

Daniela Szymańska<sup>1</sup>, Jadwiga Biegańska<sup>2</sup>

Nicolaus Copernicus University, Faculty of Earth Sciences

Gagarina 9, 87-100 Toruń, POLAND

dani@umk.pl<sup>1</sup>, jadwigab@umk.pl<sup>2</sup>

## **Infrastructure's and housing's development in the rural areas in Poland – some problems**

**Abstract.** The article refers to an analysis and an evaluation of changes in the technical infrastructure and housing in the rural areas in Poland in the years 1995-2008. The article covered all rural and rural-urban (excluding urban parts) gminas in Poland that altogether amount to 2,172 units (as of 2008). It was stated that in the rural areas in Poland a population density increases and it is caused mainly by dynamic suburbanisation processes and by a population movement from cities and towns towards suburban gminas, in the less degree by a natural increase. In the article there were presented spatial variations of rural gminas in the following elements: a length of the water-line and sewerage networks per 100 km<sup>2</sup>; a share of water-line and of sewerage systems' users; a number of dwellings per 1,000 population; a number of rooms per 1 person; the usable floor space of a dwelling in m<sup>2</sup> per 1 person; a share of dwellings fitted with water-line system and a share of dwellings equipped with flush toilet and bathroom. It was also shown that there are relationships between population density and infrastructure's and housing's elements by proving positive as well as negative correlations.

**Key words:** Poland, rural areas, infrastructure, housing.

### **1. Introduction**

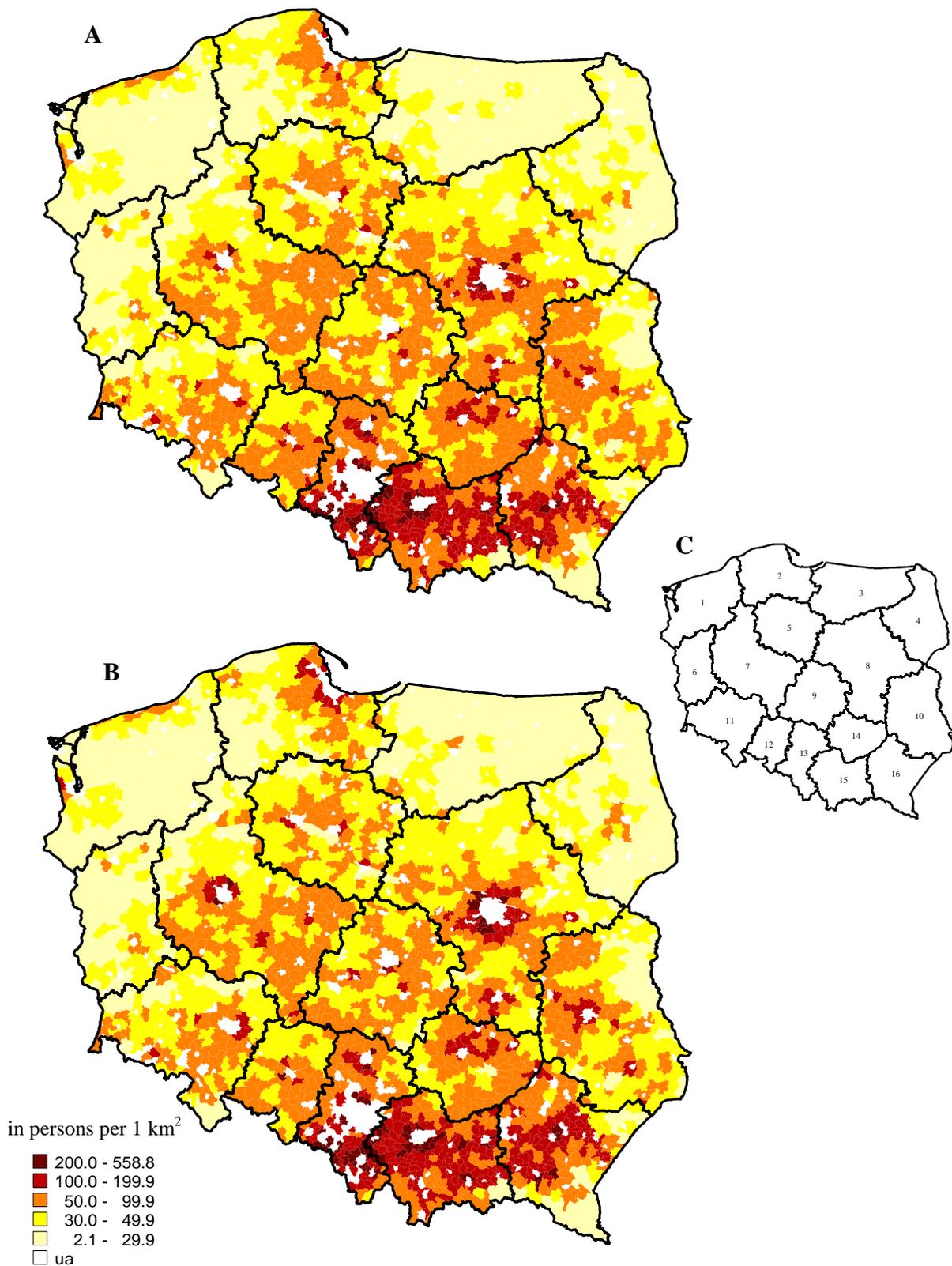
The demographic, social and economic conditions in Poland have changed immensely in both rural and urban areas. Rural areas in Poland vary in regard of their economic development, local availability of social and technical infrastructure, living conditions and

residents' incomes, as well as the local governments' wealth. Many elements of the social and technical infrastructure provision are available depending on the number and density of rural population that show strong spatial variations (Szymańska, Biegańska, 2010).

The article covers rural areas in Poland and the basic territorial units it uses are rural gminas (administrative regions of the 3<sup>rd</sup> order) and the rural parts of mixed rural-urban gminas that altogether amount to 2,172 units (as of 2008). In the analysis there were considered *inter alia* population density, the length of the water-line and sewerage networks per 100 km<sup>2</sup>; a share of water-line and of sewerage systems' users; number of dwellings per 1,000 population; a number of rooms per 1 person; the usable floor space of a dwelling in m<sup>2</sup> per 1 person; a share of dwellings fitted with water-line system and a share of dwellings equipped with flush toilet and bathroom comparing two average values calculated for the years 1995-1999 and 2005-2008. This approach prevents some data randomness that might be caused by a single-year average.

## **2. The distribution of population and infrastructure in the rural areas**

The rural population number in Poland totalled 14.8 million in 2008, exceeding its 1995 number by 115,000. This means that notwithstanding the generally downward trend in the country's population (a decline from 38.6 million in 1995 to 38.1 million in 2008), the rural population grew in number. Its share also increased larger between 1995 and 2008, from 38.2% to 38.9% of the total population. Analysing population density in the rural areas in Poland it is worth noting that it has grown constantly; compared with 1995 when 50.5 people lived on a square kilometre, the 2008 rate was already 51.0 (for the urban areas the rates were 1,139.4 and 1,090.1, respectively). This process showed two distinctive trends: while the share of the gminas with the highest population density (200-540 and 100-200 persons per 1 km<sup>2</sup>) was expanding, the share of those where the rate amounted to 50-100 persons per 1 km<sup>2</sup> was decreasing, from 36.3% in 1995 to 33.6% in 2008 (Fig. 1). In 2008 the highest number of persons per 1 km<sup>2</sup> in rural areas could be observed in Małopolskie (123 persons per 1 km<sup>2</sup>) and Śląskie voivodships (118 persons per 1 km<sup>2</sup>), whereas Warmińsko-Mazurskie (24 persons per 1 km<sup>2</sup>), Zachodniopomorskie and Podlaskie voivodships (25 persons per 1 km<sup>2</sup> each) and Lubuskie voivodship (27 persons per 1 km<sup>2</sup>) (voivodship - administrative region of the 1<sup>st</sup> order) were at the smallest end of the scale (Szymańska et al., 2009; Szymańska, Biegańska, 2010).



