Cartographic Image of Changes in Population Distribution as an Indicator of Peripherality

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Abstract

The article discuss a thesis stating that the most credible "markers" of peripherality constitute indicators referring to demographic changes, particularly depopulation related to migration, the resulting decrease in the size of population, and consequently changes in the population density. Such an assumption is based on the commonly acknowledged fact that the most intensive depopulation occurs in areas distinguished by low quality and level of life resulting from restricted accessibility and a low level of socio-economic development. The presented hypothesis is verified by analysis of maps presenting demographic changes in Poland after World War II.

Keywords: Lubelskie Voivodship, peripheral areas, depopulation, population density

Introduction

Peripherality as a multidimensional phenomenon is discussed on a number of levels. In the traditional approach, the primary factors considered are usually those related to space, including unfavourable geographical location, considerable distance from central agglomerations, as well as economic features, such as: low GNP per capita, low level of economic activity and outflow of the workforce. In the demographic-social dimension, peripherality is particularly manifested in increased outflow and the related decrease in the size of population, low population density, aging of the society, and weak social conditions. Irrespective of the considered aspect of peripherality, it has generally a negative connotation (Miszczuk 2013).

This article presents a thesis stating that the best and the most credible "markers" of peripherality include indicators referring to demographic changes, and particularly depopulation related to migration, the resulting decrease in the size of population, and consequently changes in the population density. Such a hypothesis is based on the commonly acknowledged fact that the most intensive depopulation occurs in areas with low settlement attractiveness, distinguished by low quality and level of life particularly resulting from restricted transport and accessibility and low level of socio-economic development. Therefore, population indicators strongly correspond to the basic (spatial-economic) indices determining the peripherality of areas. The presented hypothesis is verified based on the analysis of maps presenting demographic changes in east Poland after World War II. The area is commonly considered peripheral, both on the European and national scales. The unfavourable location and low level of economic development is recognised as the primary cause of the occurring demographic changes. The Lubelskie Voivodship is one of the most adequate examples of such relationships. It is the main focus of this article, and is used to illustrate the mentioned relationships.

The article is composed of two basic parts. The first part of an introductory nature presents factors determining the acknowledgement that east Poland is a peripheral area. The primary causes of such a situation are described based on the example of the Lubelskie Voivodship, both those resulting from the history of the area, and those related to the current socio-economic situation.

The second part of the article presents four maps: the first one was developed based on extensive research by other authors (Rosner and Stanny 2014) in the scope of the socio-economic situation, illustrating peripheral areas in Poland, and the other three are the authors' own elaborations presenting changes in the size and density of population in Poland in the years 1946–2012. The comparison of the maps will allow for the comparison of the ranges of the peripheral zones identified based on multifactor research with the maps of population changes. This will permit the verification of the proposed thesis stating that changes in population distribution can be treated as a credible indicator of peripherality.

1 Peripherality of the areas of east Poland

The marginality of east Poland is evident irrespective of the adopted comparative territorial scale. In Europe, the area is located in the part called the Periphery of East-Central and East Europe (Domański 2002). Similar descriptions occur in analytical and strategic documents of the European Union, where the criterion of GDP per inhabitant measured by the purchasing power parity is taken into consideration. In five voivodships in the eastern part of the country: Warmińsko-Mazurskie, Podlaskie, Lubelskie, Podkarpackie, and Świętokrzyskie, GDP value does not exceed 40% of the EU average. In addition to economic conditions, the peripherality of east Poland is largely determined by considerable distance and lack of stronger relations with the development centres of Europe, location outside the main European transport and communication routes, and location at an external border of the EU.

The peripherality of the eastern voivodships is also evident on the scale of Poland. According to the report on the state of spatial development of the country (2004), they are located outside of the traditional economic core of the country, and outside the areas covered by development and life quality growth concerning the western and central parts of Poland.

