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**IMPACT OF AGGLOMERATIONS ON SOCIAL,  
AGRICULTURAL AND ENVIRONMENTAL  
TRANSFORMATIONS OF NEIGHBOURING MUNICIPALITIES**

Key words: agglomeration, migration, suburban communes, non-agricultural functions

**ABSTRACT.** The main research objective was to define the intensity of migration processes in metropolitan areas, and highlight the scale of deagrarianisation processes in neighbouring regions where agricultural functions are on the decline. The article presents the dynamics of changes related to the number of agricultural farms located in suburban areas in the years 1996-2010. It also includes an analysis of population flows between the city and the countryside. The study covers 4 agglomerations – Warszawa, Kraków, Wrocław and Poznań – and includes all the municipalities adjacent to the abovementioned cities. The study is based on data from the last three Agricultural Censuses and resources from the Local Data Bank. The data was used to create linear models illustrating tendency and dynamics indicators. In each of the agglomerations, it is possible to observe a visible decrease in the number of agricultural farms, whereas this phenomenon is the most conspicuous in municipalities located around Warszawa and Kraków. This points to increased dynamics of urbanisation processes with regard to major cities in Poland. Detailed analysis points to the concentration of capital and the related departure from the agricultural function in municipalities located in the direct vicinity of main transit routes. The analysis of population flows reveals that the dominant direction of migration is towards suburban municipalities. Apart from accessibility in terms of transport, the most significant factors, when it comes to making decisions on where to settle, include the attractive landscape and outstanding natural features of neighbouring municipalities. Models of trend estimation developed for individual municipalities, which describe the extent of migration from cities to neighbouring municipalities, expressly point to the increasing degree of this phenomenon. The greatest flow in this direction was observed in the years 2008-2010.

**INTRODUCTION**

One of the most important determinants of the contemporary growth model is metropolisation related to the accumulation of phenomena that favour the creation of hubs of a modern, highly efficient economy with a dominant role of the service sector (academic, consulting, financial or media services). Such hubs are centres where goods, capital and ideas are exchanged, not only between individual metropolises, but also between these metropolises and the region that surrounds them. The concept of “urban agglomeration” was adopted from French geography and appeared in Poland in the 1960s, when it was used with reference to the settlement system in large cities [Dziewoński, Kosiński 1964].

In this respect, urban agglomeration was an area of spatial concentration of the population. According to the extended definition of agglomeration as an urban settlement system [Iwanicka-Lyra 1969], an agglomeration is a “compact area composed of the city core, settlements and those administrative units around it that have higher than average indicators of features recognised as urbanisation measures in specific social and economic conditions – more advanced urbanisation processes than elsewhere are a result of a close connection between the core and the areas around it”. An urban agglomeration must, therefore, possess the following features: (1) an urbanised area including cities and urbanised rural areas; (2) be composed of a core (main city) and related area surrounding it; (3) be a spatially compact area. An urban functional area is, therefore, a settlement system characterised by spatial continuity, composed of separate administrative units including a compact urban area together with the external urbanised zone which is functionally related to the core [Heffner 2015].

Papers that discuss the subject matter of spatial development note two major dimensions of polarisation<sup>1</sup> observed in our country [Domański 2008, Gorzelak, Kozak 2008, Stryjakiiewicz 2009]. The first one is related to the duality of the affluent west vs poor east (which reflects long-term historical processes), and the other one employs the distinction between metropolitan and extra-metropolitan areas (peripheral), which is the modern version of the traditional distinction between the city and countryside. At the same time, it is indicated that the metropolisation process, characteristic for the modern world, is also observed in Poland, although it is occurring with a slight delay and is less dynamic than elsewhere, in major global metropolises [Smętkowski et al. 2008, Parysek 2010]. It is relatively often that we observe situations where certain business entities (i.a. from the industrial processing sector) prefer peripheral locations, which is related to the fact that in the city, which is a place of dynamic growth, one also experiences the inconveniences of agglomeration, which dramatically increases production costs. As a result of such shifts, hubs or support poles are created, where the development of enterprises is supported through creating favourable local conditions [Grzeszczak 1999, Gaczek 2006, Satoła 2014]. In the literature on the subject, it is often emphasised that the position of a specific local or regional system depends on the role it has in the space of material flows (exchange of goods, capital flows, flow of human resources) and intangible flows (information and knowledge flow). The main dimension of spatial diversity is, therefore, the typical relational distinction between metropolises and peripheral areas (the core-periphery dichotomy), which is gradually replacing the territorial dichotomy between the city and countryside [Smętkowski 2009].

