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DEVELOPMENT OF TECHNICAL INFRASTRUCTURE IN RURAL AREAS OF POLAND IN THE YEARS 2003-2010

Summary

The subject of the article is the availability of technical infrastructure equipment in rural areas. Analysed were both the availability of technical infrastructure facilities and the tendencies of development in this area. Spatial analysis covered rural areas in Poland per provinces in the years 2003-2010. The studies comprised the following elements of infrastructure: water-pipe network, sewerage network, gas grid and road network, as well as individual and collective sewage treatment plants. For the sake of the article, which aims at the assessment of the level of technical infrastructure development in rural areas of Poland in spatial and time arrangement, the author applied methods of statistical multidimensional analysis using a construction of synthetic measure.

The results of analysis obtained in the work greatly confirm commonly known situation of rural areas in Poland. However, it is worth noticing, that despite the intense investment activities undertaken by local self-governments and noticeable improvement in the technical infrastructure facilities availability, interregional differences are diminishing only slightly. On the basis of the joint assessment, in 2010 the highest level of the technical infrastructure facilities availability in rural areas was noted in the Małopolskie and the lowest in the Lubuskie province.

Key words: rural areas, technical infrastructure

INTRODUCTION

The problem of the technical infrastructure equipment availability in Poland has not been solved yet. Depending on location in the vicinity of city agglomeration or the country boundary, rural areas reveal different level of their infrastructure, which is directly connected with the quality of inhabitants' living standard or with the potential for starting and running economic activities.

In this context the importance of regional policy addressing the disproportions in these areas development should be emphasized. Activities aimed at this direction have gained considerable importance, particularly after Poland's joining the European Union structures and realization of recommendations resulting from the Community Cohesion policy. Numerous projects using EU funding have been implemented throughout the country. To a great extent the success of rural areas development programmes depends on improvement of current availability of the technical infrastructure equipment. The level of infrastructure is regarded as one of the main factors shaping living and working conditions. It favours modernisation and intensification of agricultural production, determines the attractiveness of rural areas as regards potential development of various kinds of economic activities, which leads to their diversified development. Therefore it may be perceived as an opportunity, but also as a barrier to further development of rural areas [Jeznach M. et al., 2001; Ostrowski L., 1996].

Investment needs of rural areas considering technical infrastructure are twofold. In the sphere of quantity they should be treated as the state of underinvestment in relation to requirements expressed by the inhabitants and businesses. The quality dimension evidences poor technical state of the existing equipment. Needs concerning construction or extension of municipal infrastructure in rural districts are commonly noted but satisfied gradually in accordance with priorities set by local communities. Despite the fact that an improvement in the availability of various kinds of the technical infrastructure equipment was registered in recent years, significant regional disproportions are still noticed in this area [Rakowska J., Wojewódzka-Wiewiórka A., 2010].

The aim of the investigations presented in the article is a comparative assessment of the level of technical infrastructure development in rural areas in Poland in spatial and time arrangement.

METHODS OF INVESTIGATIONS

Statistical data supplied by GUS [Central Statistical Office] [www.gus.stat.gov.pl] were used to conduct the statistical analysis of the technical infrastructure equipment availability in rural areas of Poland. The data were organized in a spatial arrangement according to provinces and in time arrangement using information for the years 2003-2010.

The following diagnostic features were used in the characterization of the state and development of technical infrastructure in rural areas:

X_1 – road network (km per 100 km^2 of the area) – data describing country hard-surface roads were considered;

X_2 – water pipe network (km per 100 km^2 of the area);

X_3 – sewerage network (km per 100 km^2 of the area);

X_4 – gas grid (km per 100 km^2 of the area);

X_5 – collective sewage treatment plants (objects);
X_6 – individual rural sewage treatment plants (objects).

A synthetic measure was applied to make possible comparing the data with simultaneous taking into consideration all diagnostic variables. The measure makes possible evaluation of an "average" level of the values of variables characterising an investigated property achieved at some time [Pluta W., 1977]. The literature of the subject describes various methods serving to determine synthetic measures [Warżała R., 2006]. The method basing on the averaged, previously normalized values characterising analysed objects (in this case rural areas of individual provinces) was used in the paper [Malina A., Wanat S., 1995]. The arithmetic mean of the normalized values of the diagnostic features was assumed as the synthetic measure.