The considerable east-west polarisation of rural areas in Poland is evidenced by the analyses performed based on the synthetic index of the socio-economic development level (Rosner and Stanny 2014). Rural areas in the eastern part of the country show a substantially lower degree of development than the areas of west and south-west Poland (fig. 1). A considerable part of the eastern voivodships is also distinguished by low spatial accessibility, particularly resulting from its distance from large national and regional centres, and the scarcity of important transport and communication routes. The east-west pattern of spatial differentiation of the rural areas in Poland was determined historically, and developed to the highest degree during the partitions. The contemporary peripherality of certain regions, particularly in the eastern part of the country, increased in spite of the later attempts to even out the territorial differences in the level of development.

Apart from being treated as peripheral areas on the national scale, the eastern voivodships of Poland also experience internal differentiation and strong polarisation in the scope of socio-economic phenomena (Rosner and Stanny 2014). It is manifested in the demographic, social, and economic growth of the largest cities that constitute regional development centres, and the demographic degradation and concentration of social and economic problems in peripheral rural areas (Bański et al. 2014).

2 Conditions of demographic changes in the Lubelskie Voivodship

In comparison to other voivodships of Poland, but also the Eastern Wall, the Lubelskie Voivodship shows high specificity of demographic and social processes. This is determined by a group of factors related to the location and socio-economic situation of the area. They are partly determined by history, and to a certain degree also result from national policies of the post-war period. The region has usually been omitted or little considered by the authorities in national development plans. Economic growth has been hampered by its location at the tight eastern border of Poland. In the Communist period, this was the border with the Soviet Union. It made impossible any trans-border cooperation as a potential impulse for activating the local economy.

New challenges related to trans-border cooperation appeared at the moment of Poland's accession to the structures of the European Union (2004), and then the Schengen Area (2007). The Lubelskie Voivodship was now located at the external border of the European Union, subject to high restrictions in the scope of its crossing by non-EU citizens. The eastern border of Poland has become again a barrier and restriction for trans-border cooperation, including in the economic scope.

The profile of the economy implemented in the voivodship, particularly based on traditional and rather inefficient agriculture, low level of urbanisation, and scarcity of investments in the scope of infrastructure, determined the low level of life and low settlement attractiveness of the region. Intensive emigration from the areas already started in the 1950s, and lasted throughout the Communism period. Emigration mainly concerned young inhabitants of rural areas, particularly women, moving to the nearby larger cities and cities in other parts of Poland. The Lubelskie Voivodship has become one of the main depopulation areas of the country (Eberhardt 1989).

The demographic situation of the voivodship did not improve under the new economic conditions. Moreover, with time, due to the deterioration of the economic situation, the majority of unfavourable demographic phenomena intensified. The transition to a market economy in the 1990s intensified the migration processes, and modified the contemporary situation in the scope of natural movement; a decreasing natural growth became an additional factor of the population regress. As a result, areas with decreasing numbers of inhabitants grew, systematically developing increasingly extensive depopulation areas (Flaga 2002).

In the modern times, migrations still determine the general demographic situation in the Lubelskie Voivodship to the highest degree. The migration balance of the area is still negative. A large portion of the population participates in temporary migrations. Foreign emigration is not of high importance in the Lubelskie Voivodship. Inhabitants of rural areas particularly participate in domestic migrations to other voivodships, particularly to the Mazowieckie and Małopolskie Voivodships. The migrations are of selective character. They particularly concern young people, the best educated, more enterprising and innovative. This results in the impoverishment of the local human resources in both quantitative and qualitative terms (Bański et al. 2010).

3 Determination of the range of peripheral areas

The determination of the spatial distribution of peripheral areas involves the analysis of a number of factors, briefly mentioned in the first part of the article. The multifactor research is largely objective, although time-consuming. An example of such a procedure is the map included in the publication by Rosner and Stanny (2014), presenting a synthetic measure of the socio-economic development of communes in Poland. The authors distinguished five classes. The two lowest classes represented peripheral areas. The area was extracted for the purposes of this study (fig. 1) to make its range more legible and to permit comparisons with maps presenting demographic changes in Poland.

In spite of its simplicity, the index of changes in population or its measure referred to surface area has features of a synthetic index. The decisions of particular persons regarding the place of residence are determined by many geographical, social, and economic factors. Moreover, the determination of peripheral zones based on one index contributes to the ability to obtain study results considerably faster.