**Fig. 1. Population density in rural areas in Poland**

Source: Own compilation on the basis of data available at the Central Statistical Office, Regional Data Bank. Explanation: A – average value from years 1995-1999; B – average value from years 2005-2008; ua – urban areas; C - administrative regions of the 1<sup>st</sup> order: 1 – Zachodniopomorskie; 2 – Pomorskie; 3 – Warmińsko-Mazurskie; 4 – Podlaskie; 5 – Kujawsko-Pomorskie; 6 – Lubuskie; 7 – Wielkopolskie; 8 – Mazowieckie; 9 – Łódzkie; 10 – Lubelskie; 11 – Dolnośląskie; 12 – Opolskie; 13 – Śląskie; 14 – Świętokrzyskie; 15 – Małopolskie; 16 - Podkarpackie

The study has shown that the main factors expanding the group of gminas with the highest population density (i.e., in excess of 100 persons per 1 km<sup>2</sup>) were dynamic suburbanisation processes and outflows of urban residents to the suburban gminas. As regards the gminas with population density from 2 and 50 persons per 1 km<sup>2</sup>, it was mainly the natural increase that made their share grow larger. A such clearly strengthening correlations (in the period 1995-2008) between population density and the inflows of urban dwellers were observed for instance in Pomorskie (1995-1999 –  $r = 0.32$ ,  $\alpha = 0.001$ ; 2005-2008 –  $r = 0.68$ ,  $\alpha = 0.000$ ), Mazowieckie (1995-1999 –  $r = 0.58$ ,  $\alpha = 0.000$ ; 2005-2008 –  $r = 0.63$ ,  $\alpha = 0.000$ ), Małopolskie (1995-1999 –  $r = 0.38$ ,  $\alpha = 0.001$ ; 2005-2008 –  $r = 0.58$ ,  $\alpha = 0.000$ ), Lubelskie (1995-1999 –  $r = 0.25$ ,  $\alpha = 0.000$ ; 2005-2008 –  $r = 0.57$ ,  $\alpha = 0.000$ ), Zachodniopomorskie (1995-1999 –  $r = 0.34$ ,  $\alpha = 0.001$ ; 2005-2008 –  $r = 0.56$ ,  $\alpha = 0.000$ ), Kujawsko-Pomorskie (1995-1999 –  $r = 0.09$ ,  $\alpha = 0.317$ ; 2005-2008 –  $r = 0.46$ ,  $\alpha = 0.000$ ), and Wielkopolskie (1995-1999 –  $r = 0.18$ ,  $\alpha = 0.010$ ; 2005-2008 –  $r = 0.46$ ,  $\alpha = 0.000$ ) voivodships. Świętokrzyskie, Śląskie and Podlaskie voivodships in the higher degree owed population density in the rural areas to the natural increase. The correlations amount to: for the first voivodship 1995-1999 –  $r = 0.36$  ( $\alpha = 0.000$ ); 2005-2008 –  $r = 0.55$ , ( $\alpha = 0.000$ ), for the second one 1995-1999 –  $r = 0.23$  ( $\alpha = 0.012$ ); 2005-2008 –  $r = 0.42$  ( $\alpha = 0.000$ ), for the third one, i.e., Podlaskie voivodship 1995-1999 –  $r = 0.28$  ( $\alpha = 0.004$ ); 2005-2008 –  $r = 0.34$  ( $\alpha = 0.000$ ). It should be added that population density noticed in the rural areas in Lubelskie voivodship – as it was above-mentioned – was caused by population inflow from towns and high natural increase as well (1995-1999 –  $r = 0.07$ ; 2005-2008 –  $r = 0.30$ ,  $\alpha = 0.000$ ).

It could be expected that the increasing population density in the rural areas is very likely to stimulate the development and modernisation of social and technical infrastructure and of residential building, thus affecting the improvement of the living conditions of residents in these areas (Fig. 1) (Bański, 2005).

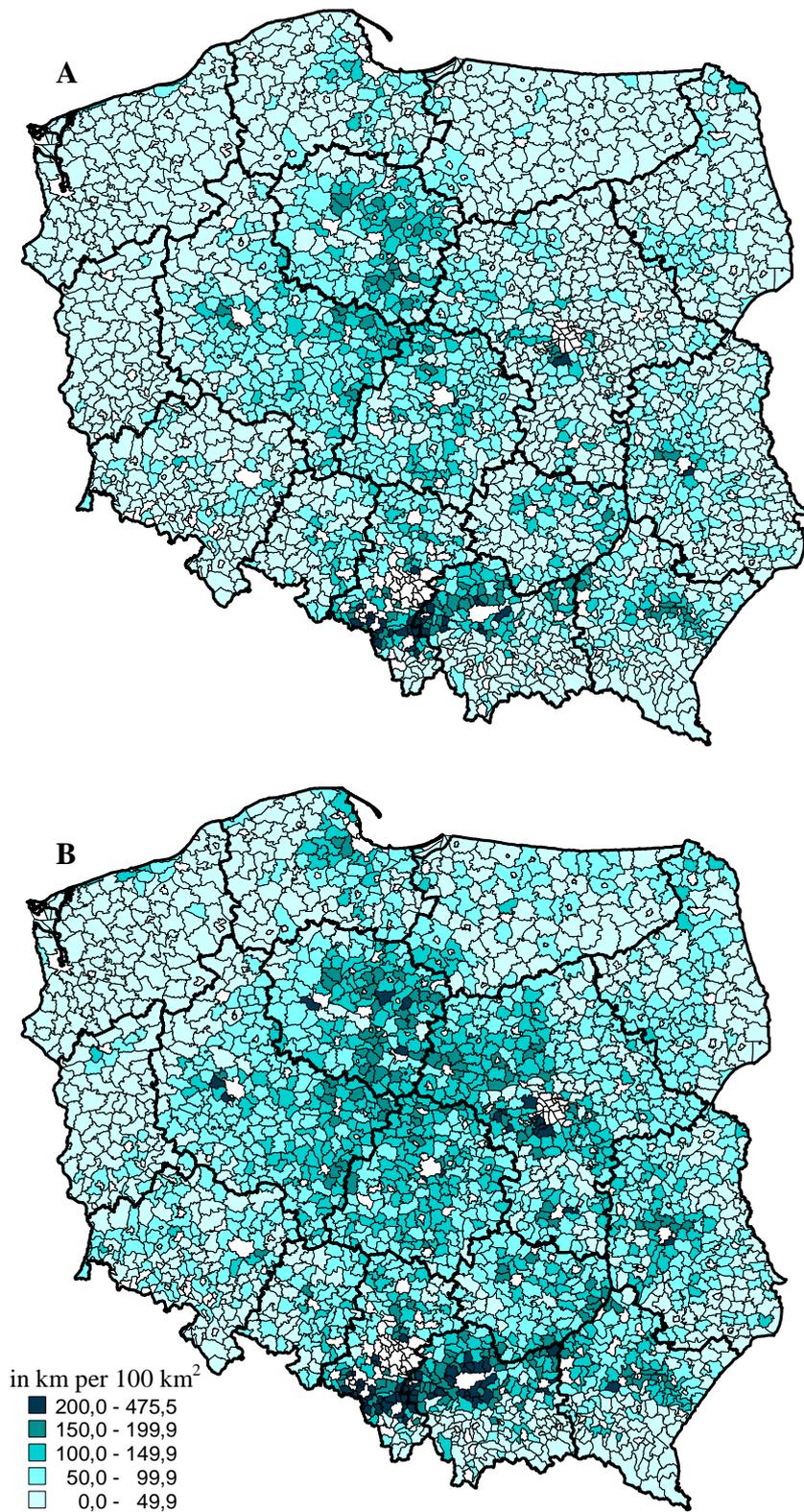
### **3. Technical infrastructure and housing stock**

