
AN APPROACH FOR MAPPING THE SPATIAL IMBALANCES IN REGIONAL DEVELOPMENT THROUGH THE CONCEPT OF SUSTAINABILITY

Rosen Yanev

South-West University “Neofit Rilski” Blagoevgrad, Bulgaria rosenqnev9@abv.bg

Galina Bezinska

South-West University “Neofit Rilski” Blagoevgrad, Bulgaria galinabezinskaswu@gmail.com

Abstract: This research is directed (main objective) towards differentiation, tracking and presentation of the functional sustainability trends of regional development in Bulgaria (NUTS BG3). The proposals are based on empirical and statistical information processed in the GIS environment for the period 2008-2016. The used research approaches are general geographic and cartographic: cybernetic approach; systematic and correlation analysis; choropleth mapping and proportional symbols. The subject of this analysis is Goal 1. of the Sustainable Development Agenda 2030, which states: “End poverty in all its forms everywhere”. The object of this research is Bulgaria (NUTS BG3). The obtained results was presented in three thematic maps, one table and one figure. Our main goals was: Presentation of the results from the considered aspect of the regional policy for sustainable development of the European Union in Bulgaria, based on the absolute values of the considered indicators (Thematic map 1 and 2); Determination of the trend of functional sustainability of regional development in Bulgaria as a means of mapping the impact of centrifugal and centripetal forces, creating and exacerbating the spatial imbalances - center / periphery in Bulgaria. (Thematic map 3) The obtained results show the decrease in the absolute values of people at risk of poverty or social exclusion and the increase of GDP per capita. The differentiated trend of functional sustainability of regional development in Bulgaria (Thematic Map 3) was transformed and supplemented on the basis of established subjectivity in the interpretation of the impact of the phenomena under consideration (the rate of people at risk of poverty or social exclusion and GDP per capita) . As a result, it was structured a method for mapping the impact of centrifugal and centripetal forces, generating and deepening the spatial imbalances - center / periphery in Bulgaria (in particular).

Keywords: sustainable development, mapping, correlation, central region, peripheral region.

1. INTRODUCTION

With the endorsement of the 2030 Agenda for sustainable Development, adopted by the United Nations General Assembly in September 2015 in New York, the following call for action, “Transform Our World”, was proclaimed, containing the statement: “We can be the first generation, has managed to eradicate poverty, or the latter, capable of saving the planet”. [1] Goal 1 which is the subject of analysis in the article it states: “ End poverty in all its forms everywhere”. The widespread nature of this statement in text (as well as each of the other sixteen goals of the 2030 Agenda for sustainable Development) distinguishes it from its predecessors (texts like – “Millennium Development Goals”, “Rio + 20” and “Rio 92”). This finding helps to present the essential characteristic of the subject and conveys the reader's attention to the “contour boundaries” of manifestation of the phenomenon under consideration or the object of our analysis - Bulgaria (NUTS BG3).

The international community (and in particular the European Commission) puts a sign of equality between the “fight” against poverty in all its forms and “fight” against social exclusion. This research is directed (main objective) towards differentiation, tracking and presentation of the functional sustainability trends of regional development in Bulgaria (NUTS BG3).

Our starting point in the study is a working definition by the European Commission on social exclusion, described as “a process by which some individuals are pushed to the brink of society and prevented to fully participate in it through the power of their poverty or lack of basic competences and opportunities for lifelong learning or as a result of discrimination”. This distances them from finding a job, income and opportunities for education and training as well as social and community networks and activities. They have limited access to regional or local authorities and organizational decision-making, and therefore they often feel powerless and can not control decisions affecting their prosperity. [6]

The main indicator of people at risk of poverty or social exclusion is the number of people affected by at least one of the three forms of poverty: monetary poverty, material deprivation or low intensity of economic activity. [6]

The aspect of the European policy of “sustainable development” – “social inclusion” (or social inclusion and fighting poverty in Bulgaria - in particular) is covered by the European Union's Strategy for Sustainable Development (Brussels, 26 June 2006) and represents a comprehensive EU target included in all its structural

documents and policies and activities. “Sustainable development” means that the needs of the present generation should be met without compromising the ability of future generations to meet their own needs. “[5] Social inclusion can be seen as a cornerstone in the concept of sustainable development in the regions.