The preparation of maps presenting the range of depopulated areas involved the isolines method. In comparison with the most frequently applied cartogram, it permits obtaining a more transparent image of the spatial distribution of the phenomenon (Cebrykow 2005). The application of isopleth maps is justified by the mathematical and visual ordering and integration of the values of the phenomenon presented in the map instead of their record as separate statistical facts referred to area (e.g., administrative) units, as in the case of the cartogram. Such integration and ordering is supposed to result in the synthesis of the phenomenon. This results in the presentation of the phenomenon in the map in the form of a smoothed statistical surface (Mościbroda 1999). It is also important to remember the interpretation of statistical maps prepared by means of the isolines method is different than in the case of the simpler and more commonly applied cartogram
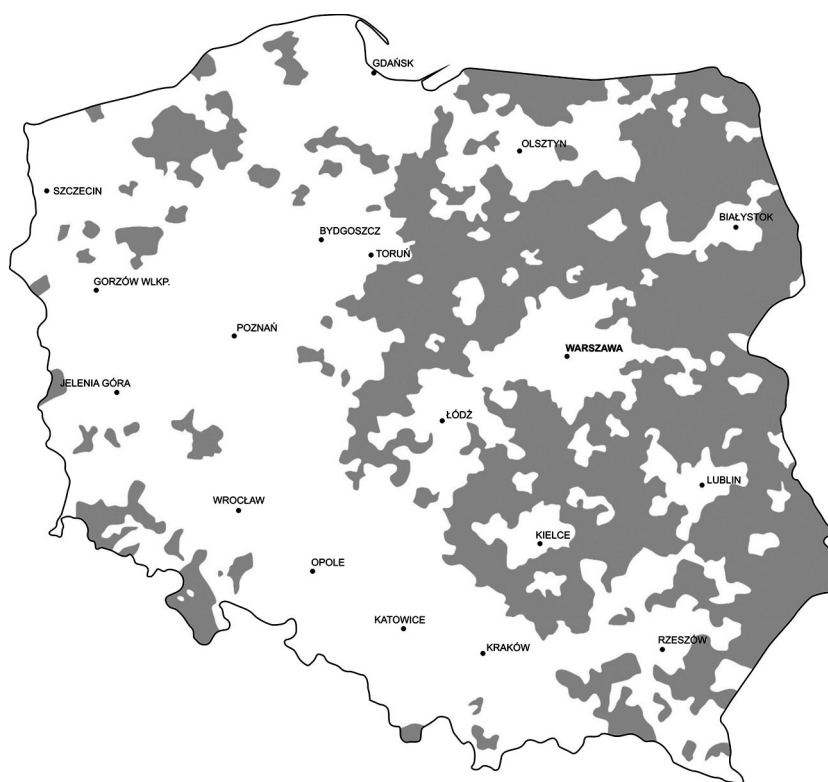
Fig. 1. Fig. 1. Range of peripheral areas in Poland
Source: Own elaboration based on a map by Rosner and Stanny (2014)

method. The isoline map does not consider the administrative boundaries collecting the data. It shows the spatial distribution of the trend of the local phenomenon of depopulation. The rule of spatial autocorrelation is of great importance for the analysis of the maps. According to the rule, areas located near one another are more similar than those at a larger distance from one another. Such an approach corresponds better with the character of the spatial distribution of the phenomenon. Therefore, the isopleth map was selected as the best presentation method and tool for the geographical research.

The preparation of the isoline maps involved the IDW (Inverse Distance Weighting) method. The method is applied to present demographic issues where spatial autocorrelation is very evident. It is a deterministic method of interpolation (approximation) of dispersed point data.

4 Map analysis — discussion

The first map presents changes covering the period from 1946 to 2012. It provides a cartographic image of changes in the distribution of population in Poland (fig. 2), where peripheral areas can be identified with the range of an area with negative changes in population density. In the map, the area is marked with blue shades. The range of the zones is largely equivalent to the peripheral areas presented in figure 1. The occurring inconsistencies concern areas where an increase in population density is symbolic and can be interpreted in the categories of stagnation.

