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REGIONAL DIVERSITY OF HOUSING CONDITIONS OF THE POPULATION LIVING IN RURAL AREAS IN POLAND

Key words: housing conditions, living conditions, rural areas, voivodships, Poland, Ward's method

ABSTRACT. The aim of the study is to assess the regional differentiation of housing conditions of the population living in rural areas and their changes in Poland between 2004 and 2016. Research was conducted on the basis of secondary data from the Local Data Bank of the CSO. Due to the complex nature of the studied phenomenon, the Ward method was used to identify typological classes of the housing condition level of the population in rural areas in a system of voivodships. A total of two typological classifications of voivodships were performed – the first in view of the level of housing conditions of the population living in rural areas in 2016, and the second in view of the level of changes in the housing conditions of the surveyed population that occurred in 2016, in relation to 2004. As a result of the research, it was found that in 2016, rural areas in the Dolnośląskie, Śląskie, Opolskie and Zachodniopomorskie voivodships were characterized by the highest level of housing conditions of the population. The lowest level of housing conditions of the population living in rural areas was observed in the Podlaskie voivodship. Dynamic, favourable changes were observed in the housing conditions of the population living in rural areas in the conditions of European integration, both in terms of accessibility and quality of housing resources. The highest increase in the percentage of dwellings equipped with central heating and network gas was observed in rural areas in the following voivodships: Dolnośląskie, Pomorskie, Wielkopolskie and Zachodniopomorskie. On the other hand, the largest increase in the percentage of dwellings equipped with a toilet and network water supply occurred in rural areas in the Lubelskie, Łódzkie, Mazowieckie, Podlaskie and Świętokrzyskie voivodships.

INTRODUCTION

Diversity in the level of socio-economic development of individual territorial units (regions, countries, etc.) is still an important problem in the contemporary European economy. It translates into the standard of living of the population, an important element of which, as indicated by Agnieszka Kozera and Cezary Kozera [2014], are housing conditions. A dwelling is an important element of the material sphere of human life and one of the most important aspects of existence and functioning of a household. First of all, it gives shelter and a sense of security, satisfying the basic needs of household members, without which it is impossible to fully develop higher-order needs. In addition to satisfying Maslow's underlying physiological needs, a dwelling is also a means to meet all higher-level needs of household members. It is also a place of work, entertainment and rest [Oleńczuk-Paszal, Sompolska-Rzechuła 2017, Głowicka-Wołoszyn et al. 2018].

Living conditions, including housing conditions of the population are regionally strongly differentiated, both in cross-sections of countries and regions, as well as in the urban-rural relationship. In recent years, especially after Poland's accession to the European Union, rural areas are becoming objects of greater interest. A lot of attention is paid to their problems, perspectives and developmental threats [cf. Bański 2014, Hadyński 2015], also in the context of assessing the housing conditions of the population [cf. Murawska 2012, Kalinowski 2015, Oleńczuk-Paszal, Sompolska-Rzeczka 2017, Głowicka-Wołoszyn et al. 2018, 2019, Stanisławska, Głowicka-Wołoszyn 2017]. The elimination of existing regional differences in the level of living conditions of the population, as well as in the urban-rural relationship is, in fact, an important goal of the implemented EU cohesion policy. The aim of the study is, therefore, to assess the regional differentiation of housing conditions of the population living in rural areas and their changes in Poland in the conditions of European integration. Empirical research was conducted on the basis of secondary data from the Local Data Bank of the Central Statistical Office, covering the years 2004 and 2016.

RESEARCH METHODS

To assess regional diversity taking place on the level of housing conditions of the population living in rural areas and, at the same time, their changes in conditions of European integration, a multidimensional analysis of this phenomenon was conducted using the Ward method¹. Two typological classifications of voivodships were executed – the first in accordance with the level of housing conditions of the population living in rural areas in 2016, and the second in accordance with the level of changes in the housing conditions of the surveyed population that occurred in 2016 in comparison to 2004. The typological analysis of voivodships was carried out in four stages [Wysocki 2010]:

- stage 1 – selecting simple features illustrating the housing conditions of the population and their changes in the examined years, based on substantive and statistical premises (Table 1),
- stage 2 – normalizing the values of simple features using the classic standardization procedure,
- stage 3 – classification of voivodships according to the level of housing conditions of the population living in rural areas in 2016 (1st classification) and their changes in the examined period (2nd classification) using the Ward method,
- stage 4 – constructing types of housing conditions for the population living in rural areas and their identification.