The positive finding arising from the analysis of the water-line network and its length per 100 km<sup>2</sup> in Poland is that it increased between 1995 and 2008 all over the country, i.e., in both urban and rural areas. Compared with the years 1995-1999 when Polish statistics showed 57.9 km of the water-line network per 100 km<sup>2</sup> (222.0 km in towns and 46.1 km in the rural areas), in the years 2005-2008 the numbers were 88.3 km (in Poland), 264.7 km (in towns)

and 67.9 km (in the rural areas), respectively. Accordingly, the greatest improvement took place in the rural areas where the network's length increased by 47% (Fig. 2), while in the urban areas by only 19%. However we should remember, towns naturally have denser and longer water-line networks, as their areas are smaller and more compact. Notwithstanding, the extending water-line networks in the rural areas reveal that deep modernisation processes and socio-economic development take place there. The share of the rural users of water-line networks that grew from 70% in the years 2002-2003 to 74% in 2007-2008 offers the same conclusion. The growth was mainly due to the increasing share of gminas where the water-line network users accounted for over 80% of the total population number, from 45.4% (2002-2003) to 52.3% (2007-2008) (Fig. 3).

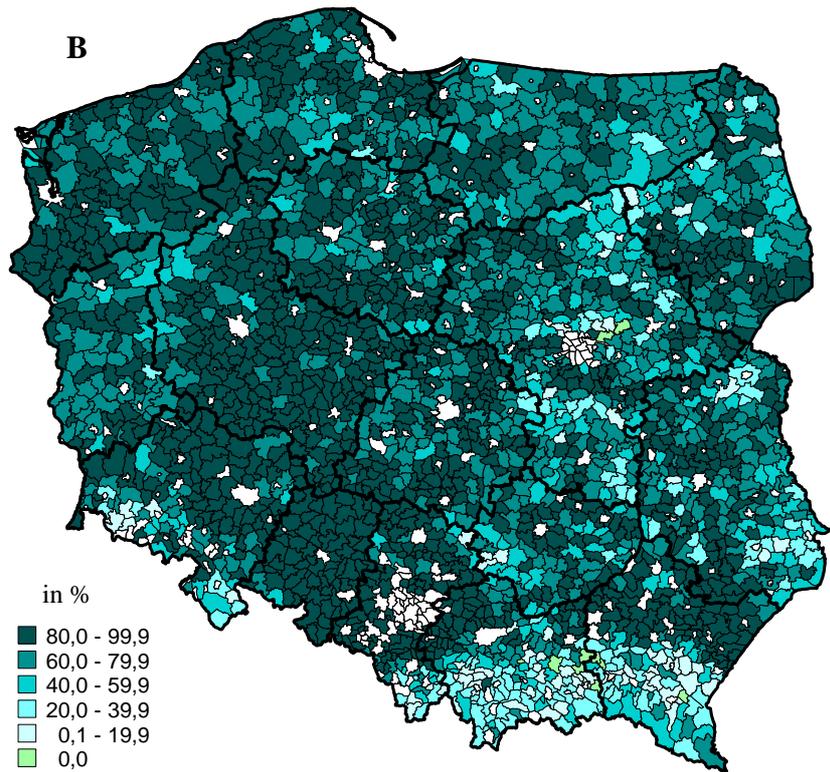
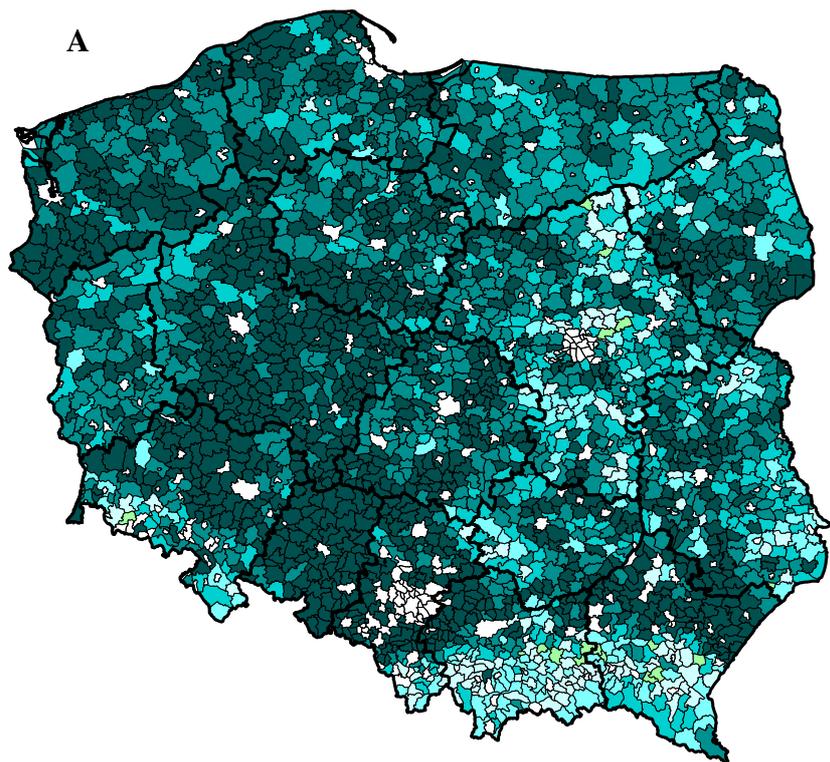
The length of the sewerage network and the percentage of its users were growing, following the extending water-line network. Compared with the years 1995-1999 when Poland had 12.7 km of the sewerage network per 100 km<sup>2</sup>, in 2005-2008 the rate reached 27.9 km, which means that additional 15.2 km per 100 km<sup>2</sup> were constructed between the two periods. In the same time the length of sewerage network in the rural areas increased from 3.0 km to 14.4 km per 100 km<sup>2</sup>. It is worth mentioning that although in the years 1995-1999 as much as 33.8% of the Polish rural areas did not have even a kilometre of the sewerage network, by the period 2005-2008 the rate declined to 17.3% (Fig. 4). This change influenced the share of population using sewerage network, which increased between 2002-2003 and 2007-2008 from 15.1% to 22.0% of the total population in the rural areas (Fig. 5). As a result, the proportion of gminas where the residents did not use sewerage network at all also declined; in the periods analysed such gminas constituted 19.7% and 14.2% of all rural gminas (Fig. 5) (Szymańska, Biegańska, 2010).

In the context of the analysed above elements of technical infrastructure (water-line and sewerage networks) it must be added that the actual availability of the two components depends on population density in the rural areas and the EU funding that the local governments can raise (Szymańska, Biegańska, 2010; Chodkowska-Miszczyk, Szymańska, 2011; Szymańska, Chodkowska-Miszczyk, 2011). In the years 1995-1999 and 2005-2008 taken for analysis, there were stated the growth of the positive correlations between the length of the water-line network per 100 km<sup>2</sup> and population density (from  $r = 0.60$  to  $r = 0.63$ ,  $\alpha = 0.01$ ) and between the length of the sewerage network per 100 km<sup>2</sup> and population density (from  $r = 0.30$  to  $r = 0.56$ ,  $\alpha = 0.01$ ). Moreover, a correlation was found, as expected, between the share of the sewerage network users and the network's length per 100 km<sup>2</sup>, which was  $r = 0.59$  ( $\alpha = 0.01$ ) throughout the period in question. The correlation between the water-line