Its main objective under the EU Sustainable Development Strategy (Brussels, 26 June 2006) is: “To create a policy of social inclusion, taking into account intergenerational and intra-generational solidarity, and to ensure and enhance the quality of life for citizens, which is a prerequisite for lasting individual well-being”.[5]

Main macroeconomic indicators for measuring economic well-being, according to the system of indicators for sustainable development of Bulgaria (the result of a joint project of Eurostat and the National Statistical Institute in cooperation with the “Energy Strategy” of the Ministry of Economy and Energy) is GDP per capita.

This article is based on empirical and statistical information for the period 2008-2016. The used research approaches are general geographic and cartographic: cybernetic approach; systematic and correlation analysis; choropleth mapping and proportional symbols.

The expected results of the implementation of the set main goal are:

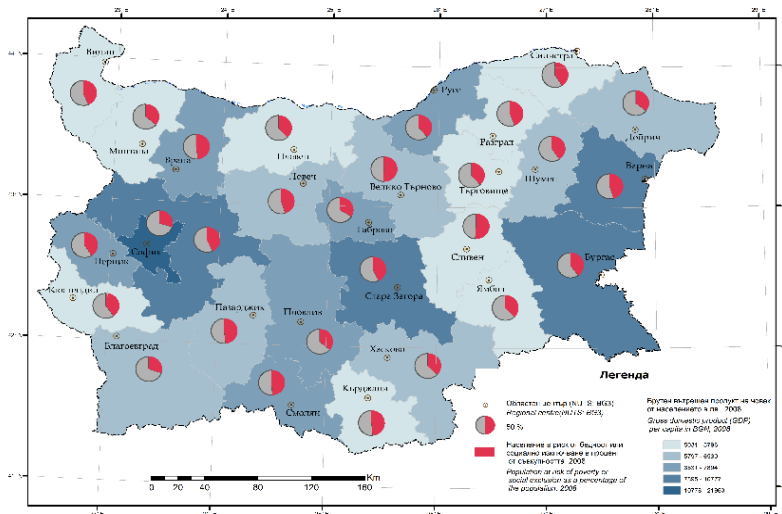
- Presentation of the results of the considered aspect of the Regional Policy for Sustainable Development of the European Union in Bulgaria (Thematic maps 1 and 2), based on the absolute values of the indicators considered;
- Identifying the course of functional sustainability of regional development in Bulgaria as a means of mapping the impact of centrifugal and centripetal forces generating and exacerbating spatial imbalances - center / periphery in Bulgaria (Thematic Map 3).

2. RESULTS AND DISCUSSION

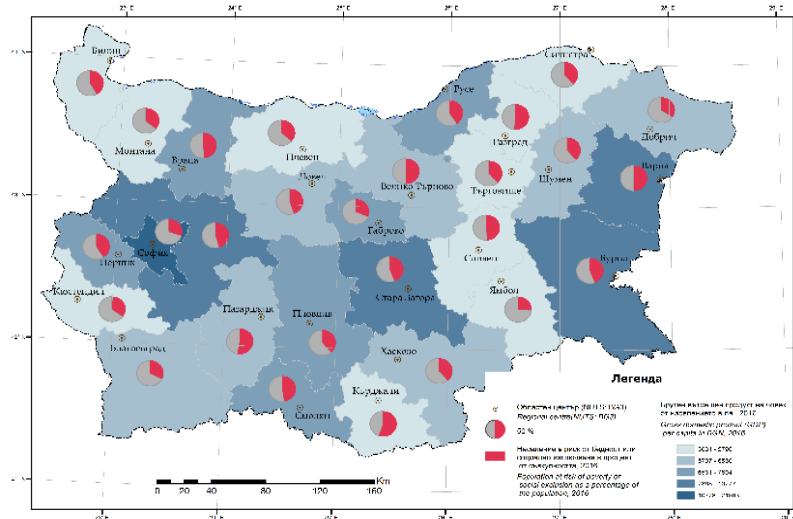
The identification, monitoring and presentation of functional sustainability trend of the regional development in Bulgaria (NUTS BG3) was done in the GIS environment (ArcGIS 9.3.).