Individual diagnostic features are distinguished by various titres, therefore in order to ensure data comparativeness, they were subjected to normalisation, which is an obligatory condition of the description of complex socio-economic phenomena by means of selected diagnostic variables [Pawełek B., 2006]. A quotient conversion was applied in the article to covert absolute values of the features to relative values [Malina A., Zeliaś A., 1997].

While choosing normalization parameters, the approach [Grabiński T., Wydymus S., Zeliaś A., 1989] was applied in which parameters of normalization equation were determined once on the basis of all cross-section and time information for an individual variable. Consequently, the obtained synthetic variables allow for an assessment of the extent and trend of changes in this respect [Pawełek B.,2005].

The synthetic factor computed in the way presented above enables an assessment to be made of the technical infrastructure equipment availability in the area and the magnitude and directions of changes in this respect. The interpretation is as follows: the area is characterised by the higher level of equipment availability, the higher value the measure assumes.

RESULTS

The results of the conducted analysis point to a considerable diversification of rural areas in individual provinces as regards infrastructure availability. The increase in average values of the observed indicators may be noticed over the whole period of the analysis. Due to the lack of space, the article does not present detailed characteristics of the analysed diagnostic features. Instead, the development of individual features during the whole period of the analysis is demonstrated in Fig. 1.

In 2010 the best developed road network (in kilometres per 100km^2 of the area) was found for the Małopolskie (127.7), Świętokrzyskie (98.8) and Śląskie

(95.0), provinces, whereas the lowest values of this indicator were registered for the Warmińsko-Mazurskie (45.0), Lubuskie and ZachodnioPomorskie (46.6 each) provinces. On the basis of the presented diagram it may be also noticed that very small or almost no changes occurred in these provinces during the eight years (2003-2010). These were particularly provinces with the most poorly developed road network, i.e. Warmińsko-Mazurskie, ZachodnioPomorskie and Lubuskie. The most dynamic changes of road network density indicators characterised rural areas of the Mazowieckie province (increase by 20.5% in 2010 in the years 2002-2010) Łódzkie (15.5%) and Kujawsko-Pomorskie (15.0).

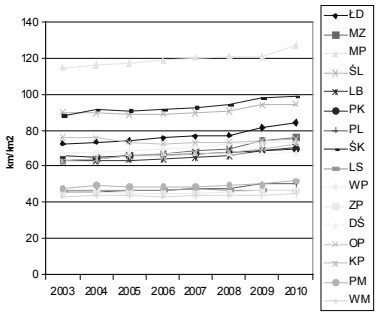
Like in the case of roads, the indicator of water pipe network density (X_2 variable) revealed relatively low dynamics over the whole analysed period (Fig. 1b).The highest increase in this indicator (in kilometres per 100km^2 of the area) was noted in the Mazowieckie (increase by 35.8% in the years 2003-2010) and in Warmińsko-Mazurskie province (34.4%). In 2010, the water pipe network density indicator reached the highest values in rural areas of the Kujawsko-Pomorskie (188.5) and Śląskie (117.1) provinces, whereas the lowest values were noted in Zachodniopomorskie (34.6) and Lubuskie (35.8) provinces.

The kind of technical infrastructure investment revealing an exceptional dynamics are outlays on sewerage network (X_3 variable). In the scale of the country the indicator of sewerage network density (in km per 100 km^2 of the area) increased in 2003-2010 by 103%. The greatest changes in this respect were registered in the Śląskie province (increase by 199.3%) while the smallest in the Podlaskie province (increase by 68.8%). Disproportions among individual provinces concerning the availability of this element of technical infrastructure are most apparent (Fig. 1c). In 2010 the least sewered were rural areas of: Podlaskie (6.2 km/100km^2) and Lubuskie (9.5 km/100km^2) provinces, whereas the area best covered by sewerage systems was Podkarpackie province (61.4 km/100km^2).