The comparative analysis of the ranges of depopulation zones (fig. 2) with the range of peripheral areas (fig. 1) suggests conclusions justifying the thesis that changes in population density can be interpreted as an indicator of peripherality. The authors of the study verified the hypothesis by analysing the data over a shorter period of time. A map presenting changes in population density in 1989–2012 was prepared for the comparative purposes (fig. 3). The analysis of the map draws attention to the areas of the largest cities of Poland where the population density index decreases. Interestingly, areas with opposite tendencies are observed in their near vicinity. A negative population density index in large cities coexists with positive values in their direct vicinity. This may be
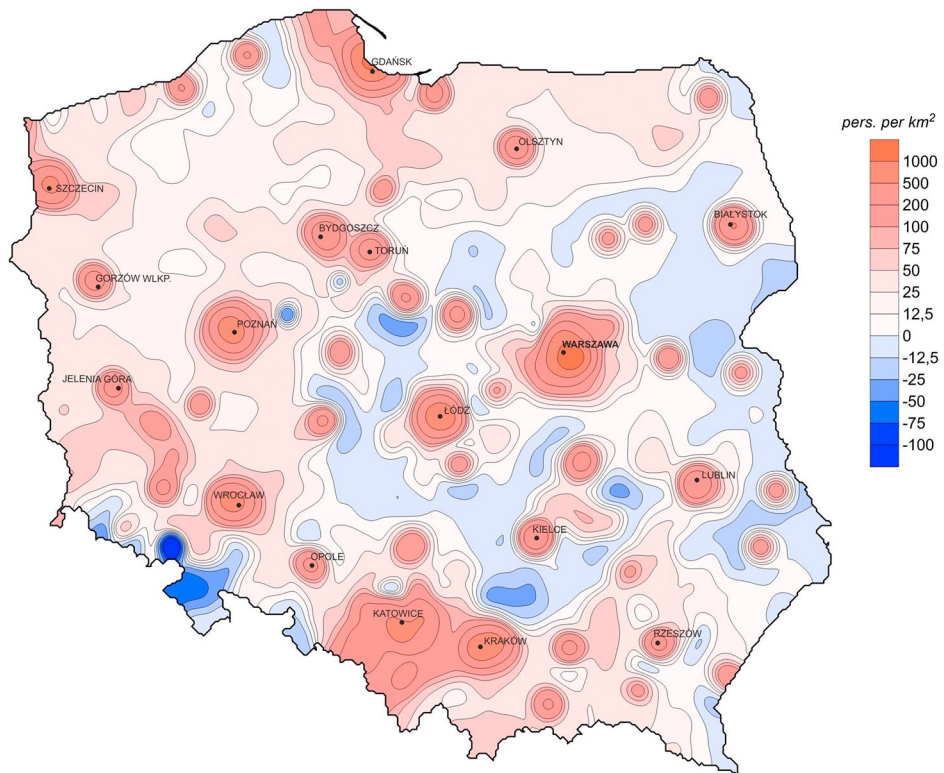
Fig. 2. Map of changes in population density in Poland in 1946–2012. The depopulation areas determine the range of peripheral zones
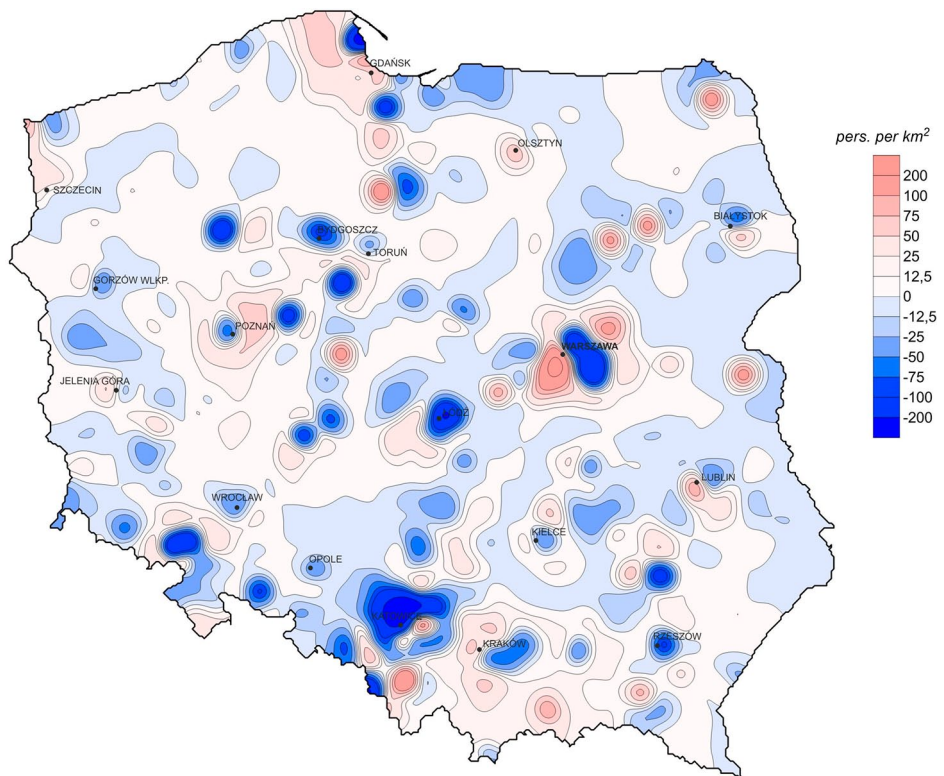

