

DEMOGRAPHIC POTENTIAL AND LIVING CONDITIONS IN RURAL AREAS OF NORTH-EASTERN POLAND

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Abstract

Rural areas are characterized by considerable diversity in terms of natural conditions, social and economic. These conditions interact with each other thus determining the development of rural areas and thus affect the living conditions of rural population. Nowadays more and more important role in the socio-economic development plays a demographic potential. This article is an attempt to demonstrate the potential of population in rural areas north-eastern Poland in relation to the socio-economic development. For the purposes of testing, data from the Central Statistical Office for the year 2014. The study area included the rural communes of the Warmińsko-Mazurskie and Podlaskie Voivodship. In order to determine the demographic potential and socio-economic development of the rural areas used indicators on the basis of the literature and own research. The synthetic measure of potential of population and socio-economic development used by Hellwig taxonomic method. Then, on the basis of research results verified the relationship between the potential of demographic and socio-economic development of rural areas of north-eastern Poland.

Key words: demographic potential, North-eastern Poland, rural areas

JEL Code: J10, J11,

Introduction

Diversification of rural areas in Poland in terms of demography is first and foremost determined by natural, demographical, cultural, economic and historical conditions, as well as by factors related to the geographical location of these areas (Gwiaździńska-Goraj, Jeziarska-Thole, 2013). North-eastern Poland comprises the Region of Warmia and Mazury and the Region of Podlasie. Rural areas in north-eastern Poland occupy 42,830 km², they account for 97 % of its territory (Goraj, Gwiaździńska-Goraj, Nowak, 2014, Goraj, Nowak, Gwiaździńska-Goraj, 2014). The investigated area borders the Kaliningrad Region, Lithuania and Belarus, and it marks the easternmost boundary of the European Union. North-eastern

Poland is characterized by a high degree of naturalness. The natural features of North-Eastern Poland are recognized for their uniqueness not only in Poland, but also across Europe. The Białowieża Forest has been designated a UNESCO Biosphere Reserve (Goraj, Nowak, Gwiaździska-Goraj, 2014). With the exception of one constituent municipality, North-eastern Poland is part of the area referred to as the Green Lungs of Poland that covers the most attractive natural sites in the country (Gwiaździska-Goraj, Goraj, 2013, Goraj, Nowak, Gwiaździska-Goraj, 2014, Goraj, Gwiaździska-Goraj, Nowak, 2014). In 2015 the rural areas of north-eastern Poland were inhabited by 1,060,720 people, which was 6.9% of the whole Polish population. The region is characterised by a relatively low population density: 60 people/km² in rural areas, which was over two times lower than the national average (123 people/km²). In Warmia and Mazury as well as in Podlasie agriculture and food production continue to be the main economic drivers, but the share of non-agricultural activities is expanding steadily (Goraj, Nowak, Gwiaździska-Goraj, 2014). The central focus of the paper is the analysis of the demographic potential of the rural areas in north-eastern Poland with regard to the socio-economic development. For the purposes of this work the rural areas of north-eastern Poland include the rural communes of the Warmińsko-Mazurskie Voivodship (100) and of the Podlaskie Voivodship (103). The research data was supplied by the Central Statistical Office in Poland. At the same time, for the sake of a more comprehensive analysis of the demographic potential and the socio-economic development, the spatial patterns of selected indicators are presented.

1. Demographic features of rural areas in north-eastern Poland

In 2015 the rural areas of north-eastern Poland were inhabited by 1,060,720 people. The region is classified together with the least populated areas in Poland. In 2014 the population density in the rural areas of north-eastern Poland equalled 60 people/km². The lowest population density, i.e. 5 people/km², was noted in the rural commune of Krynki (Podlaskie Voivodship) and the highest population density, i.e. 90 people/km², featured in the commune of Juchnowiec Kościelny (Podlaskie Voivodship). The highest population density was mostly characteristic of the communes in the direct neighbourhood of Olsztyn (the capital city of the Warmińsko-Mazurskie Voivodship) and Białystok (the capital city of the Podlaskie Voivodship), as well as in the south-eastern part of the Warmińsko-Mazurskie Voivodship and in the west-central part of the Podlaskie Voivodship. Whereas the lowest population density was recorded in the communes located in the northern part of the Warmińsko-