In stage 3, by classifying provinces using the Ward method, in order to determine the number of classes, the agglomeration chart was analyzed. On the other hand, identifying the type (stage 4), consists of calculating basic descriptive statistics – intra-class averages, and then extracting the characteristics in typological classes. For this purpose, a pseudo average difference test was used. The value of this test is size [Wysocki 2010]:

$$t_{ck(d)} = \frac{\bar{x}_{ck} - \bar{x}_k}{s_{ck}}$$

¹ Taxonomic analysis allows for the assessment of diversity of examined objects (in this case voivodships), described by a set of simple features (i.e. partial indicators of housing conditions of the population). It leads to the determination of clusters of these objects in terms of development similarity, as well as to obtaining homogeneous classes of objects in view of their characteristic properties.

The value of this test measures the distance between the class average (\bar{x}_{ck}) and the overall average (\bar{x}_k) of the k -th feature in units of the standard error of the class average, where [Wysocki 2010]:

$s_{ck}^2 = \frac{N - N_c}{N - 1} \cdot \frac{s_k^2}{N_c}$ – is the variance of the average in the case of the dependent random (without returning), N_c objects of the c -th class ($c = 1, \dots, C$), s_k^2 – is the empirical variance of the k -th feature in the collectivity, $\frac{N - N_c}{N - 1}$ – it is a correction on finite collectivity N .

Table 1. The indicators for assessing the level of housing conditions of the population living in rural areas and their changes

Intocator mark	Indicator name
1 st typological classification	
x_{11}	Number of dwellings per 1,000 population
x_{12}	Average dwelling area [m ²]
x_{13}	Average dwelling area per person [m ²]
x_{14}	Percentage of total dwellings equipped with a network water supply [%]
x_{15}	Percentage of total dwellings equipped with sewage [%]
x_{16}	Percentage of total dwellings equipped with a toilet [%]
x_{17}	Percentage of total dwellings equipped with a bathroom [%]
x_{18}	Percentage of total dwellings equipped with a network gas supply [%]
x_{19}	Percentage of total dwellings equipped with central heating [%]
2 nd typological classification	
x_{21}	Dynamics of changes in the number of dwellings per 1,000 population in 2016 in relation to 2004 (year 2004 = 100%)
x_{22}	Dynamics of changes in the average usable dwelling area in sq.m. (year 2004 = 100%)
x_{23}	Dynamics of changes in the average usable dwelling area per person [m ²] (year 2004 = 100%)
x_{24}	Change in the percentage of dwellings equipped with a network water supply in 2016 compared to 2004 [percentage points – p.p.]
x_{25}	Change in the percentage of dwellings equipped with sewage in 2016 compared to 2004 [p.p.]
x_{26}	Change in the percentage of dwellings equipped with a toilet in 2016 compared to 2004 [p.p.]
x_{27}	Change in the percentage of dwellings equipped with a bathroom in 2016 compared to 2004 [p.p.]
x_{28}	Change in the percentage of dwellings equipped with a network gas supply in 2016 compared to 2004 [p.p.]
x_{29}	Change in the percentage of dwellings equipped with central heating in 2016 compared to 2004 [p.p.]

Source: own study based on [A. Kozera, C. Kozera 2014, Oleńczuk-Paszal, Sompolska-Rzechuła 2017, GUS 2016]

The higher the absolute value of the test assigned to a given feature, the more characteristic it is. The values of the pseudo average difference test formed the basis for distinguishing characteristic features in typological classes, using the following value scale [Wysocki 2010]:

- $t_{ck}(d) \in (-\infty; -3 > v < 3; +\infty)$ – there is a very high intensity of the k -th feature in the c -th class (the feature is highly negative or positive),
- $t_{ck}(d) \in (-3; -2 > v < 2; 3)$ – there is a high intensity of the k -th feature in the c -th class (the feature is moderately negative or positive),
- $t_{ck}(d) \in (-2; 2)$ – there is a moderate intensity of the k -th feature in the c -th class (the feature does not stand out and is not characteristic).