Fig. 3. Map of changes in population density in Poland in 1989–2012

explained by the suburbanisation process showing the current tendency for settlement in suburban zones with simultaneous stagnation within cities, and particularly their centres. Such areas cannot be considered peripheral zones as defined in this paper.

The issue could be solved by combining the areas of large cities with their direct vicinity, developing agglomerations. In such a case, the population density change index would be averaged, and as a result it would have a positive value. Similar results could be obtained by introducing stronger generalisation of the statistical surface leading to a reduction in local differences.

Interesting effects could also be obtained by excluding the population of cities from the map. Such a solution was introduced in the map in figure 4.
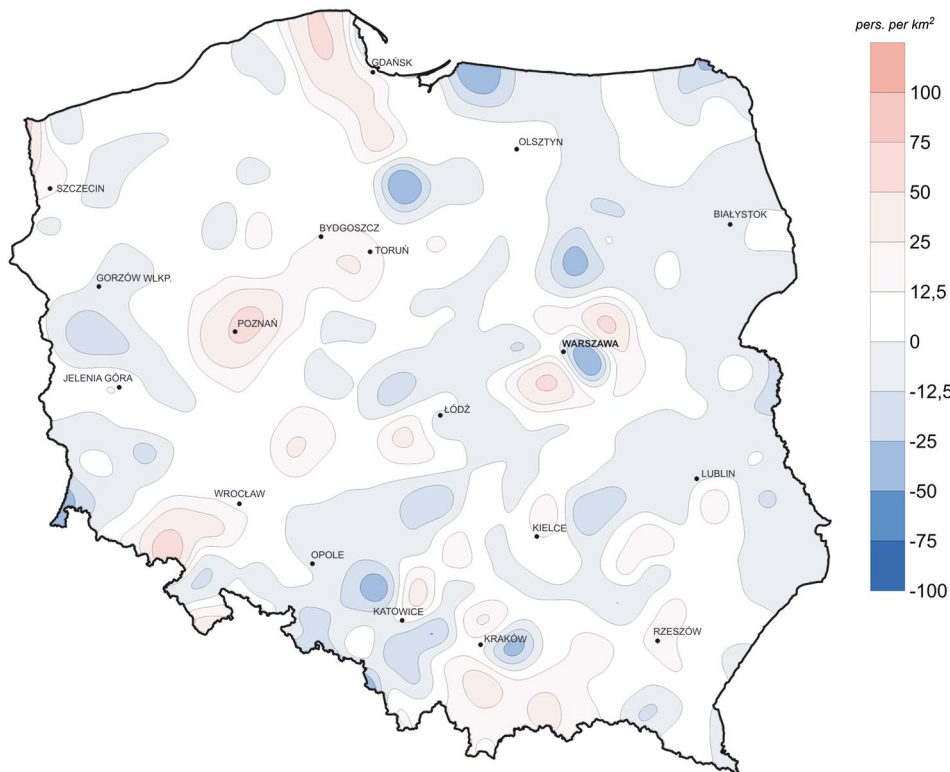