Mazurskie Voivodship and eastern part of the Podlaskie Voivodship. Notably, they are in the border area of the Kaliningrad Oblast, Lithuania and Belarus. The spatial pattern of the population density can be analysed according to the core-periphery concept which suggests that regional centres of growth dominate over peripheries (Grosse, 2002). That theory may stand behind the assumption that in the future a large increase in the rural population will take place in the communes situated within a 50-kilometre radius from big municipal centres (Wilkin, 2005), whereby the strength of the impact the city will have on the adjacent areas will obviously depend on the size of the city, i.e. the bigger the city, the stronger the impact. (Gwiaździńska-Goraj, 2011, Gwiaździńska-Goraj, Jezierska-Thole 2013). In order to demonstrate the dynamics of changes in the population of the rural areas in north-eastern Poland between 2004 and 2014 the results yielded for 2004 were treated as the benchmark and were ascribed 100 points, which enabled the calculation of the relative (i.e. in relation to the benchmark of 100 points) value for 2014. Thus, if the result of calculations was below 100 points, it meant that the last year of the analysed period suffered a decrease in a particular feature in relation to the first year of the period under examination. On the other hand, if the result equalled 100 points, it proved absence of changes; or if the result exceeded 100 points, it meant that a particular feature was on the increase. The rural areas of north-eastern Poland saw the dynamic of changes in population within the last ten years at the level of 99.9, with the result of 103.8 for Poland as a whole. Simultaneously, the changes in the population of the rural communes in the region analysed were spatially diversified. The analysis of the pattern led to the conclusion that the population was on the decrease in 60% of the whole area studied, while in 40% of the rural communes the population grew. The most pronounced increase in the population featured in the communes lying in the direct neighbourhood of the capital cities of the two voivodships – Olsztyn and Białystok – and in the south-western part of the Warmińsko-Mazurskie Voivodship. Whereas the largest population deficit was predominantly in the rural communes of the south-eastern part of the Podlaskie Voivodship. This region is mentioned together with the least populated areas in Poland. In the analysis of the spatial patterns of changes in population it emerged that these patterns are related to those of the population density. It means that the population distribution in the rural areas of the Warmińsko-Mazurskie Voivodship is more or less steady and, in the course of time, it becomes an established phenomenon. However, undoubtedly, the strongest influence on the population size is attributed to the vital statistics and migratory movement of people. Population growth is conditioned by the birth rate, which – in turn – is determined by many variables, including: the number of women and men at the reproductive age; family model;

economic conditions; and the death rate – a factor related to genetics, lifestyle and healthcare availability and standards (Gwiaździńska-Goraj, Goraj, 2015). In 2014 the crude natural increase per 1,000 people oscillated between -24.3 in the rural commune of Czyże (Podlaskie Voivodship) and 9.5 in the commune of Stawiguda (Warmińsko-Mazurskie Voivodship); the average crude natural increase in the region was -1.6. Positive results of the said index were found in 47% of the rural communes in north-eastern Poland, 70% of which were the Warmińsko-Mazurskie Voivodship communes. While the communes with negative values of the index (per 1,000 people) were mostly in the eastern and south-eastern parts of the Podlaskie Voivodship. The analysis of migration levels is yet another essential factor in the process of establishing the demographic potential. Indeed, the balance of migration reflects the socio-economic situation of a particular region and shapes the population size, structure and distribution. In 2014 across the rural areas of north-eastern Poland the total balance of migration of people holding the permanent residency status per 1,000 people was -1.8, whereas the internal migration of permanent residents amounted to -0.2. In 2014, in the rural areas of north-eastern Poland, the highest indexation was in the commune of Stawiguda, i.e. 29.3 (Warmińsko-Mazurskie Voivodship), and the lowest indexation was in the commune of Reszel, i.e. -21.7 (Warmińsko-Mazurskie Voivodship). However, a positive balance of migration per 1,000 people featured only in 24% of all the rural communes analysed. The rest of the rural communes had a negative balance of migration, whereby the result of -10.0 ‰ (or less) was noted in 14 rural communes. This index proved to have highly diverse spatial patterns at the level of communes, with the highest scores discovered in the rural communes located in the direct neighbourhood of the capital cities of each of the two voivodships: Olsztyn (Warmińsko-Mazurskie Voivodship) and Białystok (Podlaskie Voivodship). An extremely negative balance of migration per 1,000 people was noted in the communes concentrated mostly in the northern part of the Warmińsko-Mazurskie Voivodship and the west-central part of the Podlaskie Voivodship. Essentially, what conditions the population structure and sex ratio is the crude natural increase and migratory movements of people. As it is, when a downward trend of the crude natural increase is a long-lasting phenomenon accompanied by an excessive outflow of people, the age structure of population may be unfavourably changed. In order to study the population structure the percentage of people at pre-working, productive and retirement ages must be established. Upon the analysis of the relations between these three economic groups of the rural population it emerged that in 2014 the Warmińsko-Mazurskie Voivodship was in a better situation than the Podlaskie Voivodship. In fact, the aging of population can be observed when the share of people at a

retirement age in the whole population is growing. In the rural areas of north-eastern Poland the share of these people in the whole population varied from 11.8 % in the commune of Hawa (Warmińsko-Mazurskie Voivodship) to 42.7 % in the commune of Dubicze Cerkiewne (Podlaskie Voivodship).