While analysing the impact of urban agglomerations on the functioning and growth of neighbouring areas, it is worth noting that contemporary empirical research focuses on the analysis of large urban agglomerations in Poland with regard to population changes, spatial and economic transformations, or changes observed in social and economic functions or in the dynamics of agglomeration growth [Korcelli ed. 1996, 1997, Domański ed. 2000, Kołodziejski, Parteka ed. 2001]. The analysis of urban agglomeration with regard

<sup>1</sup> In this respect, polarisation is understood as the impact of the development pole (which is usually the agglomeration) and “... the appearance and expansion of intermediate hubs, whose number would be sufficient to stimulate the creation, concentration or conversion of industry in certain areas, which offer easy access to labour reserves” [Davin et al. 1959, p. 159].

to the systemic approach was also used in the study of agglomeration as a subsystem in higher-rank settlement systems (regional or national).

What is an important element in social and economic geography is the spatial paradigm [Lisowski 2005], the main role of which is to explain social and economic structures and processes in the spatial dimension on various levels of existing territorial organisation. Proper accessibility, in terms of transport, creates favourable conditions for wide contact with other units in the system, which, in turn, increases the attractiveness of the area for investors. Research on modelling concentration shows that improving the position of a specific unit in the transport network definitely increases its chances and opportunities for development – also in the case of smaller localities with poor demographic potential [Mlek, Zipser 2007]. The main purpose of the study was to define the intensity of migration processes in selected metropolitan areas, and describe the scale of deagrarianisation processes observed in neighbouring regions, which are characterised by a decline in agricultural functions.

## MATERIAL AND RESEARCH METHODS

The article uses mass statistical data from resources of the Local Data Bank, covering the period 1996-2018, related to changes in municipalities located around 4 urban centres. The study focused on the analysis of the migration balance and population flows between the city and countryside. The analysis also covered changes in the number of agricultural farms in the discussed areas, based on the data from the last three Agricultural Censuses conducted between 1996 and 2010. The study included information related to territorial entities around 4 agglomerations – Warszawa, Kraków, Wrocław and Poznań. Data analysis used chain indicators of dynamics and gradients of lines describing trends, so as to compare the pace of changes in population flows. In order to verify the created models, the coefficient of determination was defined as well as standard errors in assessing parameters, which were then used to define the statistical significance of estimated parameters<sup>2</sup>.

## RESULTS OF RESEARCH

Due to the scope and strength of relations with surroundings, especially the relationship between the city and countryside, rural areas are currently classified in three general relation types [Wilkin 2007, Heffner 2014]: integrated rural areas, transitional rural areas and peripheral rural areas.

The subject matter of this paper, which is part of a broader study related to the multifaceted impact of metropolises on neighbouring municipalities, is the evaluation of the impact of urban agglomerations on the first two of the abovementioned categories of rural areas with regards to the functioning of agricultural farms and population changes. The basic issue raised with reference to the impact of metropolitan areas on neighbouring rural areas is a change in the scale of agricultural activity. The presence of large urban hubs often determines a change in the profile of activities pursued by agricultural farms (e.g.

<sup>2</sup> From among a total of 240 created models, 197 proved to be statistically significant and were included in the analysis.

Table 1. Dynamics of changes in the number of agricultural farms in neighbouring municipalities in 1996-2010