TYPOLOGICAL CLASSIFICATION OF VOIVODSHIPS IN VIEW OF THE LEVEL OF HOUSING CONDITIONS OF THE POPULATION LIVING IN RURAL AREAS IN POLAND IN 2016

Rural areas in Poland are strongly differentiated in terms of the level of socio-economic development, as well as the scope of their functions. As Agnieszka Kozera and Romana Głowicka-Wołoszyn notice [2018], basic functions of rural communes are still related to agriculture, however, along with socio-economic development, many of them change their character from typically agricultural to communes with residential and service functions. With the development of the housing function, the housing conditions of the population in rural areas are improving, however, they are still lower compared to urban areas [cf. Murawska 2012], as well as regionally diverse. The diversity of housing conditions of the population living in rural areas in the system of voivodships is presented on the basis of separate typological classes. Executed typological studies, using the disjoint classification method – the Ward method, enabled to identify six classes of voivodships (Figure 1 and 2), characterized by different levels of housing conditions of the population living in rural areas in 2016 (Table 2).

The first typological class was created by the Podlaskie Voivodship. Characterized by a high level of housing resources, quantified by a number of dwellings per 1000 population and a high average size, the level of housing conditions of the population living in the rural areas of the Podlaskie Voivodship is relatively low. This is demonstrated by, among others, a very low percentage of the population using a sewage system (only 21.1% with an average for rural areas in Poland of over 40%) and a low percentage of flats equipped with central heating (less than 55% with an average for all rural areas of over 70%). A feature that distinguishes rural areas in the Podlaskie Voivodship in terms of housing conditions of the population is also a very low percentage of flats equipped with a network gas supply (less than 4% in 2016) (Table 2). Worse housing conditions for the rural population in this voivodship may result from the socio-economic situation of the region as well as from geographical conditions. These areas are characterized by a very low population density (only 24.2 people per sq. km). Furthermore, they are affected by the phenomenon of depopulation, and also have a low level of entrepreneurship development. In rural areas with a low population density, it is unprofitable to develop a gas network.

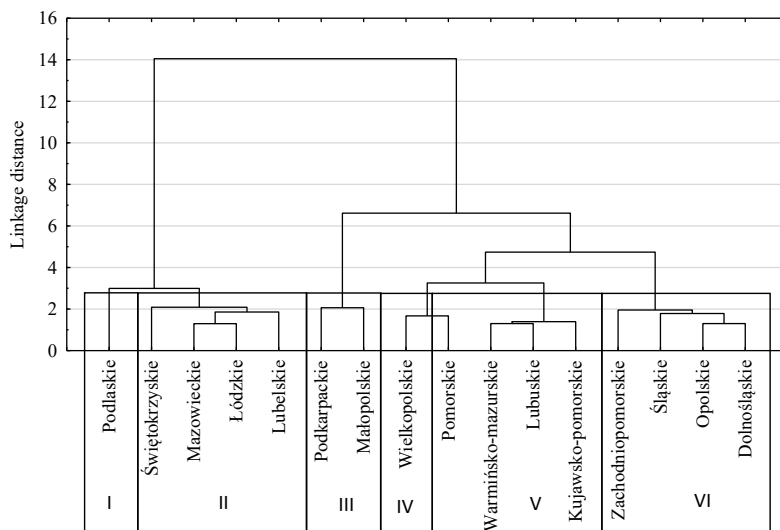


Figure 1. Classification of voivodships according to the housing conditions of the population living in rural areas in Poland in 2016 (the Ward method, Euclidean distance)

Source: own study based on data from the Central Statistical Office [BDL 2018]

A low percentage of dwellings equipped with gas from a network also distinguishes rural areas in voivodships forming class V – Warmińsko-Mazurskie, Lubuskie and Kujawsko-Pomorskie. These voivodships, similarly to the Podlaskie Voivodship, are characterized by a low population density, which is a destimulant for the development of a gas network in rural areas (Table 2). A characteristic feature of class II voivodships (located in the central-eastern part of Poland), similarly to the Podlaskie Voivodship, are high housing resources, despite the level of housing conditions being low.