Tab. 1: The structure of the population by age in 2014

Specification	The structure of the population in percent		
	pre-working age	productive age	retirement age
North-eastern Poland	19.7	63.1	17.2
Warmińsko-Mazurskie Voivodship	20.7	64.7	14.6
Podlaskie Voivodship	18.4	61.2	20.4

Source: Own elaboration based on www.stat.gov.pl

The analysis of the spatial distribution of this index values clearly showed some spatial differences: the lowest indexation was predominantly with the rural communes of the Warmińsko-Mazurskie Voivodship; the highest indexation was with the communes of the Podlaskie Voivodship. At the same time, this spatial pattern refers back to the spatial pattern of the crude natural increase per 1,000 people, where the Warmińsko-Mazurskie Voivodship also enjoyed much more favourable results. What it means is that the unfavourable changes in the population structure of the Podlaskie Voivodship mostly originate in the decreasing crude natural growth. The ratio of the number of women to men changes alongside the age continuum. In the rural areas of north-eastern Poland the population of women is bigger than that of men in the age group of +60, which is the outcome of an excess mortality among men. In younger age groups, following common trends, the situation is quite the reverse due to a higher birth rate of boys than girls.

2. Demographic potential and socio-economic development

In order to determine the demographic potential of the rural areas in northern Poland Hellwig's taxonomic method has been applied (Hellwig, 1968). This method is one of the methods of linear arrangement (Węgrzyn, 2013). In order to determine the demographic potential and socio-economic development of the rural areas used indicators on the basis of the literature and own research (Gwiaździńska-Goraj, 2011, Gwiaździńska-Goraj, Jezierska-Thole, 2013, Gwiaździńska-Goraj, Goraj, Nowak, 2014). For this purpose, indicators characteristic of the demographic potential of a particular year for a specific rural commune of north-eastern Poland were established through calculation:

- dynamics of exchange of population 2004-2014,
- density 2014,
- natural increase per 1000 population 2014
- net migration per 1,000 population in 2014,
- the percentage of the population of working age to total population in 2014.

Subsequently, the figures were arranged in a matrix where the rural communes were marked on a row vector and the index values were represented by columns; then they were subjected to the standardisation procedure represented by the formula:

$$z = \frac{x - \mu}{\sigma} \quad (1)$$

where:

x - variable standardized,

μ - the average of the population,

σ - standard deviation of the population.

Next, to arrange the communes in the linear order, an abstract point of reference was created – the model commune. It had the maximal values of the favourable features (stimulants) and the minimal values of the unfavourable features (destimulants). The further phase of the study pivoted on the calculation of the demographic potential level for each rural commune. It is always positive in value or equals 0; as a rule it does not exceed 1. The closer to the zero point a commune is, the better its infrastructure is developed; the more proximate it is to 1, the poorer its infrastructure development is. The synthetic measure for each rural commune is given by the formula:

$$d_i = \frac{C_{ij}}{C_o} \quad (2)$$

where:

C_{ij} - euclidean distance between the value for rural communes and the model object given by the formula:

$$C_{ij} = \sum_{k=1}^m [(z_{ij} - z_{jk})^2]^{\frac{1}{2}} \quad i= 1,2,\dots,n \quad (3)$$

z_{ij} – value of the j th variable for i th rural common (after standardisation)

z_{jk} – value of the j th variable for the model object

C_o - critical (limit) the distance of the value for rural communes from the model object given by the formula:

$$C_o = \bar{C}_{ij} + 2S_o \quad (4)$$

$$\bar{C}_{ij} = \frac{1}{n} \sum_{i=1}^n C_{ij} \quad (5)$$

$$S_o = \left[\frac{1}{n} \sum_{i=1}^n (c_{ij} - \bar{c}_j)^2 \right]^{\frac{1}{2}} \quad (6)$$

Then, basing on the arithmetical average and the standard deviation of the demographic potential level, four classes of communes were differentiated, whereby categorisation to class I meant the highest demographic potential and to class IV – the lowest demographic potential.