Specification	Number of agricultural farms in year			Dynamics index 2002/1996	Dynamics index 2010/1996
	1996	2002	2010		
Neighbouring municipalities of Warszawa					
Izabelin	80	115	27	1.438	0.338
Jabłonna	393	428	268	1.089	0.682
Józefów	93	46	32	0.495	0.344
Konstancin Jeziorna	703	652	409	0.927	0.582
Lesznowola	756	780	619	1.032	0.819
Łomianki	338	305	255	0.902	0.754
Marki	164	101	37	0.616	0.226
Michałowice	317	233	123	0.735	0.388
Nieporęt	712	714	281	1.003	0.395
Ożarów Mazowiecki	764	689	559	0.902	0.732
Piaseczno	1,069	939	509	0.878	0.476
Piastów	82	8	25	0.098	0.305
Raszków	586	464	287	0.792	0.49
Stare Babice	962	922	606	0.958	0.63
Sulejówek	227	135	53	0.595	0.233
Wiązowna	845	1157	674	1.369	0.798
Ząbki	30	8	28	0.267	0.933
Zielonka	43	21	30	0.488	0.698
Geometric mean				0.70578	0.50067
Neighbouring municipalities of Kraków					
Igołomia – Wawrzeńczyce	1,317	1,288	1,168	0.978	0.887
Kocmyrzów – Luborzyca	1,517	1,492	1,241	0.984	0.818
Liszki	1,790	1,648	1,007	0.921	0.563
Michałowice	1,037	1,077	764	1.039	0.737
Mogilany	628	756	407	1.204	0.648
Niepołomice	1,705	1,648	983	0.967	0.577
Skawina	1,875	1,734	962	0.925	0.513
Świątniki Górnne	305	318	151	1.043	0.495
Wieliczka	1,918	1,707	946	0.89	0.493
Wielka Wieś	1,192	1,180	662	0.99	0.555
Zabierzów	977	824	443	0.843	0.453
Zielonki	1,008	1,146	704	1.137	0.698
Geometric mean				0.99827	0.64326

Table 1. Cont.

Specification	Number of agricultural farms in year			Dynamics index 2002/1996	Dynamics index 2010/1996
	1996	2002	2010		
Neighbouring municipalities of Wrocław					
Czernica	468	539	342	1.152	0.731
Długołęka	1,270	1,421	1,054	1.119	0.83
Kąty Wrocławskie	950	933	735	0.982	0.774
Kobierzyce	753	669	523	0.888	0.695
Miękinia	682	765	493	1.122	0.723
Oborniki Śląskie	784	878	637	1.12	0.813
Siechnice	no data	676	494	no data	no data
Wisznia Mała	647	627	489	0.969	0.756
Geometric mean				1.02885	0.79467
Neighbouring municipalities of Poznań					
Suchy Las	241	252	208	1.046	0.863
Rokietnica	313	286	219	0.914	0.7
Tarnowo Podgórne	477	514	370	1.078	0.776
Dopiewo	346	328	245	0.948	0.708
Komorniki	263	285	283	1.084	1.076
Luboń	49	65	48	1.327	0.98
Puszczykowo	19	28	17	1.474	0.895
Kórnik	632	619	500	0.979	0.791
Kleszczewo	263	248	265	0.943	1.008
Swarzędz	415	331	268	0.798	0.646
Czerwonak	209	224	133	1.072	0.636
Geometric mean				1.04753	0.83044

Source: own work based on Local Data Bank Central Statistical Office (CSO) data

towards functions related to the so-called special branches of agricultural production). In the long run – as a result of processes known as city sprawling, as well as changes in the designation of the land, as defined by spatial management plans formulated by municipal councils, agricultural land becomes a target for investors, who use it for non-agricultural purposes – mainly residential. If there is a good transport infrastructure connecting such areas with the local urban hub or the vicinity of main communication routes that connect the area and the centre of the agglomeration, then such land is used for commercial purposes – shopping malls, logistic bases or service centres/production plants.

While analysing the changes in the number of agricultural farms based on data included in Table 1, one should note the constant decrease in the number of farms in the studied period. It points to the progressing disagrарisation of neighbouring municipalities and may be conformation of increasing polarisation as well as the increasing significance of large urban hubs – and consequently – the expansion of urbanised areas into neighbour-

ing municipalities. Based on the indication of the geometric mean, the greatest relative decrease in the number of agricultural farms is observed in municipalities located around two major urban hubs: Warszawa and Kraków. In the case of the capital city – the decrease in the studied period constituted 50%, and for municipalities with the highest economic potential it even exceeded 70%. This mainly refers to municipalities located near main exit roads from Warszawa – such as Marki, Piastów or Sulejówek. In the case of the Kraków agglomeration, the average drop in the number of agricultural farms was slightly over 35%. Among the localities with the greatest degree of reduction in the number of farms, the dominant municipalities are those where special economic and industrial zones were organised over the past two decades (Skawina and Niepołomice), as well as business parks (Zabierzów), i.e. areas with a good location with regards to transport. A significant drop in the number of agricultural farms (40-50%) was also observed in those municipalities which were attractive as residential areas. Due to outstanding natural features and landscape, dominant localities included those in Pogórze Wielickie (municipalities such as Wieliczka, Świątniki Górne), and Jura Krakowsko-Częstochowska (Wielka Wieś).