In this class, the percentage of people

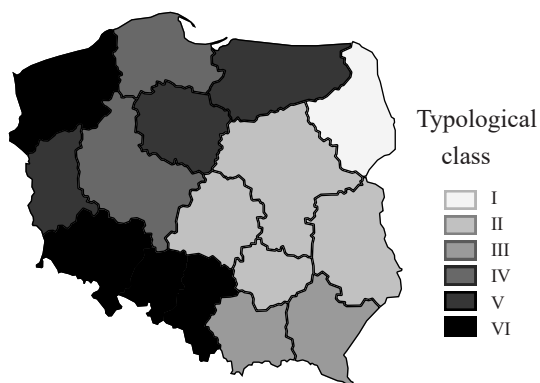


Figure 2. Classification of voivodships according to the housing conditions of the population living in rural areas in Poland in 2016

Source: own study based on Figure 1

using the sewage system, as well as flats equipped with a toilet and central heating, was lower in relation to the average for all rural areas. Despite the level of socio-economic development, quantified by the GDP per capita level of the Mazowieckie Voivodship being high, it should be remembered that it is mainly generated by Warsaw. Rural areas in this voivodship are mainly distinguished by low and very low levels of development [EFRWP 2016], which translates into living conditions of the population.

Table 2. Classification results of voivodships according to the level of housing conditions of the population living in rural areas in Poland in 2016*

Specification	Typological class					
	I	II	III	IV	V	VI
	Podlaskie	Lubelskie, Łódzkie, Mazowieckie, Świętokrzyskie	Małopolskie, Podkarpackie	Pomorskie, Wielkopolskie	Kujawsko-pomorskie, Lubuskie, Warmińsko-mazurskie	Dolnośląskie, Opolskie, Śląskie, Zachodniopomorskie
Active features						
Number of dwellings per 1000 population	348.7 [*]	325.5 ^{5.0}	273.8 ^{-23.6}	279.3 ^{-8.8}	299.9 ^{-1.2}	315.1 ^{2.5}
Average dwelling area per person in sq. m.	32.6 [*]	29.3 ^{1.4}	26.0 ^{-2.7}	27.2 ^{-1.4}	25.9 ^{-3.8}	29.8 ^{2.1}
Percentage of total dwellings equipped with sewage [%]	21.1 [*]	26.8 ^{-5.0}	46.0 ^{0.6}	52.9 ^{1.7}	39.9 ^{-0.2}	49.0 ^{3.3}
Percentage of total dwellings equipped with a toilet [%]	73.3 [*]	77.6 ^{-5.2}	88.0 ^{0.6}	93.5 ^{5.8}	89.1 ^{1.6}	93.6 ^{9.1}
Percentage of total dwellings equipped with a network gas supply [%]	3.8 [*]	12.0 ^{-1.9}	54.9 ^{7.9}	16.8 ^{-0.2}	6.5 ^{-5.5}	17.1 ^{-0.1}
Percentage of total dwellings equipped with central heating [%]	54.9 [*]	65.1 ^{-3.1}	69.8 ^{-0.4}	79.0 ^{13.1}	71.9 ^{0.4}	77.5 ^{4.9}
Passive features						
Population per sq.km.	24.2	55.4	102.1	51.9	33.8	63.5
Entities entered in the REGON register per 10 000 inhabitants (2016)	568.9	675.4	669.0	887.3	706.2	841.0

* in the headnotes, the values of the pseudo average difference test for features in typological classes are given, shades of grey indicate its high absolute values – characteristic features (dark and light grey colours mean high and low intensity of the k -th characteristic in the c -th class, respectively), while \times means that it is not possible to calculate the value of this test for a one-piece class

Source: own study based on data from the Central Statistical Office [BDL 2018]

Housing resources in rural areas in voivodships forming class III – Podkarpackie and Małopolskie are lower in relation to the average for Poland. A distinctive feature in this class is the high percentage of dwellings equipped with a network gas supply. Over half of them, in the voivodships concerned, are equipped with a network gas supply, while in rural areas the total figure is less than 18%. Rural areas in the voivodships concerned are distinguished by a relatively high population density in comparison to rural areas in general (Table 2).