Tab.2: Classification of demographic potential in rural communes in North-eastern Poland in 2014 year

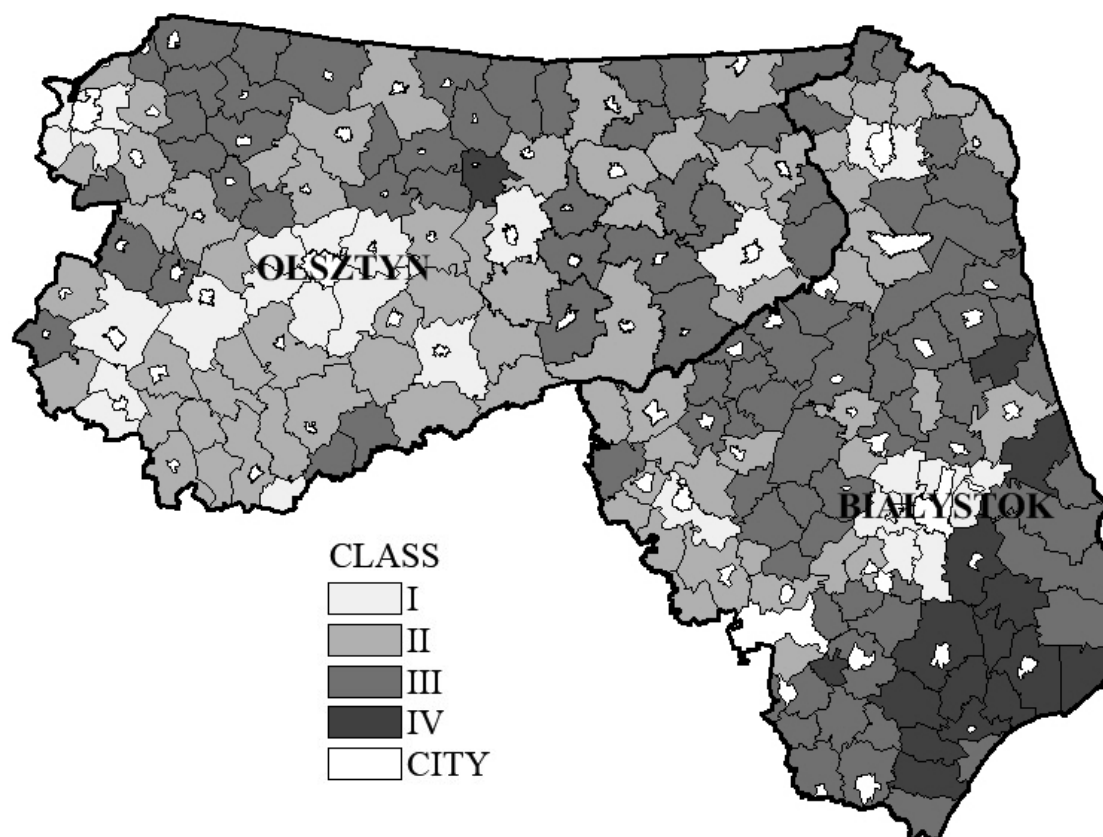
Class	North-eastern Poland	Warmińsko-Mazurskie Voivodship	Podlaskie Voivodship
	The number of rural communes		
I	25	17	8
II	73	43	30
III	89	39	50
IV	18	1	17
total	205	100	105

Source: Own elaboration

When it comes to the rural areas of north-eastern Poland, the majority of the communes were qualified to classes II and III. However, the communes located in the Warmińsko-Mazurskie Voivodship emerged as having more favourable characteristics than those in the Podlaskie Voivodship. Class I, gathering the communes with the highest demographic potential, included only 12% of all rural communes in the area studied here. These communes have a high demographic potential as almost all of the indicators measured for them were above the average. As far as the location of these communes is concerned, they can be found mostly in the neighbourhood of the capital cities of the two voivodships: Olsztyn and Białystok. Class II communes had an above-the-average demographic potential, whereby usually three out of five indicators analysed exceeded the average result for the rural communes of north-eastern Poland. As it happens, 59% of these rural communes were situated in the Warmińsko-Mazurskie Voivodship. Class III amassed 43% of all the rural communes in the area under examination. Yet, the most difficult situation – the lowest demographic potential – was encountered in class IV communes. They were characterised by: a large share of population at a retirement age; usually a low population density; crude natural growth and balance of

migration below the average for the voivodship; and small dynamics of change in the population size. These communes were mostly found in the southern part of the Podlaskie Voivodship.