The number of farms near Wrocław dropped by slightly more than 20%. Just as in the case of the previously discussed agglomerations, the greatest decrease was observed in municipalities with the best transport connection, where service centres and production plants were established – such as Kobierzyce or Miękinia.

Less dynamic changes were observed in the Poznań agglomeration – in the studied period, an average of 17% of farms were closed down here, and in municipalities with a good transport infrastructure and large proportion of non-agricultural economic entities (Swarzędz, Tarnowo Podgórne) this figure was ca. 30%.

Another analysed phenomenon, which points to the significant impact of urban hubs on neighbouring municipalities, was population flows. Table 2 presents basic indicators related to the fluctuation of inhabitants of municipalities located in the four studied agglomerations.

The analysis of the scale of population flows in municipalities focused around large urban hubs points to an increase in migration towards the studied municipalities over a period of over two decades (1996-2018). In the case of the Warszawa agglomeration, the greatest influx is observed in municipalities where intense investment resulted in an increased supply of accommodation. A considerable increase in prices, as observed on the real estate market in the capital city, shifted some of the demand towards neighbouring municipalities – such as Piaseczno, Marki, Ząbki, Lesznowola or Ożarów Mazowiecki. This guarantees lower prices of accommodation and more favourable conditions with regards to the purchase of land for single-family housing. What is interesting – only half of the influx is related to migration from cities, which proves that the constant increase of the population in the Warszawa agglomeration results from population flows from peripheral locations. At the same time, in most of the abovementioned municipalities, a considerable outflow to the city is observed (one can infer that it is mostly related to the city core), although the analysis of the net migration rate also confirms intense settlement in neighbouring municipalities.

In the Kraków agglomeration, one can observe a constant increase in the number of inhabitants in all neighbouring municipalities – except for the inherently agricultural municipality of Igołomia – Wawrzeńczyce. The greatest influx of inhabitants occurs in localities in the southern part of the agglomeration – mainly Wieliczka and the north –

Table 2. Gradients of lines describing the model of trend estimation for population flow

Specification	Registration rate	Registration rate from cities	Deregistration rate	Deregistration rate to cities	Net migration rate
Neighbouring municipalities of Warszawa					
Izabelin	2.042	0.855	6.742	2.647	-4.7
Jabłonna	10.442	8.453	9.769	7.67	0.673
Józefów	-1.365	-1.574	2.965	2.872	-4.33
Lesznowola	34.1	24.133	11.913	8.224	22.187
Łomianki	2.042	0.855	6.742	2.647	-4.7
Marki	31.529	24.819	10.54	7.563	20.989
Michałowice	-6.859	-6.679	2.236	1.234	-9.095
Nieporęt	1.807	1.911	1.235	0.094	0.572
Ożarów Mazowiecki	23.61	17.018	3.324	1.466	20.286
Piaseczno	39.415	19.262	41.57	23.209	-2.155
Piastów	-7.242	-6.418	-1.549	-4.096	-5.693
Raszków	-4.816	-3.471	2.645	0.812	-7.461
Stare Babice	2.042	0.855	6.742	2.647	-4.7
Sulejówek	0.021	-0.372	0.375	-0.273	-0.354
Wiązowna	10.878	9.076	1.112	0.916	9.766
Ząbki	38.075	24.579	18.221	13.234	19.853
Zielonka	-5.975	-4.139	0.143	0.115	-6.119
Neighbouring municipalities of Kraków					
Igołomia – Wawrzeńczyce	-1.416	-1.051	-1.155	-0.807	-0.26
Kocmyrzów – Luborzyca	7.981	7.681	0.238	0.195	7.743
Liszki	3.563	2.479	1.006	0.635	2.557
Michałowice	7.612	6.184	1.997	1.234	5.614
Mogilany	8.063	6.443	2.763	1.697	5.3
Niepołomice	23.496	17.7	2.64	1.399	20.855
Skawina	3.292	4.37	0.91	0.337	2.382
Świątniki Górnne	4.781	4.382	1.433	0.725	3.348
Wieliczka	38	28.539	7.169	2.986	30.831
Wielka Wieś	12.361	10.189	0.821	0.685	11.54
Zabierzów	6.781	5.981	1.238	0.387	5.543
Zielonki	19.132	15.791	5.422	3.71	13.709

Table 2. Cont.

