - Demir Hisar	16.3	2.1
Dolno Divjatsi - Tser	10.0	3.8
Dolno Divjatsi - Zheleznets	12.5	6.3
Dolno Divjatsi - Demir Hisar	18.8	2.5
Demir Hisar - Smilevo	10.7	7.0
Demir Hisar - Vardino	3.6	2.7
Demir Hisar - Zhvan	10.2	7.3
Demir Hisar - Divjatsi	18.8	16.3
Demir Hisar - Zheleznets	16.3	14.2
Tser - Zheleznets	10.3	6.4
Tser - Dolno Divjatsi	10.0	6.2

Micro region of Demir Hisar - located in the southern and eastern part of the mine region is the largest in the area, with the majority of inhabitants and settlements. It is characterized with number of institutions and industrial facilities, that are mainly located in the city of Demir Hisar, engaging workers from nearby settlements. It is bordered by five micro regions and has great gravity power. In this direction, the border of gravitation to Dolno Divjatsi region is 16.3*km*, to the region of Zheleznets 14.2*km*, to the Zhvan region 7.2*km*, to the Vardino region 2.7*km* and to the Smilevo region 7*km*. With such an intense gravity power there are 13 populated places in this micro region.

Micro nodal region of Vardino - It stands out as an individual spatial unit, as a result of the functional characteristics of the village Vardino in aspect of the capacities that generate jobs,

but also the orography of the terrain, which has a typical plain feature. On one hand this micro region is typical for the great connection to the city of Demir Hisar due to their proximity, and on the other hand the intensive interaction among the populated areas inside of the micro region that dominates more than in the neighboring micro region.



Map 2: Micro nodal regions in the Demir Hisar region

Micro nodal region of Smilevo – From a physical-geographic point of view, this micro region is defined as a typical mountain terrain. In the village of Smilevo, the presence of a school, a post office and a shop enables conditions for connecting the two rural settlements.

Regarding the gravitational power of the village Smilevo in relation to Demir Hisar is 3.7*km* while with the village Zhvan 8,3*km*. According to the Reilly`s method of gravitation, the villages of Bohista and Tserovo have to be within to the region of Smilevo, but the orographic factors allocate them in the of micro region of Zhvan.

Micro nodal region of Zhvan - Located in the central and south-western part of the Demir Hisar region, as a micro regional center is the village of Zhvan, which houses a school, ambulance, a post office and a shop. Traditionally this settlement had gravitational power to the other surrounding settlements. During the 1960s, with the construction of the iron-ore mine near the village of Sopotnitsa strengthened the development of this region by employing people in this capacity as well as engaging people from the neighboring micro regions. At the end of the nineties, the mine was closed, and consequently the significance of the village of Sopotnitsa in the micro region , but also in the whole region started to decrease.

This region borders the micro regions of Demir Hisar to which the gravitational power is 2.9*km*, then to the village of Zeleznets 4.5*km*, Dolno Divjatsi 9.3*km* and Smilevo 6.4*km*. According to their functional characteristics in this region gravitate 11 rural settlements.

Zheleznets micro nodal region - The favorable geographical position and the presence of educational institution creates conditions the village of Zheleznets to act as nodal microcenter regarding to this part of the Demir Hisar. The presence of ambulance and post office would contribute to greater cohesiveness and its further development.

The gravitational power to the neighboring micro regions is as it follows: towards Tser 10.3*km*, towards Dolno Divjatsi 6.2*km*, towards Demir Hisar 2.1*km* and towards Zhvan 1.7*km*. In these defined limits of gravitational power, the micro region has seven populated places with 367 inhabitants.

Micro nodal region of Tser - located in the northwestern part of the Demir Hisar region, it is characterized with low density of both settlements and population. According to the orographic features, this micro region is part of the Demir Hisar region, but the gravitational power of the city of Kichevo and the Municipality of Drugovo is the main precondition for the population of these regions to maintain the connection.

The lack of administrative and economic facilities in this micro region caused its depopulation.

It is bordered by the micro regions of Zheleznets and Dolno Divjatsi, while testing the maximum gravitational power to the regions is 6.4*km* and 6.2*km* accordingly. There are three populated places in this micro region.