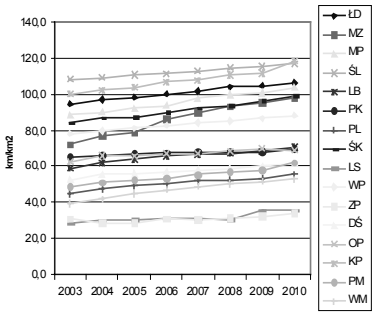
Gas grid (Fig.1d) is a relatively stabile component of rural areas management in Poland, although in this case there are provinces where a significant improvement in gas grid availability was noted, e.g. the Lubuskie (by 124.8%) or Podlaskie province (by 179%).The highest values of gas grid density indicator in 2010 were noted in the rural areas of the following provinces: Małopolskie – 123.9 km/100km^2 and Podkarpackie - 89.0, whereas the lowest was registered in the provinces of Podlaskie - 3.4 and Warmińsko-Mazurskie – 5.3.

The number of collective sewage treatment plants situated in rural areas is a feature greatly diversified in space and time. In 2010, the highest number of such facilities were in the Wielkopolskie province – 315 objects, i.e. 5 times more than in rural areas of the Opolskie province (63 objects). Also in this case, both the number of facilities and spatial disproportions between individual provinces increased during the investigated period.

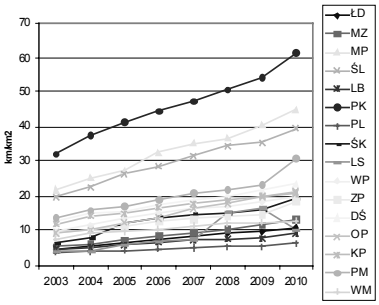
a) hard-surfaced country roads



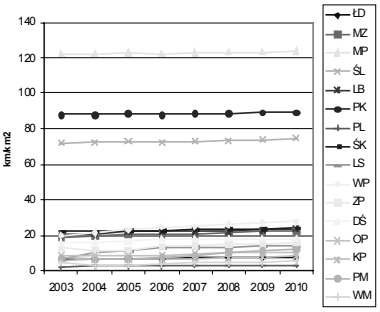
b) water-pipe network



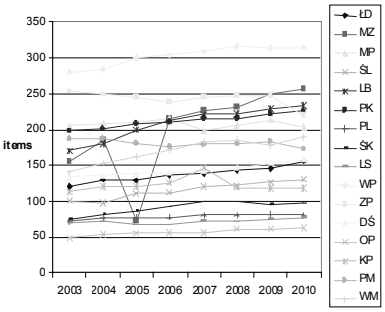
c) sewerage network



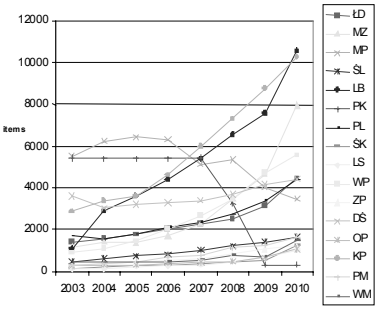
d) gas grid



e) collective sewage treatment plants



f) individual sewage treatment plants



Source: Author's own computations based on data provided by GUS: www.stat.gov.pl.

Figure1. Values of selected indicators of the technical infrastructure equipment availability in rural areas per provinces in 2003-2010. Provinces: Dolnośląskie – DŚ, Kujawsko-Pomorskie – KP, Lubelskie – LB, Lubuskie – LS, Łódzkie – ŁD, Małopolskie – MP, Mazowieckie – MZ, Opolskie – OP, Podkarpackie – PK, Podlaskie – PL, Pomorskie – PM, Śląskie – ŚL, Świętokrzyskie – ŚK, Warmińsko-Mazurskie – WM, Wielkopolskie – WP, Zachodniopomorskie – ZP

The number of collective sewage treatment plants in rural areas of Poland increased from 2321 in 2003 to 2694 in 2010. It is worth noticing that considering this variable (X_5) there were provinces where a decline in the number of collective sewage treatment plants was registered in 2003-2010: in Zachodniopomorskie (by 13.4%) and in Pomorskie (by 7.5%). The highest increase in this feature value (64.7%) occurred in rural areas of the Mazowieckie province. Such rapid decrease in the number of sewage treatment plants in this province noted in 2005 is surprising. One may suspect a mistake in the data provided by GUS (Fig.1e).