The change of the absolute values of the indicators in the beginning (2008) and the end (2016) of the surveyed period was adopted under the “functional sustainability trend” in Bulgaria (NUTS BG3). These statistics are presented on thematic maps 1 and 2. For this purpose, indicators like population at risk of poverty or social exclusion (% of population) and GDP per capita (lev) in Bulgaria for the period 2008 to 2016 g . [2] are visualized through the spatial analysis methods used in the GIS environment: “choropleth mapping” and “proportional symbols”.

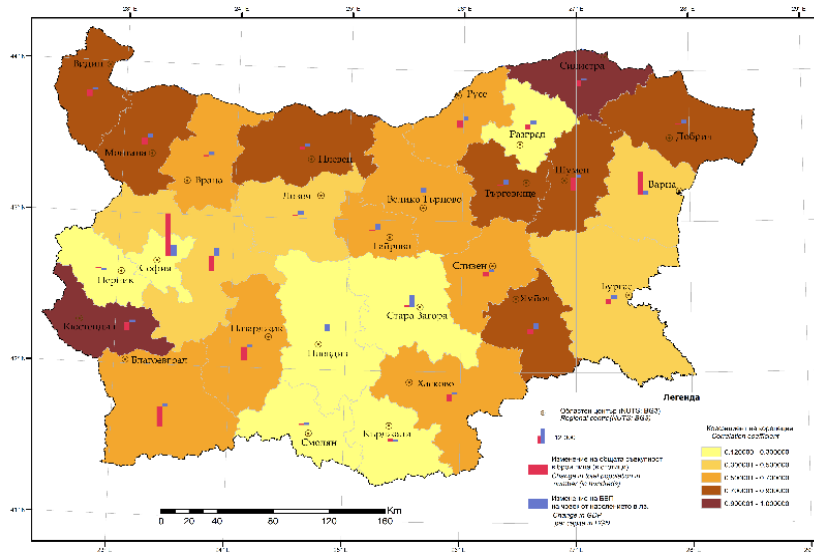
The results of the correlation analysis are presented on thematic map 3. The “choropleth mapping” method is used again. The expressed (correlation) dependencies between the population at risk of poverty or social exclusion and GDP per capita in Bulgaria for the whole period of survey 2008-2016 define the functional sustainability trend of Bulgaria.



Thematic map 1. Absolute values of the indicators considered for 2008.



Thematic map 2. Absolute values of the indicators considered for 2016.



Thematic map 3. Correlation analysis of the surveyed indicators in Bulgaria (NUTS: BG3) 2008-2016

The correlation coefficient takes values from (-1) to (1). When $R = 0$, there is no linear relation between the variables, i.e. no correlation is observed. When $R = 1$ or $R = -1$ we have a perfect linear connection between the two variables (X - independent variable - GDP per capita, Y - dependent variable - at risk of poverty or social exclusion). The sign before R indicates the direction of dependence between the two variables. When R is with a positive sign there is a direct dependence between the two variables. When X (factor) increases, Y (result) increases also. When the mark is negative, there is a reverse dependence. As X increases, Y decreases. In Fig. 1 expressed are also (two outputs of R) the index: R^2 and K^2 . The determination coefficient (R^2), which is equal to the square of the correlation coefficient (R), describes the so-called explained dispersion. It shows how much of the variance of Y is due to the differences in X values, i.e. the impact of the researched factor. For convenience, it is multiplied by 100, so-presented it represents the power of influence of the dependent variable in percentages. The uncertainty factor (K^2) describes the influence of the non-included factors in the study due to the so-called unexplained dispersion. Its value is obtained by subtracting from the general dispersion of the variable Y expressed as a unit (100%) the explained with the help of Determination Coefficient (R^2). In other words $K^2 = 1 - R^2$. [3]

The requisite thoroughness of the study and easy readability of the data presented in thematic maps 1, 2 and 3 necessitate complementing the thematic map 3. Whereby we consider that the functional sustainability trend of regional development in Bulgaria will gain a foreseeable focus for a wide range users of spatial information. The

mapping method used is again a "proportional symbols". It presents the change of the total population (the total number of the population by districts in Bulgaria) as the difference between its absolute values for 2016 and 2008; as well as the change in GDP per capita in the country for the same period (the difference between the absolute values for 2016 and 2008).