The Pomorskie and Wielkopolskie voivodships form another class – IV. They are distinguished by a high percentage of all dwellings equipped with a toilet and central heating. Similar housing conditions were also observed in voivodships making up class VI (Dolnośląskie, Śląskie, Opolskie and Zachodniopomorskie). In their case, additional characteristic features are high housing resources, high average dwelling size, as well as a high percentage of the population using the sewage system. Housing conditions of the population living in rural areas in this class can therefore be considered the most favourable.

TYPOLOGICAL CLASSIFICATION OF VOIVODSHIPS IN VIEW OF THE LEVEL OF CHANGES IN THE HOUSING CONDITIONS OF THE POPULATION LIVING IN RURAL AREAS IN POLAND IN 2016 COMPARED TO 2004

In 2016, compared to 2004, favourable changes were observed in the housing conditions of the general population living in rural areas. Among others, there was an increase in the percentage of the population using the sewage system (by 21.9 percentage points – p.p.), as well as flats equipped with a toilet (by 12.6 p.p.), a network gas supply (by 3.9 p.p.) or central heating (by 8 p.p.). However, there is significant regional variation in the dynamics of changes in the level of housing conditions of the population living in rural areas, which was presented on the basis of separate typological classes. The conducted research allowed to separate four classes of voivodships (Figure 3, Figure 4), characterized by a different level of changes in the housing conditions of the population living in rural areas in 2016 compared to 2004 (Table 3).

The first typological class was made up of the Lubelskie, Łódzkie, Mazowieckie, Podlaskie and Świętokrzyskie voivodships. They are characterized by a high, compared to other classes, increase in housing stock quantified by the number of dwellings per 1000 population (by 6.4 p.p.) and a high increase in the percentage of dwellings equipped with a toilet (16 p.p.). However, among the class I voivodships, a relatively low increase in the percentage of the population using the sewage system was observed (only by 15.2 p.p. with the average for rural areas of over 21.9 p.p.) and a low increase in the percentage of dwellings equipped with a network gas supply (by 2.7 p.p.) (Figure 3 and 4, Table 3).

Małopolskie, Opolskie, Podkarpackie and Śląskie voivodships form another typological class II (Figure 3). In the analyzed period, they were distinguished by a high increase in the percentage of the population using the sewage system (by 28.9 p.p.). In their case, the smallest increase was also seen, compared to other classes, in the percentage of dwellings equipped with a network gas supply (2.2 p.p.) and central heating (5.6 p.p.) (Table 3).

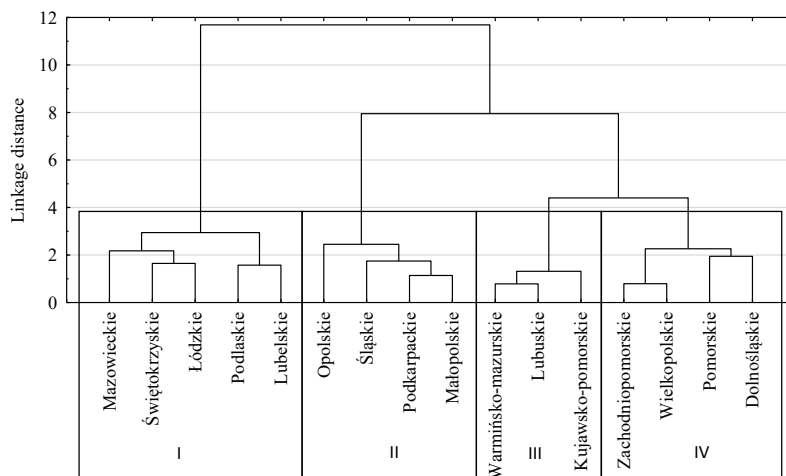


Figure 3. Classification of voivodships according to the level of changes in housing conditions of the population living in rural areas in Poland in 2016 in relation to 2004 (the Ward method, Euclidean distance)