Dispersed settlement network makes the construction of network facilities (increasing the cost of investments) difficult. Therefore, a frequent alternative for a collective sewerage system are private home sewage treatment plants. This alternative is greatly popular, as evidenced by e.g. 14-fold increase in their number in the Lubuskie province during the investigated period of time. In 2010 over 10 thousand individual rural treatment plants operated in the Lubelskie province (10 554 vs. 1064 in 2003) and Kujawsko-Pomorskie (10 269 vs. 2847 in 2003). A decrease in the value of this feature (X_6 variable) was noted in the Podkarpackie and Małopolskie provinces. Considering the Podkarpackie province a change in this feature value is considerable and the sources may be sought in the increase of sewerage network density indicator and its generally high value (against the background of other provinces). Extension of sewerage network is due to the fact that the previous users of home sewage treatment plants are connecting to it, causing a considerable decline in the number of facilities, as shown in Fig.1f.

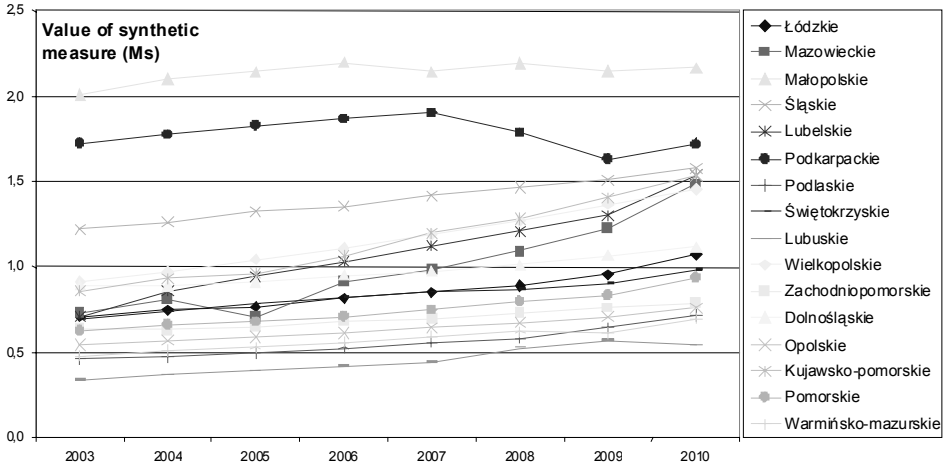
Table 1 shows the normalized values of the diagnostic features for comparison at the beginning and end of the analysis. Increasing value of a normalized variable determines greater intensity of the availability of individual facilities in the area. A higher value of a variable (owing to applied normalization method referring to inter-period average) is caused exclusively by yearly improving state of infrastructure availability in a given province but not by worsening of the situation in other provinces (as in case of normalization using average value of a feature for a given year). Values of a synthetic measure (M_s) were also compiled in the Table 1. Values of synthetic measure and individual diagnostic features, which proved bigger than the average value for rural areas in Poland total, were indicated in colour.

The province whose rural areas obtained the lowest synthetic assessment concerning all jointly regarded diagnostic features in 2010 was Lubuskie (M_s = 0.53). Technical infrastructure was best developed in the Małopolskie (2.17), Podkarpackie (1.72) and Śląskie (1.58) provinces. In 2010 the level of rural areas development regarding technical infrastructure assessed using presented methods ranged from 0.53 to 2.17, whereas in 2003 from 0.33 (Lubuskie province) to 2.0 (Małopolskie province). On this basis a high diversification may be stated in this area and, although it slightly diminished in the 2003-2010 period (Fig. 2).

Table 1. Values of normalized diagnostic features in an assessment of the level of technical infrastructure availability in rural areas of Poland per provinces in 2003-2010