Specification	Registration rate	Registration rate from cities	Deregistration rate	Deregistration rate to cities	Net migration rate
Neighbouring municipalities of Wrocław					
Czernica	26.272	22.372	3.84	2.544	22.433
Długołęka	50.871	43.938	6.123	4.294	44.749
Kąty Wrocławskie	28.587	24.433	4.964	3.435	23.623
Kobierzyce	29.462	25.922	6.386	4.614	23.076
Miękinia	23.396	20.525	2.849	2.222	20.547
Oborniki Śląskie	2.35	3.194	1.262	0.56	1.088
Siechnice	40.392	32.205	8.29	2.817	32.103
Wisznia Mała	5.839	5.207	0.725	0.887	5.113
Neighbouring municipalities of Poznań					
Czerwonak	-1.801	-2.819	7.89	0.021	-9.691
Dopiewo	48.795	37.852	9.132	4.485	39.663
Kleszczewo	13.902	10.586	2.292	0.731	11.609
Komorniki	61.11	51.072	12.523	4.485	48.586
Kórnik	46.57	38.07	8.127	3.151	38.443
Luboń	-4.474	-6.337	13.34	1.532	-17.814
Puszczykowo	-2.766	-3.212	0.073	-1.125	-2.839
Rokietnica	34.099	25.602	4.267	-0.025	29.832
Suchy Las	6.869	5.464	5.546	2.047	1.323
Swarzędz	30.981	22.833	21.424	0.437	9.557
Tarnowo Podgórne	30.289	21.436	3.954	0.324	26.335

Source: own work based on the Local Data Bank Central Statistical Office (CSO) data

Wielka Wieś and Zielonki – which, once again, confirms the abovementioned residential attractiveness of these municipalities. What is unique, in this respect, is the municipality of Niepołomice – it was previously regarded as a peripheral area, rather than the core. Due to investment in infrastructure and the establishment of an industrial zone, and the related creation of numerous jobs, more and more people were inclined to move and settle here – mainly from Kraków. A similar situation was observed in municipalities near Wrocław – such as Długołęka, Siechnice or Kąty Wrocławskie, which are not only natural areas of settlement for people who used to live in Wrocław, but, due to the establishment of industrial plants and a great supply of jobs, they have become increasingly attractive to new residents. Analysis of the net migration rate in the Poznań agglomeration confirms the above conclusions – a lot of people migrate to settle down in municipalities with attractive natural features and those with multiple jobs to offer in the non-agricultural sector.

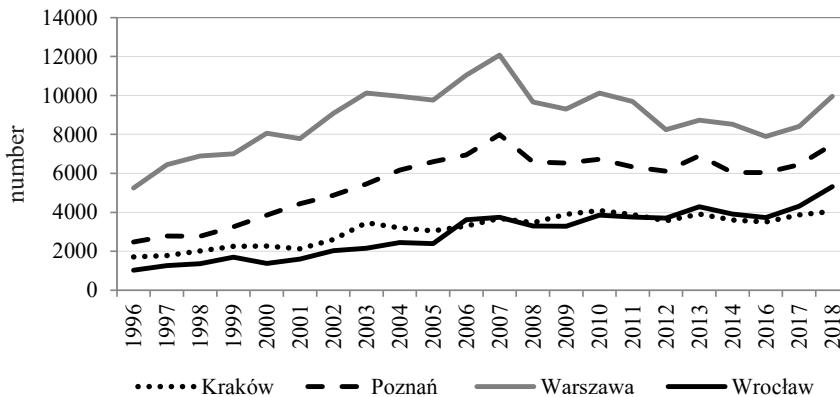


Figure 1. Dynamics of changes related to a population influx from cities to neighbouring municipalities around Warszawa, Kraków, Wrocław and Poznań in 1996-2018