Source: own study based on data from the Central Statistical Office [BDL 2018]

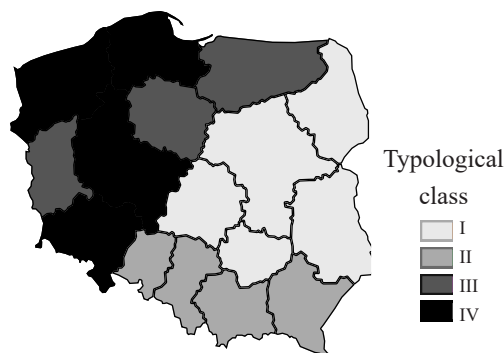


Figure 4. Classification of voivodships according to the level of changes in housing conditions of the population living in rural areas in Poland in 2016 in relation to 2004

Source: own study based on Figure 3

The distinguishing feature in class III (created by the following voivodships: Kujawsko-Pomorskie, Pomorskie, Lubuskie, Warmińsko-Mazurskie) is a relatively high increase in the percentage of dwellings equipped with central heating (by 9.5 p.p.). On the other hand, the dynamics of changes in the percentage of dwellings equipped with a water supply system, a network gas supply or toilet, as well as the percentage of the population using the sewage system in conditions of European integration was below average for rural areas in Poland (Table 3).

(Figure 3). They are distinguished by a very high, compared to other classes, dynamics of changes in the percentage of dwellings equipped with central heating (increase by 10 p.p.), a network gas supply (increase by 3.9 p.p.) and percentage of the population using the sewage system (an increase of 24.4 p.p.). On the other hand, among the voivodships discussed, the lowest increase in the percentage of flats equipped with a water supply system (by 1.8 p.p.) was noticed, compared to other classes.

Class IV was created by the Dolnośląskie, Pomorskie, Wielkopolskie and Zachodniopomorskie voivodships

Table 3. Results of the classification of voivodships according to the level of changes in housing conditions of the population living in rural areas in 2016 in relation to 2004*

Specification	Typological class			
	I	II	III	IV
	Lubelskie, Łódzkie, Mazowieckie, Podlaskie, Świętokrzyskie	Małopolskie, Opolskie, Podkarpackie, Śląskie	Kujawsko- pomorskie, Lubuskie, Warmińsko- mazurskie	Dolnośląskie, Pomorskie, Wielkopolskie, Zachodnio- pomorskie
Change of percentage of total dwellings equipped with a water supply in 2016 compared to 2004 [%]	6.4 ^{4.8}	2.2 ^{-2.5}	2.3 ^{-2.8}	1.8 ^{-8.3}
Change of percentage of total dwellings equipped with sewage in 2016 compared to 2004 [%]	15.2 ^{-2.7}	28.9 ^{2.8}	20.5 ^{-0.7}	24.4 ^{1.7}
Change of percentage of total dwellings equipped with a toilet in 2016 compared to 2004 [%]	16.0 ^{6.3}	10.6 ^{-2.6}	11.8 ^{-2.5}	11.1 ^{-1.7}
Change of percentage of total dwellings equipped with a network gas supply in 2016 compared to 2004 [%]	2.7 ^{-1.5}	2.2 ^{-4.9}	2.8 ^{-1.8}	7.9 ^{4.7}
Change of percentage of total dwellings equipped with central heating in 2016 compared to 2004 [%]	7.5 ^{-1.2}	5.6 ^{-4.7}	9.2 ^{9.1}	10.0 ^{4.7}

* in the headnotes, the values of the pseudo average difference test are given for features in typological classes, shades of grey mean its high absolute values – characteristic features (dark and light grey colours mean high and low intensity of the k -th feature in the c -th class, respectively)

Source: own study based on data from the Central Statistical Office [BDL 2018]