Province	X_1		X_2		X_3		X_4		X_5		X_6		M_S	
	2003	2010	2003	2010	2003	2010	2003	2010	2003	2010	2003	2010	2003	2010
Łódzkie	1.06	1.23	1.32	1.48	0.29	0.65	0.25	0.27	0.76	0.98	0.58	1.82	0.71	1.07
Mazowieckie	0.92	1.11	1.00	1.36	0.32	0.78	0.67	0.79	0.98	1.62	0.48	3.27	0.73	1.49
Małopolskie	1.68	1.86	1.24	1.44	1.30	2.68	4.26	4.32	1.29	1.28	2.27	1.43	2.01	2.17
Śląskie	1.31	1.39	1.50	1.62	1.18	2.34	2.52	2.62	0.63	0.82	0.19	0.67	1.22	1.58
Lubelskie	0.92	1.03	0.82	0.98	0.27	0.56	0.74	0.82	1.07	1.47	0.44	4.35	0.71	1.54
Podkarpackie	0.96	1.02	0.91	0.97	1.91	3.66	3.08	3.10	1.25	1.42	2.24	0.12	1.72	1.72
Podlaskie	0.66	0.74	0.63	0.78	0.22	0.37	0.07	0.12	0.45	0.50	0.69	1.79	0.45	0.72
Świętokrzyskie	1.29	1.44	1.17	1.38	0.38	1.14	0.77	0.85	0.47	0.60	0.05	0.50	0.69	0.99
Lubuskie	0.68	0.68	0.39	0.50	0.24	0.60	0.22	0.50	0.43	0.49	0.03	0.43	0.33	0.53
Wielkopolskie	0.98	1.08	1.09	1.22	0.58	1.19	0.70	0.97	1.76	1.98	0.37	2.29	0.91	1.46
ZachodnioPomorskie	0.67	0.68	0.43	0.48	0.56	1.10	0.45	0.55	1.59	1.38	0.10	0.50	0.64	0.78
Dolnośląskie	0.99	0.98	0.73	0.86	0.77	1.39	0.56	0.63	0.84	1.00	1.47	1.81	0.90	1.11
Opolskie	1.11	1.10	0.87	0.96	0.56	1.27	0.29	0.36	0.31	0.40	0.11	0.44	0.54	0.76
Kujawsko-Pomorskie	0.92	1.06	1.39	1.64	0.71	1.23	0.21	0.29	0.71	0.74	1.17	4.23	0.85	1.53
Pomorskie	0.70	0.76	0.68	0.86	0.81	1.83	0.26	0.42	1.18	1.09	0.11	0.67	0.62	0.94
Warmińsko-Mazurskie	0.64	0.66	0.55	0.74	0.46	0.77	0.16	0.18	0.88	1.19	0.17	0.62	0.48	0.69

Source: Author's own computations based on GUS data: www.stat.gov.pl.



Source: Author's own calculation based on GUS data: www.stat.gov.pl

Figure 2. Level of technical infrastructure availability in rural areas of Poland in 2003-2010 per provinces

Diagram (Fig. 2) shows synthetic measure for individual provinces over the whole investigated period. With its help an improvement in infrastructure equipment availability in rural areas is obvious in all provinces except Podkarpackie. The development of infrastructure may be also assessed, which proved steady in a majority of provinces. A group of provinces which apparently intensified technical infrastructure investments (Kujawsko-Pomorskie, Wielkopolskie, Lubelskie and Mazowieckie) is distinguishable. The other regions (except previously mentioned three leaders) were characterized by a relative stagnation in this respect.

CONCLUSION

Disproportions occurring in regional development is both natural and obvious, which does not make it a positive phenomenon (although various theoretical approaches may be encountered in this respect, too). Currently realized doctrine of regional development of the European Union member states unambiguously points to a necessity of undertaking activities aiming at equalizing chances of regions, among others through an improvement of technical infrastructure equipment availability in the area. Therefore, subject research in this sphere is strongly justified and purposeful, whereas the obtained results may be helpful in decision making process at the level of government and self government administration.

Results of analysis obtained in the paper to a considerable extent corroborate generally known situation of rural areas in Poland. However, it should be noticed that despite the intensive investment activities undertaken by local self-governments and noticeable improvement of technical infrastructure equipment availability, interregional differences are diminishing only slightly.

Considering the conformity of the obtained results of the analysis to actual situation of technical infrastructure availability in rural areas, the selection of indicators for the conducted assessment should be also taken into consideration. Obtained results demonstrated that simultaneous studying such values as the number of collective sewage treatment plants and the length of sewerage network together with the number of individual wastewater treatment plants (as frequently done by various authors) is not always justifiable. Home wastewater treatment plants are undoubtedly more advantageous solution in comparison with cesspools used by households. However, they should be treated as substitutes for collective sewage disposal and treatment. In the situation when a decrease in the number of individual sewage treatment plants is observed with simultaneously increasing e.g. sewerage network density indicator, it may happen that the real picture of the situation is distorted giving lower values of synthetic indicators (this happened in case of the Podkarpackie province).

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