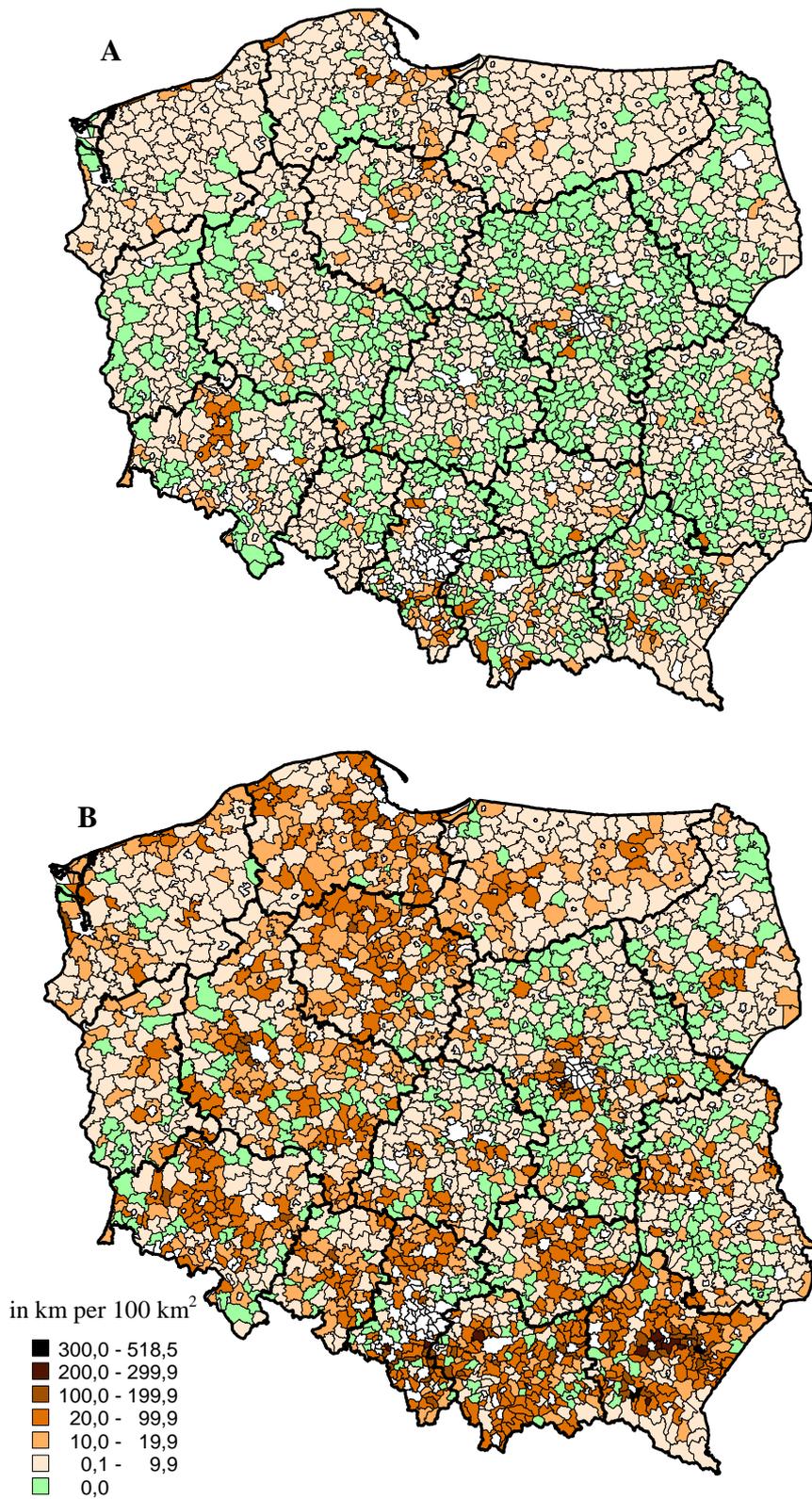
**Fig. 2. Length of the water-line network per 100 km<sup>2</sup> in the rural areas in Poland**

*Source: Own compilation on the basis of data available at the Central Statistical Office, Regional Data Bank. Explanation: A – average value from years 1995-1999; B – average value from years 2005-2008; ua – urban areas*



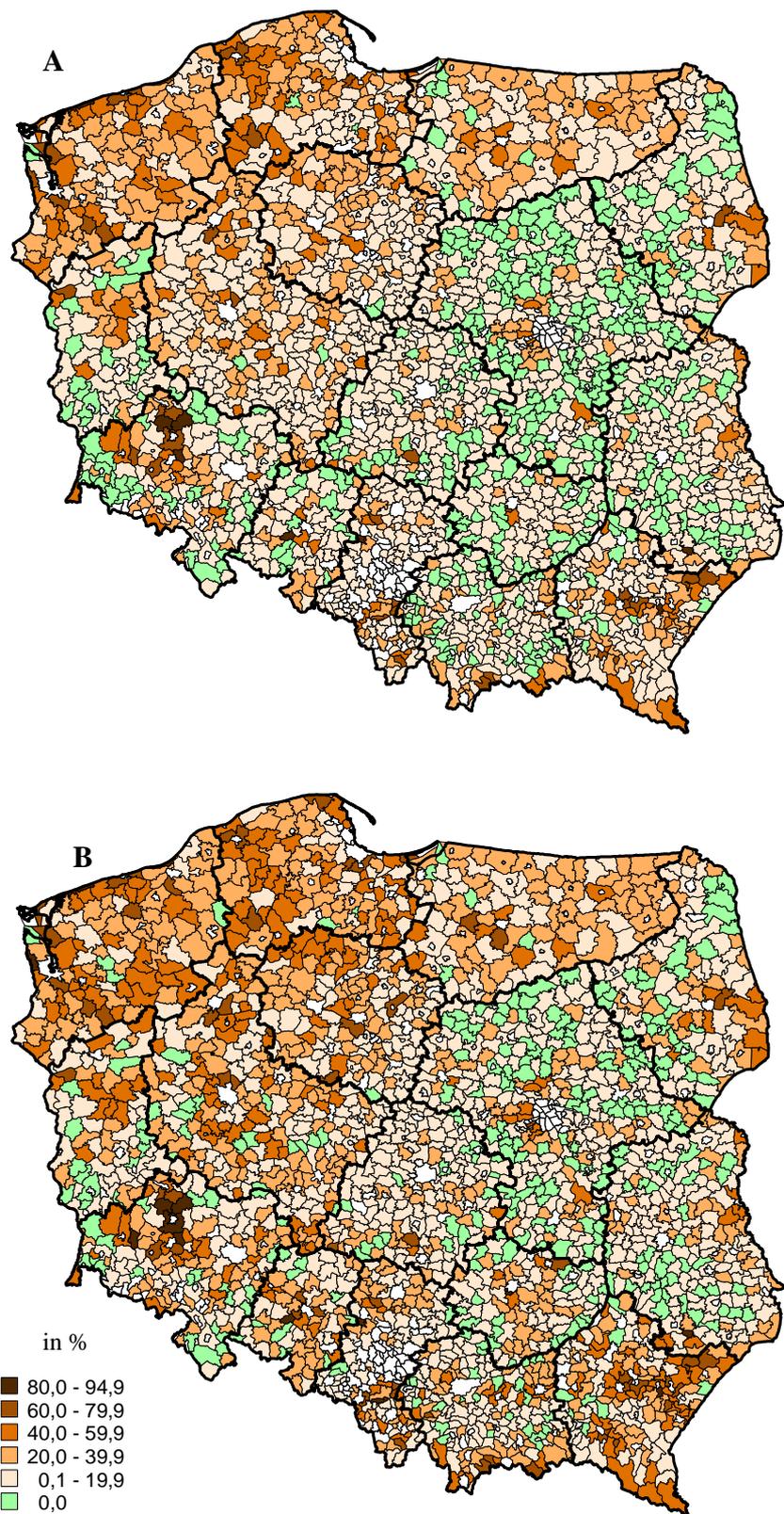
**Fig. 3. Share of water-line systems' users in the rural areas in Poland**