SUMMARY AND CONCLUSIONS

Favourable living conditions, including housing, as well as a high standard of living are recognized as the overarching goal of socio-economic development, both at a local, national and international level. It is, therefore, important to monitor them, especially in regional cross-section and urban-rural relationship. As a result of research, it was found that, in 2016, rural areas in the Dolnośląskie, Śląskie, Opolskie and Zachodniopomorskie voivodships were characterized by the highest level of housing conditions. They were distinguished by a high percentage of dwellings equipped with a toilet and central heating, as well as a high level of housing resources, a high average size of dwelling and a high percentage of the population using the sewage system. The lowest level of housing conditions of the population living in rural areas was observed in the Podlaskie Voivodship. This is demonstrated, among others, by a very low percentage of the population using the sewage

system and network gas supply, as well as a low percentage of total housing equipped with central heating. The impact on the current state of the level of socio-economic development of rural areas in Poland from a regional perspective (including the level of housing conditions) has not only natural and socio-economic conditions (including industrialization and urbanization), but also geographical and historical ones. The spatial distribution of the level of housing conditions and the dynamics of their changes are clearly visible on both maps presented in the article – connected with historical borders, both partitions and those from the interwar period.

Dynamic, favourable changes were observed in the housing conditions of the population living in rural areas in the conditions of European integration, both in terms of accessibility and quality of housing resources. An incentive for these changes could have been EU funds allocated for the construction and modernization of technical infrastructure. The highest increase in the percentage of dwellings equipped with central heating and a network gas supply was observed in rural areas in the following voivodships: Dolnośląskie, Pomorskie, Wielkopolskie and Zachodniopomorskie. On the other hand, the largest increase in the percentage of dwellings equipped with a toilet and water supply occurred in rural areas in the Lubelskie, Łódzkie, Mazowieckie, Podlaskie and Świętokrzyskie voivodships.

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REGIONALNE ZRÓŻNICOWANIE WARUNKÓW MIESZKANIOWYCH LUDNOŚCI ZAMIESZKUJĄCEJ OBSZARY WIEJSKIE W POLSCE

Słowa kluczowe: warunki mieszkaniowe, warunki życia, obszary wiejskie, województwa, Polska, metoda Warda

ABSTRAKT

Celem artykułu jest ocena regionalnego zróżnicowania warunków mieszkaniowych ludności zamieszkującej obszary wiejskie i ich zmian w Polsce w warunkach integracji europejskiej. Badania empiryczne przeprowadzono na podstawie danych wtórnych pochodzących z Banku Danych Lokalnych GUS, obejmujących lata 2004 i 2016. Ze względu na złożony charakter badanego zjawiska, wykorzystano metodę Warda w celu identyfikacji klas typologicznych poziomu warunków mieszkaniowych ludności na obszarach wiejskich w układzie województw. Przeprowadzono łącznie dwie klasyfikacje typologiczne województw – pierwszą ze względu na poziom warunków mieszkaniowych ludności zamieszkującej obszary wiejskie w 2016 roku, natomiast drugą ze względu na poziom zmian warunków mieszkaniowych badanej populacji, które zaszły w 2016 roku w relacji do 2004 roku. W wyniku przeprowadzonych badań empirycznych stwierdzono, że w 2016 roku najwyższym poziomem warunków mieszkaniowych ludności odznaczały się obszary wiejskie w województwach dolnośląskim, śląskim, opolskim i zachodniopomorskim. Najniższy poziom warunków mieszkaniowych ludności zamieszkującej obszary wiejskie wystąpił w województwie podlaskim. Zaobserwowano dynamiczne, korzystne zmiany w zakresie warunków mieszkaniowych ludności zamieszkującej na obszarach wiejskich w warunkach integracji europejskiej, zarówno w zakresie dostępności, jak i jakości zasobu mieszkaniowego. Największy poziom wzrostu w zakresie odsetka mieszkań wyposażonych w centralne ogrzewanie i w gaz z sieci zaobserwowano na obszarach wiejskich w województwach dolnośląskim, pomorskim, wielkopolskim i zachodniopomorskim. Największy wzrost odsetka mieszkań wyposażonych w ustęp i wodociąg wystąpił na obszarach wiejskich w województwach lubelskim, łódzkim, mazowieckim, podlaskim oraz świętokrzyskim.

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