Fig.1. Classification of demographic potential in rural communes in North-eastern Poland in 2014 year



Source: Own elaboration

The analysis of the socio-economic development of the rural areas in north-eastern Poland in 2014 was based on indicators which were selected, among other things, upon the availability of data at the level of commune:

- proportion of the number of unemployed persons to the working age population,
- the average usable floor space for 1 person,
- the percentage of homes with a bathroom to the total number,
- economy entities per 1000 population at working age,
- economy entities newly registered 10 thousand. of the population,
- total income per 1 inhabitant.

Subsequently, as was the case with the demographic potential, Hellwig's taxonomic method was employed to define the socio-economic development level of the rural communes in north-eastern Poland.

Tab.3: Classification of socio-economic development in rural communes in north-eastern Poland in 2014 year

Classes	North-eastern Poland	Warmińsko-Mazurskie Voivodship	Podlaskie Voivodship
	The number of rural communes		
I	25	9	16
II	59	26	33
III	94	48	46
IV	27	17	10
total	205	100	105

Source: Own elaboration

The largest number of the rural communes in this region of Poland fell into class III. However, by far more favourable distribution of communes was in the Podlaskie Voivodship. Class I – including communes of the highest demographic potential – gathered 25% of all the rural communes from the region. Location-wise, these were mostly the communes situated in the neighbourhood of the capital cities of the two voivodships: Olsztyn and Białystok, as well as the communes lying adjacent to the following towns: Suwałki, Augustów, Elbląg and Giżycko. At the same time, half of the communes grouped in this class were also qualified as class I in terms of their demographic potential. Class II communes were found in the central part of the Warmińsko-Mazurskie Voivodship, southern part of the Podlaskie Voivodship and in the Lake Districts of Suwałki and Mazury – in the touristically highly-attractive areas. With regard to the demographic potential, these communes were in class III. When it comes to class III of the socio-economic development – communes with the development level below the average – there were as many as 46% of all the rural communes in the analysed region. In terms of the demographic potential, 92% of these communes qualified as class II or III. Nevertheless, the most difficult situation was in class IV communes; noteworthy, none of them reached class I demographic potential. Predominantly, they were located in the northern part of the Warmińsko-Mazurskie Voivodship. These were typically agricultural communes, which additionally had a large share of the areas which used to be state-owned farms [PGR] and which were in the border area. In the Podlaskie Voivodship, class IV communes were in its west-central part and along the border with the Warmińsko-Mazurskie Voivodship.

Conclusion

Upon the studies carried out it can be concluded that the demographic potential of the rural areas in north-eastern Poland is regionally diversified. The communes enjoying the highest demographic potential, where almost all of the analysed indicators exceeded the average, amounted to 12% of all rural communes. In terms of their location, they were mostly found in the neighbourhood of the capital cities of the two voivodships: Olsztyn and Białystok. On the other hand, the lowest indexation predominated among the communes situated in the southern part of the Podlaskie Voivodship, which made up 18% of all rural communes. First and foremost, that area is characterised by a poor crude natural growth and a large share of population at a retirement age in the total population, which consequently leads to unfavourable demographic processes. Undoubtedly, demographic potential is a vital element deciding for or against area's attractiveness for economic activity. On the other hand, a high level of socio-economic development and geographical location may have an impact on the residential attractiveness and standard of living, which may in turn condition the level of demographic potential. Therefore, an unambiguous definition of these impacts and their mutual relations is difficult to establish. For rural areas is very important sustainable development of calls for reconciliation of three dimensions of development, which take into account the main objectives of rural area development: economic, social and environmental development (Dudzińska, Kocur-Bera, 2015). The analysis of the socio-economic development evinced its big spatial diversification. The highest levels were in the rural communes in the neighbourhood of the regional capital cities, with the impact of Białystok and Olsztyn being the strongest. The same communes had a high demographic potential as well. Whereas the lowest levels of the socio-economic development were typical of the communes in the northern part of the Warmińsko-Mazurskie Voivodship which were agriculturally-driven and which used to be occupied by state-owned farms, on the border with the Kaliningrad Oblast. Characteristically, these communes had also a poor demographic potential, to a large extent, due to a low balance of migration and a deeply-rooted attractiveness of emigration among their inhabitants. Additionally, the lack of entrepreneurship was yet another factor contributing to their poor demographic potential.

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