*Source: Own compilation on the basis of data available at the Central Statistical Office Regional Data Bank. Explanation: A – average value from years 2002-2003; B – average value from years 2007-2008; ua – urban areas*



**Fig. 4. Length of the sewerage network per 100 km<sup>2</sup> in the rural areas in Poland**

*Source: Own compilation on the basis of data available at the Central Statistical Office Regional Data Bank. Explanation: A – average value from years 1995-1999; B – average value from years 2005-2008; ua – urban areas*



**Fig. 5. Share of sewerage systems' users in the rural areas in Poland**

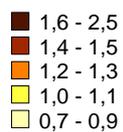
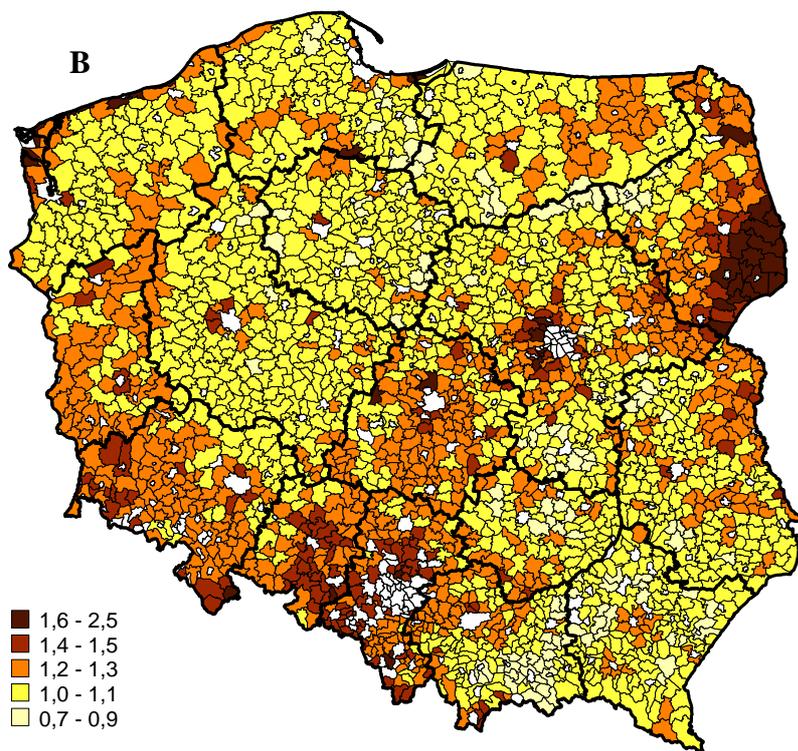
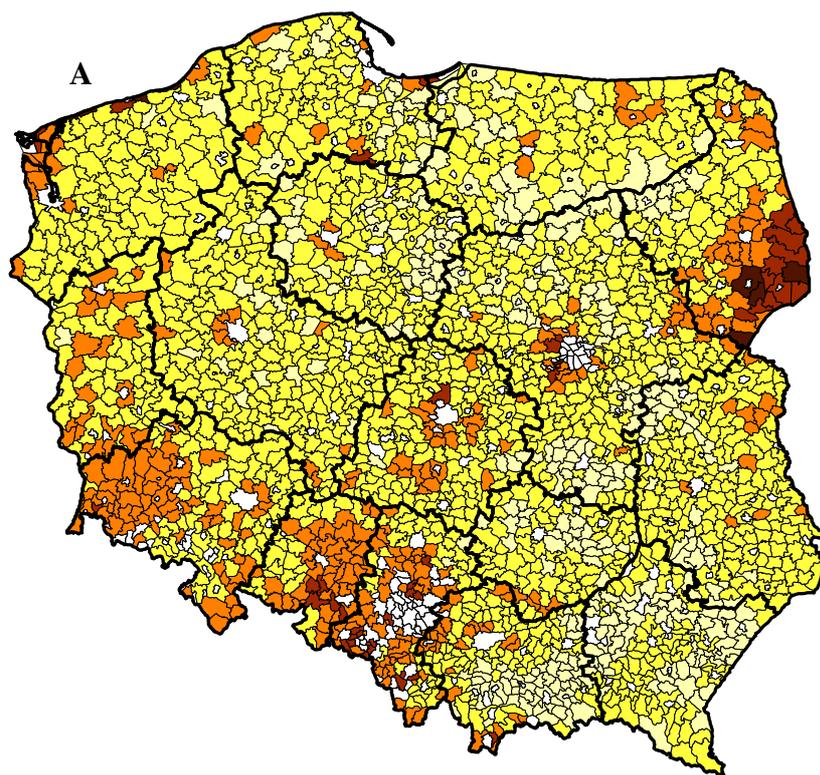
*Source: Own compilation on the basis of data available at the Central Statistical Office, Regional Data Bank. Explanation: A – average value from years 2002-2003; B – average value from years 2007-2008; ua – urban areas*

network users and the dwellings fitted with the water-line systems somewhat decreased, from  $r = -0.54$  ( $\alpha = 0.01$ ) in the years 2002-2003 to  $r = 0.48$  ( $\alpha = 0.01$ ) between 2007 and 2008.

The quality of life and living conditions are significantly determined, not only in the rural areas, by the housing factor, i.e., the number of rooms per 1 person, the cubic space in a dwelling, the access to basic utilities in a dwelling (gas, water, sewerage, electricity, etc.). The changes that have been commenced by the period of market economy, EU funds and direct subsidies have also indirectly improved the housing situation in the Polish rural areas (Wesołowska, 2004), as shown by larger dwelling sizes and more dwellings having central heating, network gas, bathrooms and flush toilets. Considering the years 2002-2003 and 2007-2008, it must be mentioned that generally in Poland the number of persons per 1 dwelling declined from 3.1 to 2.9 persons, and in the rural areas from 3.7 to 3.5 persons. It is notable that the share of rural gminas with not more than 3 persons per 1 dwelling increased more than quadrupled (from 3.1% in 2002-2003 to 13.4% in 2007-2008), likewise of those with 3.5 persons per 1 dwelling (Table 1). At the same time, the share of gminas characterised by the highest person-per-dwelling ratio (i.e., 3.9-5.1 persons) declined twofold, from 29.2% to 14.8%. The proportion of gminas with an increasing number of rooms per 1 person also grew larger (Fig. 6). For instance, in the years 2002-2003 the gminas where the number of rooms per 1 person was the highest (i.e., in excess of 1.6-2.5 rooms) accounted for only 0.4%, but in the period 2007-2008 the rate reached 1.8%. Besides, the share of the gminas with more than 1.2 rooms per 1 person was more than doubled (Table 1, Fig. 6).