3. RESULTS

The presented results of the reviewed aspect of the Regional Policy for Sustainable Development of the European Union in Bulgaria (Thematic maps 1 and 2) express a decrease in the absolute value of people at risk of poverty or social exclusion in Bulgaria and an increase of GDP per capita. This study could be suspended at this point because they have absolute values corresponding to the indicators for sustainability of regional development. The problem is that the data so-presented (in Thematic maps 1 and 2) is not related to the change of the total population in the country.

The identified functional sustainability trend of regional development in Bulgaria (Thematic map 3) can be considered as a mean for mapping of the impact of centrifugal and centripetal forces, creating and deepening the spatial imbalances - center / periphery in Bulgaria (in particular). This assumption is supported by the established impact of those forces (centrifugal and centripetal) on the total population in the country. As a result, it can be concluded that the weak to medium correlation dependence among those people at risk of poverty or social exclusion and GDP per capita in the country are characteristic of the development of the "central" regions, and the significant, high and very high correlation dependence is observed in the development of the "peripheral" regions.

The results of the correlation analysis are presented in Table 1 .:

Correlation scale [2]	Low correlation: $0,01 < R < 0,3$	Medium correlation $0,31 < R < 0,5$	Significant correlation $0,51 < R < 0,7$	High correlation $0,71 < R < 0,9$	Very high correlation $0,91 < R < 1$
Straight dependence (number of areas)	2	2	0	0	0
Reverse dependence (number of areas)	5	2	8	7	2

Table 1. Straight and reverse correlation dependencies of the functional sustainability trend of regional development in Bulgaria (NUTS BG3) from 2008 to 2016.

- Weak straight correlation dependence is observed in BG411 Sofia (capital) district and BG425 Kardzhali. Weak reverse correlation is observed in district of BG324 Razgrad; BG344 Stara Zagora; BG414 Pernik; BG421 Plovdiv and BG424 Smolyan. Research interest is the fact that only 2 of them (BG324 Razgrad and BG421 Plovdiv) mark a negative real trend of the general population, the remaining 5 mark are growing. I.e. the sum of the natural and mechanical growth in this districts is a positive.
- Medium straight correlation dependence is observed in BG331 Varna and BG341 Burgas districts. Medium reverse correlation dependence is observed in BG315 Lovech and BG412 Sofia. One of them (BG331 Varna) marks a positive actual movement of general population, the value of the remaining three is negative.
- Significant reverse correlation dependence is observed in BG313 Vratsa, BG321 Veliko Tarnovo, BG322 Gabrovo; BG323 Ruse; BG342 Sliven; BG413 Blagoevgrad; BG422 Haskovo and BG423 Pazardzhik districts. They all mark a negative actual movement in the general population.
- High reverse correlation dependence is observed in BG311 Vidin; BG312 Montana; BG314 Pleven; BG332 Dobrich; BG333 Shumen; BG334 Targovishte and BG343 Yambol districts. They all mark a negative actual movement of general population.
- Very high reverse correlation dependence is observed in BG324 Silistra and BG415 Kyustendil districts. They all mark a negative actual movement of general population.

Coefficient of Correlation (R) values; The determination coefficient (R²) and the uncertainty coefficient K² are presented in Fig. 1.