Fig. 4. Map of changes in population density in Poland in 1989–2012, excluding the population of cities

Final conclusions

The comparison of all of the maps presenting the range of peripheral zones permits the verification of the thesis proposed in the introduction of the article. The answer is not clear. In spite of general similarities, the ranges differ in details. The differences have two causes. The first one is obviously determined by differences in the data used for the preparation of the maps (the map of peripherality prepared based on Rosner and Stanny (2014) was based on multi-index data as opposed to the maps based on data only concerning changes in population numbers). The second cause involves the methodology of preparing the maps. The application of the isoline method with simultaneous generalisation of the statistical surface blurs the boundaries of administrative units, perfectly visible in the case of the cartogram. This fact might be inconvenient, particularly when the maps are subject to analysis by statisticians for whom administrative boundaries are frequently an important map attribute. On the other hand, the removal of administrative boundaries from the map makes it more suggestive by making its content more legible. Notice also that the isoline map shows the intensity of a decrease in population density which can be interpreted as an increase in peripherality.

The above suggests that the application of maps of changes in population density as an index of peripherality is possible, but the specificity of such presentation, restricted to a very general

determination of such changes, should be considered. Promising effects can only be obtained in the case of determination of peripheral areas developed over longer periods of time. In such a situation, a number of factors causing movement of population are averaged. For example, suburbanisation does not introduce the possibility of inaccurate interpretation of peripheral areas.

The proposed manner of determination of peripheral zones has many limitations. The authors are convinced, however, that the method provides a good perspective. Evidencing this fact requires further research involving the introduction of improvements contributing to the credibility of the proposed method.

References

Bański, J., J. Dobrowolski, M. Flaga, W. Janicki, and M. Wesołowska. 2010. *Wpływ granicy państwowej na kierunki rozwoju społeczno-gospodarczego wschodniej części województwa lubelskiego, Studia Obszarów Wiejskich.* Warszawa: Polskie Towarzystwo Geograficzne.

Bański, J., W. Pantylej, W. Janicki, M. Flaga, and M. Wesołowska. 2014. *Współczesne przekształcenia społeczno-gospodarcze a potencjał ludnościowy wschodniej Polski, Studia Obszarów Wiejskich.* Warszawa: IGiPZ PAN; PTG.

Cebrykow, P. 2005. "Metoda wygładzania Kartogramu jako alternatywa dla tradycyjnych sposobów wykonywania map izopletowych." *Polski Przegląd Kartograficzny* no. 37 (1):3–12.

Domański, R. 2002. *Gospodarka przestrzenna.* Warszawa: PWN.

Eberhardt, P. 1989. *Regiony wyludniające się w Polsce, Prace Geograficzne.* Wrocław: Zakład Narodowy im. Ossolińskich.

Flaga, M. 2002. "Zmiany zaludnienia na obszarach wiejskich województwa lubelskiego po roku 1989." *Annales Universitatis Mariae Curie-Sklodowska, Sectio B, Geographia, Geologia, Mineralogia et Petrographia* no. 57 (12):211–233.

Miszczuk, A. 2013. *Uwarunkowania peryferyjności regionu przygranicznego.* Lublin: Norbertinum Wydawnictwo-Drukarnia-Księgarnia.

Mościbroda, J. 1999. *Mapy statystyczne jako nośniki informacji ilościowej.* Lublin: Wydawnictwo Uniwersytetu Marii Curie-Skłodowskiej.

Rosner, A., and M. Stanny. 2014. *Monitoring rozwoju obszarów wiejskich. Etap 1, Przestrzenne zróżnicowanie poziomu rozwoju społeczno-gospodarczego obszarów wiejskich w 2010 roku.* Warszawa: Fundacja Europejski Fundusz Rozwoju Wsi Polskiej; Instytut Rozwoju Wsi i Rolnictwa PAN.