Micro nodal region of Dolno Divjatsi - Comprised of four typical mountain villages (Dolno Divjatsi, Gorno Divjatsi, Pusta Reka and Arilevo). Observed from the geographical aspect, this micro region belongs to the main Demir Hisar region, but administratively it is part of the municipality of Krushevo. The relatively small distance from the city of Krushevo conditions the population to gravitate towards it. The boundary for maximum gravity power of Dolno Divjatsi as the center of the micro region with the neighboring centers received the following values: towards Tser 3.8*km*, towards Zheleznets 6.3*km* and towards Demir Hisar 2.5*km*.

CONCLUSION

The region of Demir Hisar is located in the western part of the Republic of Macedonia on an area of 626.4km^2. Although it has good natural geographical preconditions for further

development, the region itself has an unfavorable demographic and age structure. This primarily refers to agricultural land cultivation and production of eco-friendly products, development of rural tourism, etc.

Defining the boundaries of micro nodal regions refers to the circulation of people, goods, services and information.

The main factor for regionalization of this area are the physical and geographical conditions. The watershed lines are the main components for determining the boundaries of micro nodal regions. Using of Reilly's method, were tested the boundary gravity points of two adjacent micro-regional centers, which determined their definitive limits.

The micro regions of Tser and Dolno Divjatsi are distinguished from the others, as they naturally and geographically belong to that region, including the influence of the cities of Kichevo and Krusevo that enables better connection.

With the exception of the Demir Hisar region, the lack of basic institutional-administrative and economic facilities in all micro regions contribute to uneven regional development. As a consequence of the inadequate regional policy the migration of the population, is becoming more evident, especially in the farthermost settlements from the city of Demir Hisar.

REFERENCES

Agency for real estate cadaster (2006): Topographic maps, scale 1:25.000, sections: Vraneshtitsa, Latovo, Velmej, Velmevtsi, Pribiltsi, Krushevo, Smilevo, Demir Hisar, Ivanjevtsi

Claval, P. (1998): Introduction to regional geography. Blackwell, Oxford

Dziewoński, K. (1967): Concepts and terms in the field of economic regionalization. Economic regionalization. Academia, Praha, pp. 25-36.

Haggett, P. (1965): Locational Network Analysis in Human Geography. Arnold, London,

Kalevski T. (2013): Geographic potentials for development of Demir Hisar region, master thesis (in Macedonian)

Klapka, P. Halás, M. Tonev, P. (2013): Functional regions: concept and types. 16th International colloquium on regional sciences, Brno

State Statistical Office (2002): Census of population, households and dwellings in the Republic of Macedonia, Skopje

U.S. Geological Survey (2015): SRTM for territory of Republic of Macedonia

НОДАЛНИ МИКРОРЕГИОНИ ВО ДЕМИРХИСАРСКИОТ РЕГИОН

Владимир ЗЛАТАНОСКИ

Институт за географија, Природно-математички факултет,
Архимедова бр. 3, 1000 Скопје, Република Македонија
е-маил: v.zlatanoski@gmail.com

АПСТРАКТ

Регионалната географија со својот интердисциплинарен приод и научни методи дава реална слика за одредена просторна целина, како и аспектите за подобро унапредување и функционирање.

Состојбата на одреден регион пред се зависи од географските карактеристики, но и можностите кои што општеството ги увидело со цел нивно подобро искористување, а со тоа и негов развој. Голем дел од регионите во Република Македонија, од пред нејзиното осамостојување до денес, забележуваат негативен економски развој и депопулација.

Во трудот се обработени физичко географските позитивни и негативни страни, но исто така социо-економските и инфраструктурните проблеми со кои се соочува овој регион. Со помош на Рејловиот метод за гравитациската моќ на населените места тестирани се границите на соодветните нодални микро региони.

Со вака утврдените проблеми и предизвици со кој се соочува Демирхисарскиот регион утврдени се причините за моменталната состојба и дадени се предлози како истиот да се ревитализира со што би ја вратил својата функционална одлика која што ја имал пред се до шеесеттите години од минатиот век.

Клучни зборови: Демир Хисар, регионализација, регионален развој, Рејлиев метод, проблеми, предизвици