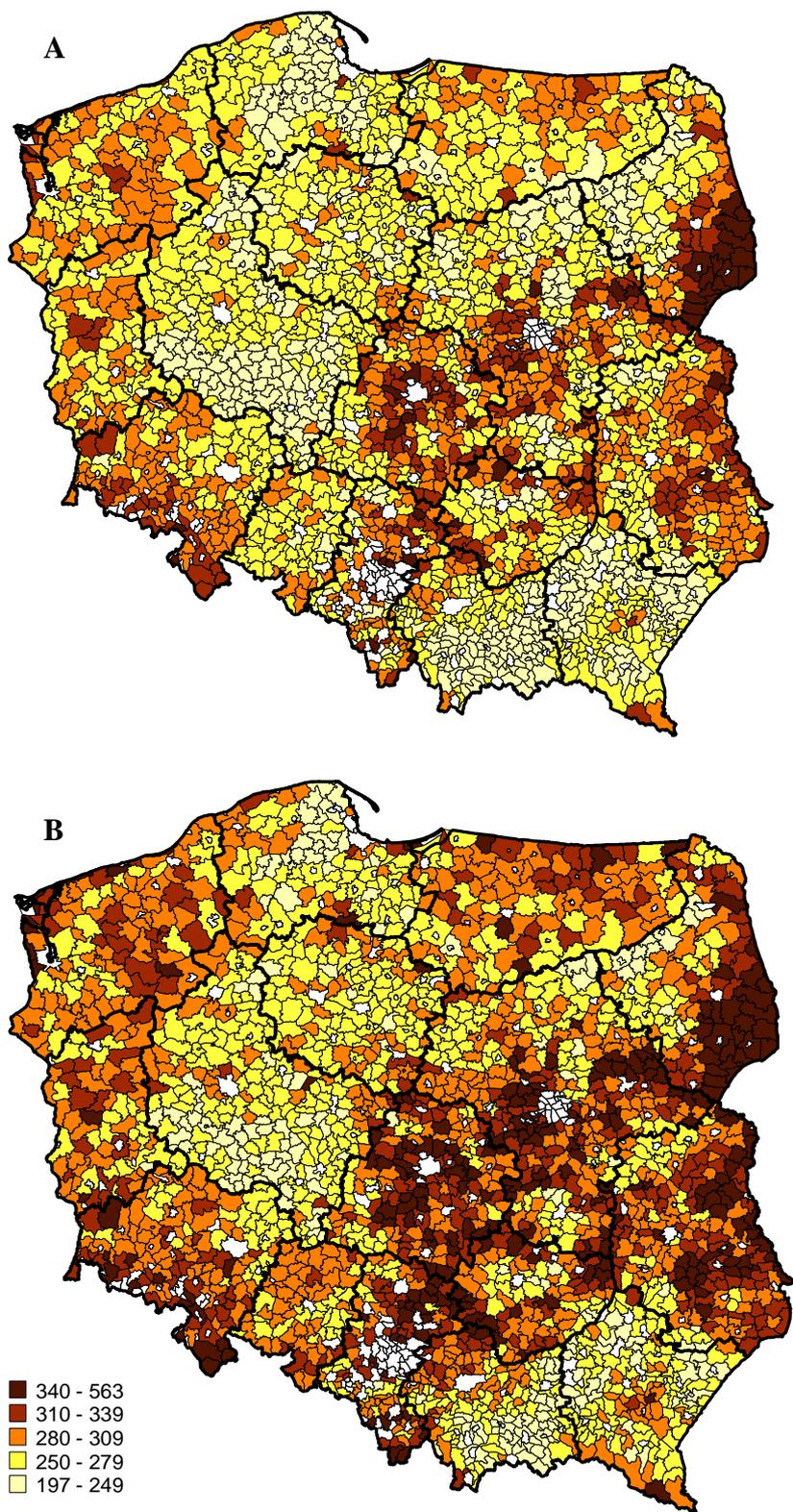
Simultaneously in the rural areas the number of dwellings per 1,000 population also kept growing, as shown by the share of gminas with more than 280 dwellings per 1,000 population, which was 37.3% in the years 2002-2003, but as much as 59.0% in 2007-2008 (Table 1, Fig. 7). A negative correlation between the number of dwellings per 1,000 population and the number of persons per 1 dwelling ( $r = 0.98$ ,  $\alpha = 0.01$ ), showing that the more dwellings, the fewer residents per 1 dwelling, was noted all the time. Besides, some positive correlation between the number of rooms per 1 dwelling and the dwellings equipped with bathrooms and those with flush toilets was observed. In the first case the correlation reached  $r = 0.61$  (2002-2003) and  $r = 0.63$  (2007-2008) and in the second case it was  $r = 0.59$  (2002-2003) and  $r = 0.61$  (2007-2008).

Equally important for the quality of life is the usable floor space (in  $m^2$ ) per 1 person and generally the dwelling size. In the rural areas the average usable floor space of dwellings kept growing, from  $22.9 m^2$  in 2002-2003 to  $24.9 m^2$  in 2007-2008. The same trend could be observed countrywide. There is noticed that the permanent growth of the number of rural



**Fig. 6. Average number of rooms per 1 person in the rural areas in Poland**

*Source: Own compilation on the basis of data available at the Central Statistical Office, Regional Data Bank. Explanation: A – average value from years 2002-2003; B – average value from years 2007-2008; ua – urban areas*



**Fig. 7. Number of dwellings per 1,000 population in the rural areas in Poland**

*Source: Own compilation on the basis of data available at the Central Statistical Office, Regional Data Bank. Explanation: A – average value from years 2002-2003; B – average value from years 2007-2008; ua – urban areas*

gminas where the dwellings had the usable floor space per 1 person in excess of 25 m<sup>2</sup>. Their share increased between 2002-2003 and 2007-2008 from 20.2% to 42.9% (Table 1, Fig. 8). Therefore, a clear decline took place in the number of gminas where the usable floor space per 1 person was relatively small; for instance, the share of gminas with dwellings to 20 m<sup>2</sup> per 1 person declined threefold in the period in question (from 12.3% to 4.4%) (Table 1). The trend was the most visible in the rural areas surrounding the large cities (because new large houses were constructed and the existing ones were enlarged) and in the depopulating eastern part of the country (so called 'eastern wall'), where the population inflow and the present housing stock caused that the numbers of square meters per 1 person grew (Fig. 8). It is worth adding that the size of a dwelling in the rural areas and generally in Poland increased in the last decade by about 2 m<sup>2</sup> on average (from 68.6 m<sup>2</sup> to 70.0 m<sup>2</sup> in Poland; and from 84.5 m<sup>2</sup> to 86.3 m<sup>2</sup> in the rural areas). The number of rural gminas where the dwelling size exceeded 90 m<sup>2</sup> clearly increased. Their share rose from 24.0% in the years 2002-2003 to 29.9% in the period 2007-2008 (Table 1). Between the usable floor space per 1 person and the number of persons per 1 dwelling a growing and negative correlation was found ( $r = -0.47$  in 2002-2003 and  $-0.59$  in 2007-2008,  $\alpha = 0.01$ ) and a growing and positive correlation between the usable floor space of a dwelling and the number of rooms per 1 person ( $r = 0.82$  and  $0.87$ ,  $\alpha = 0.01$ ).

It has been observed that the provision of Polish rural dwellings with basic utilities (water-line system, sewerage system, gas-line system, etc.) (Czapiewski, 2004, Wesołowska, 2004) has been somewhat changing for better for many years. The improvement noted between 2003 and 2008 was rather small, as the share of rural dwellings with access to water-line network being 88.1% of all rural dwellings in 2003-2004 grew to only 88.8% in 2007-2008 (Table 1, Fig. 9) (the urban rates were 99.4% and 98.5%, respectively). A similarly small increase was noted in the case of dwellings equipped with flush toilets. In the years 2007-2008 in the rural areas shares of dwellings with flush toilets were 70.4% and in the urban areas they equalled 94.5%. It should be emphasized that there is a very strong correlation between the number of dwellings fitted with the water-line system and the number of dwellings equipped with flush toilets and bathrooms (Fig. 10). Throughout the period in question the correlation was  $r = 0.85$  ( $\alpha = 0.01$ ). The correlation between the number of dwellings with bathrooms and those equipped with flush toilets was very high too ( $r = 0.99$ ,  $\alpha = 0.01$ ). In the rural areas, dwellings with bathrooms accounted for 75.7% of their total number, in the urban areas the rate was 92.2% (2007-2008) (Table 1). The percentage of rural gminas where the rate exceeded 80% was growing (from 35.8% in 2003-2004 to 38.0% in 2007-2008) (Table 1).