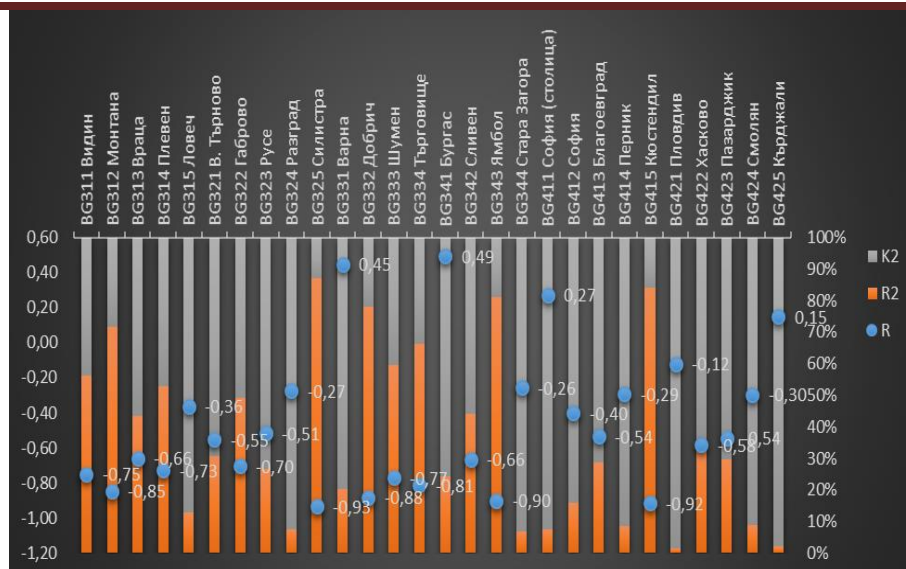


Fig.1 Correlation analysis of the relevant indicators in Bulgaria (NUTS: BG3) 2008-2016 year.

The “center-periphery” problem is also particularly relevant in terms of improving spatial organization of communities. An account must be taken of the specificities of their development in tackling this problem. and a corresponding differentiated regional development strategy and policy. An appropriate differentiated regional development strategy and policy must be pursued with a view to achieving unity in spatial planning –higher quality of life, income and social sensitivity [4].

4. CONCLUSION

By creating, tracking and presenting the course of functional stability of the regional development in Bulgaria (NUTS BG3) carried out in the GIS environment a new method (or approach) for mapping the impact of centrifugal and centripetal forces generating and deepening the spatial imbalances - center / periphery. We argue that the reason for the observed phenomenon is precisely (centrifugal and centripetal forces), based on the following scientific research:

Thematic map 3 illustrates the change in socioeconomic potential (population and GDP per capita) on the basis of which it was established, regularity between the absolute values and the correlation indices of the indicators under consideration in the areas “center” and “periphery”.

Regularity has shown that: The “donors” of the established monocentric regional development model in Bulgaria (“periphery” regions) are characterized by a regressive course of regional development (expressed by the negative real growth of the total population), which is always linked to high levels of correlation interdependence indicators; The “beneficiaries” in their turn of the established monocentric model of regional development in Bulgaria (the “center” regions) are characterized by a progressive course of regional development (expressed by the positive real growth of the total population), which is always associated with low levels of correlation between the indicators under consideration.

An exception to this pattern was observed in the peripheral regions of the country populated by the Muslim Bulgarians. The reasons for this phenomenon can be found in the ethno-demographic nature of the demographic catastrophe in which our country is located, but the case is beyond the subject of analysis in this study. Anxiety should trigger the fact that reverse correlation is a sign of the presence of large social groups of the general population in the central and peripheral regions experiencing an indirect risk of poverty or social exclusion based on economic conditions.

LITERATURE

- [1] Да преобразим нашия свят: Плана за устойчиво развитие до 2030 година. Организация на обединените нации. Ню Йорк. септември 2015. стр. 14, 17.
- [2] Население в риск от бедност или социално изключване (в % от съвкупността) и БВП на човек от населението (в лв.) в България за периода 2008-2016 г.: [https://infostat.nsi.bg/infostat/pages/module.jsf?x_2=1]

[3] Шишманова, М., (2010), Авангард Прима, Регионален анализ, Благоевград, стр. 149; 152; и 153.

[4] Шишманова, М., (2010), Авангард Прима, Централните райони в контекста на регионалното развитие в Р. България, Благоевград, стр. 173; 255

[5] EU Sustainable Development Strategy. European Council. Council of the European union. Brussels. June 2006. Page 2, 17.

[6] Sustainable development in the European Union (2015 monitoring report of the EU Sustainable Development Strategy). Eurostat. Luxembourg. 2015. p. 117 and 118.