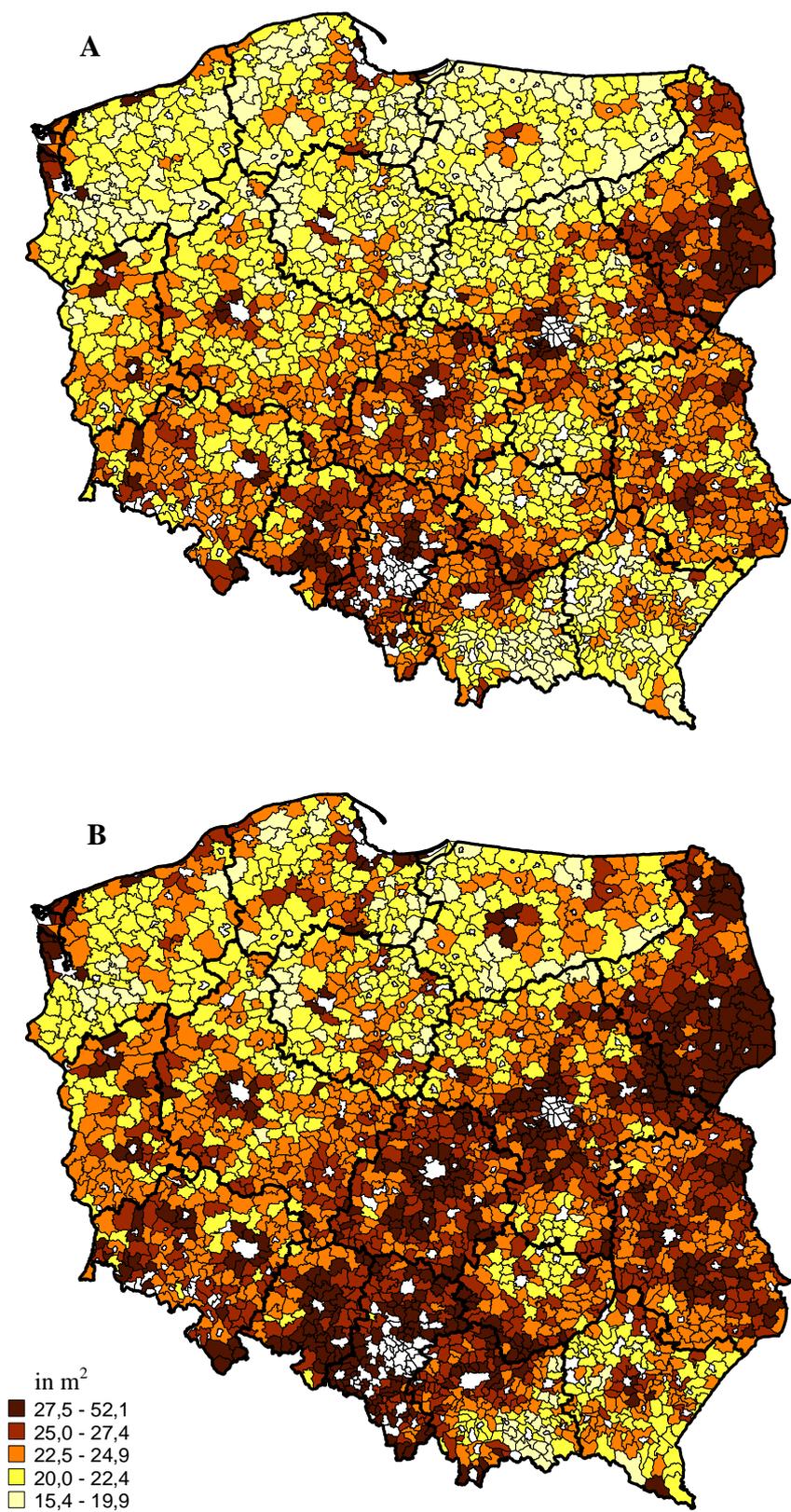
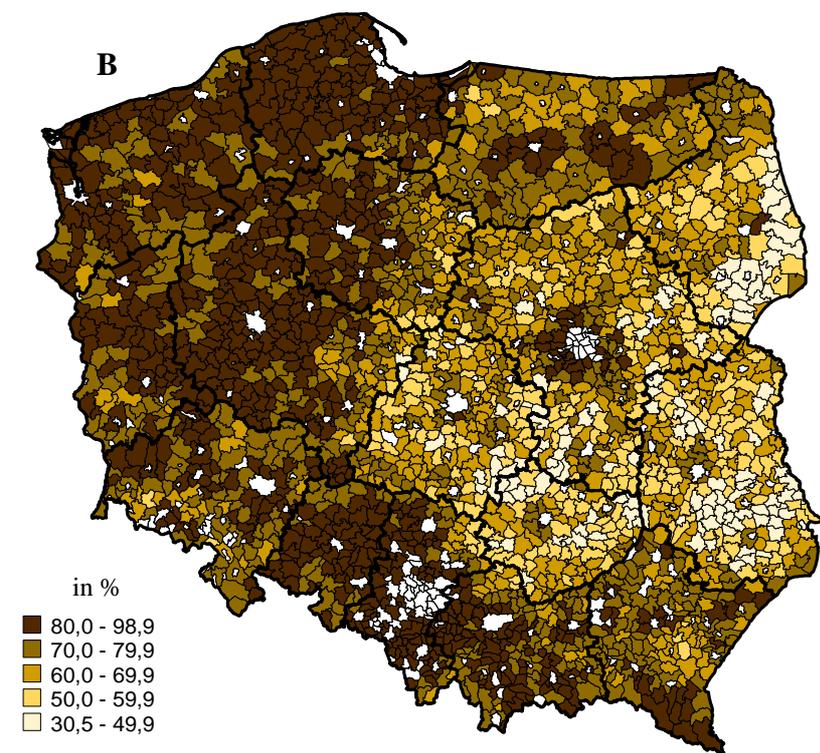
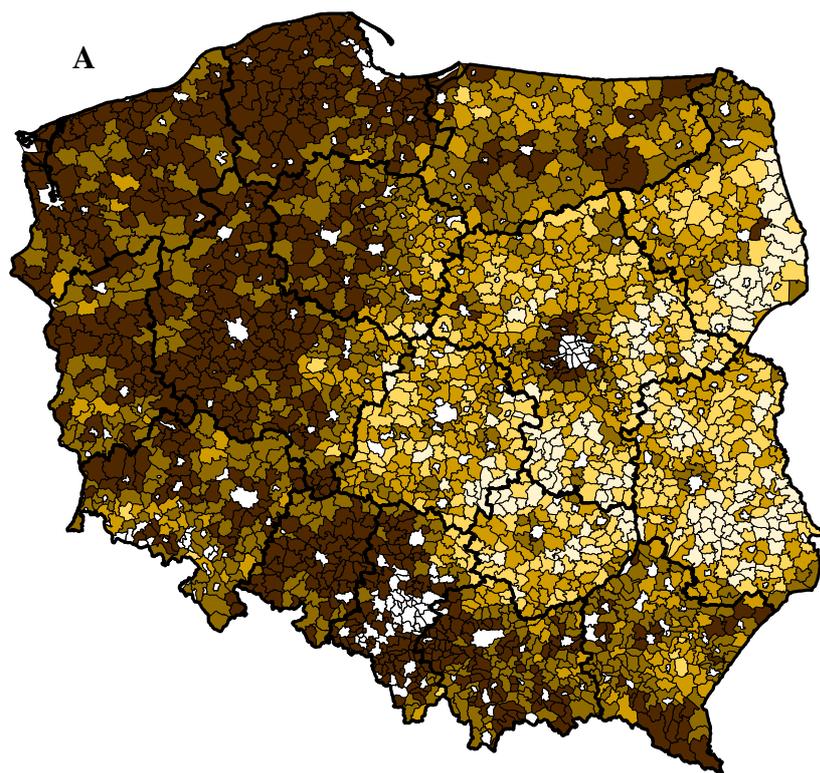


Fig. 8. The usable floor space of a dwelling per 1 person in the rural areas in Poland  
 Source: Own compilation on the basis of data available at the Central Statistical Office, Regional Data Bank. Explanation: A – average value from years 2002-2003; B – average value from years 2007-2008; ua – urban areas



**Fig. 9. Share of dwellings fitted with water-line system in the rural areas in Poland**

*Source: Own compilation on the basis of data available at the Central Statistical Office, Regional Data Bank. Explanation: A – average value from years 2003-2004; B – average value from years 2007-2008; ua – urban areas*



**Fig. 10. Share of dwellings equipped with flush toilet in the rural areas in Poland**

*Source: Own compilation on the basis of data available at the Central Statistical Office, Regional Data Bank. Explanation: A – average value from years 2003-2004; B – average value from years 2007-2008; ua – urban areas*

**Table.1. Selected characteristics of housing in the rural areas in Poland**

	I	II		I	II		I	II
Number of persons per 1 dwelling			Number of dwellings per 1,000 population			Number of rooms per 1 person		
Poland	3.1	2.9	Poland	319	343	Poland	1.2	1.3
UA	2.9	2.7	UA	348	377	UA	1.2	1.3
RA	3.7	3.5	RA	271	289	RA	1.1	1.2
a			a			a		
3.9-5.1	29.2	14.8	340-563	2.3	11.2	1.6-2.5	0.4	1.8
3.6-3.8	31.6	23.3	310-339	9.5	16.1	1.4-1.5	2.0	6.9
3.3-3.5	23.5	29.7	280-309	25.5	31.7	1.2-1.3	15.7	32.2
3.0-3.2	12.6	18.8	250-279	41.6	31.6	1.0-1.1	65.3	53.1
1.7-2.9	3.1	13.4	197-249	21.1	9.4	0.7-0.9	16.6	6.0
	I	II		I	II		I	II
Number of rooms per 1 dwelling			The usable floor space of a dwelling in m <sup>2</sup> per person			The average usable floor space of 1 dwelling in m <sup>2</sup>		
Poland	3.7	3.7	Poland	21.9	24.0	Poland	68.6	70.0
UA	3.5	3.5	UA	21.2	23.4	UA	60.9	62.1
RA	4.1	4.1	RA	22.9	24.9	RA	84.5	86.3
a			a			a		
4.6-6.1	7.4	9.0	27.5-52.1	5.4	19.1	100.0-126.7	6.4	8.2
4.3-4.5	15.3	16.8	25.0-27.4	14.8	23.8	90.0-99.9	17.6	21.7
4.0-4.2	30.3	30.2	22.5-24.9	32.0	30.8	80.0-89.9	40.2	38.3
3.7-3.9	29.1	27.6	20.0-22.4	35.5	21.9	70.0-79.9	29.3	26.7
3.1-3.6	17.9	16.4	15.4-19.9	12.3	4.4	59.8-69.9	6.5	5.1
	III	II		III	II		III	II
Share of dwellings fitted with water-line system			Share of dwellings equipped with flush toilet			Share of dwellings equipped with bathroom		
Poland	95.0	95.3	Poland	87.3	87.9	Poland	86.2	86.8
UA	98.4	98.5	UA	94.2	94.5	UA	91.8	92.2
RA	88.1	88.8	RA	73.2	74.4	RA	74.6	75.7
a			a			a		
95.0-100.0	26.0	27.3	80.0-98.9	31.5	33.9	90.0-97.6	4.9	5.9
90.0-94.9	23.8	25.0	70.0-79.9	27.5	27.3	80.0-89.9	30.9	32.1
85.0-89.9	17.9	17.7	60.0-69.9	20.5	20.7	70.0-79.9	27.8	28.0
80.0-84.9	12.3	12.7	50.0-59.9	13.5	12.3	60.0-69.9	18.6	18.7
36.9-79.9	20.0	17.3	30.5-49.9	7.0	5.8	31.6-59.9	17.8	15.3

Source: Own compilation on the basis of data available at the Central Statistical Office. Regional Data Bank. Explanation: a – % of rural gminas within particular percentage bands; UA – urban areas; RA – rural areas; I – 2002-2003; II – 2007-2008; III - 2003-2004

It can be concluded that the analysis has revealed huge transformation processes and connected with them modernisation taking place in the rural areas in Poland. There is observed a steadily inflow of population into rural areas, particularly those surrounding large cities.

#### 4. Conclusion

In the period taken for analysis technical infrastructure and housing conditions changed considerably. It should be stated that technical infrastructure constantly becomes more available in the rural areas. The water-line network's and sewerage network's lengths extend every year and this directly augments the share of rural population benefitting from these utilities and the number of dwellings with access to the water-line and sewerage systems. However, there are still rural gminas in Poland where the above-mentioned networks are not available at all (17.3% rural gminas without sewerage networks and 0.8% of rural gminas without water-line networks, years 2007-2008). It has been observed that along with

the considerable improvement in the rural technical infrastructure the standard of rural housing has also risen. It means that *inter alia* dwelling sizes and the number of rooms per 1 person increase in rural gminas; at the same time, the number of persons having to share the same dwelling decreases. Moreover, the proportion of rural population having dwellings with access to the water-line system and gas-line networks and equipped with flush toilets, bathrooms, central heating, etc., also increases. Better availability of the utilities can essentially improve the rural population's living conditions that are still short of being adequately met, because urban and rural infrastructure and housing stock show differences that have not been eliminated yet.

## References

- Bański, J., Przestrzenny wymiar współczesnych procesów na wsi (Spatial dimension of contemporary processes in the countryside – in Polish). In: *Studia Obszarów Wiejskich* (Rural Studies – in Polish), 9, Warszawa: IGiPZ PAN, PTG, 2005, pages 149.
- Chodkowska-Miszczyk, J., Szymańska, D., Update of the review: Cultivation of energy crops in Poland against socio-demographic factors. In: *Renewable and Sustainable Energy Reviews*, Elsevier, 2011, in press.
- Czapiewski, K., Wyposażenie infrastrukturalne i potencjał gospodarczy obszarów wiejskich a pozarolnicze funkcje gmin (Infrastructure provision, potential of rural areas and out of agriculture functions of gminas – in Polish). In: E. Pałka (ed.), *Pozarolnicza działalność gospodarcza na obszarach wiejskich* (Out of agriculture and economic activity in the rural areas – in Polish), *Studia Obszarów Wiejskich* (Rural Studies – in Polish), 5, Warszawa: IGiPZ PAN, PTG, 2004, pages 57-73.
- Szymańska, D., Biegańska, J., Potencjał demograficzny. Infrastruktura techniczna. Warunki mieszkaniowe (Demographic potential. Technical infrastructure. Housing conditions – in Polish). In: *Charakterystyka obszarów wiejskich w 2008 r.* (Description of rural areas in 2008- in Polish), Główny Urząd Statystyczny, Urząd Statystyczny w Olsztynie, 2010, pages: 49-54, 61-66.
- Szymańska, D., Biegańska, J., Gil, A., Rural areas in Poland in the context of changes in population age structure in 1996, 2001 and 2006. In: D. Szymańska, D.J. Domin (eds.), *Bulletin of Geography. Socio-economic Series*, 12, Toruń: Nicolaus Copernicus University Press, 2009, pages 91-107.

Szymańska, D., Chodkowska-Miszczuk, J., Endogenous resources utilization of rural areas in shaping sustainable development in Poland. In: *Renewable and Sustainable Energy Reviews*, 15, 3, Elsevier, 2011, pages 1497-1501.

Wesołowska, M., Rozwój budownictwa mieszkaniowego na obszarach wiejskich (Development of residential building in rural areas – in Polish). In: J. Bański (ed.), *Polska przestrzeń wiejska: procesy i perspektywy* (Polish rural space: processes and perspectives – in Polish), *Studia Obszarów Wiejskich* (Rural Studies – in Polish), 6, Warszawa: IGiPZ PAN, PTG, 2004, pages 165-175.