Source: own work based on Local Data Bank Central Statistical Office (CSO) data

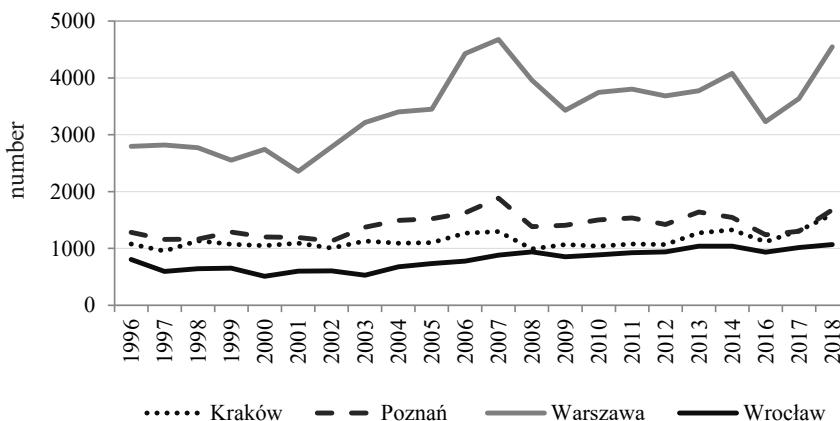


Figure 2. Dynamics of changes related to the outflow of the population from neighbouring municipalities to cities in 1996-2018

Source: own work based on Local Data Bank Central Statistical Office (CSO) data

When analysing the dynamics of population migration movements in the studied agglomerations, it can be observed that migration from cities to neighbouring municipalities is clearly dominant, and consequently, there is a high positive net migration rate (Figure 3).

The increasing tendency for people to move from the city to countryside is visible in each of the studied hubs. This process was the most intense in Warszawa and Poznań, especially in the first half of the studied period. The greatest increase in the number of registered residents was observed in the period from 2005 to 2007 (Figure 1). The outflow from neighbouring municipalities to cities remains fairly stable in the case of three hubs, with the only exception being Warszawa with an upward trend in this respect.

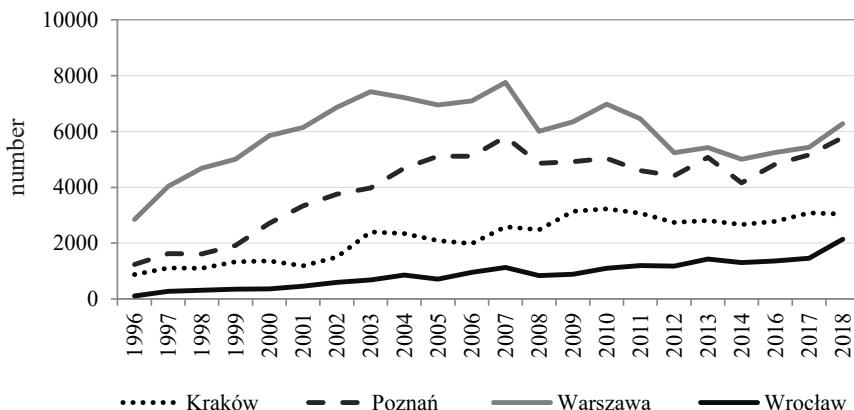


Figure 3. Dynamics of changes in the net migration rate for neighbouring municipalities around Warszawa, Kraków, Wrocław and Poznań in 1996-2018

Source: own work based on Local Data Bank Central Statistical Office (CSO) data

## SUMMARY

Dynamic phenomena within and in the direct vicinity of urban agglomerations as well as the parallel progressive polarisation and deglomeration of these centres are also observed in major Polish cities. Tendencies related to cities sprawling into the area of neighbouring municipalities determine the limitation and reduction of agricultural functions and a decrease in the number of agricultural farms in neighbouring localities. Investment in infrastructure in the abovementioned areas not only promotes an increase in entrepreneurship (which results in a greater supply of jobs), but are also a significant incentive, which encourages city-dwellers to seek a larger and more comfortable living space. This leads to the intensification of phenomena related to suburbanisation: this term refers to a phase in the urbanisation process whereby inhabitants – together with their lifestyle, landscape forms and land use, urban infrastructure and workplaces – move from the city to rural areas, which, in turn, gradually transforms these areas into semi-urban ones. The dynamic increase in real property prices in cities, observed over the past decade in particular, has resulted in increased interest in neighbouring municipalities, which is expressly confirmed by the abovementioned data on population flows in agglomerations, which have caused permanent changes in the functioning, demography and economy of the studied localities.

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## WPŁYW AGGLOMERACJI NA PRZEOBRAŻENIA SPOŁECZNE I ROLNOŚRODOWISKOWE GMIN OŚCIENNYCH

Słowa kluczowe: aglomeracja, migracje, gminy podmiejskie, funkcje pozarolnicze

### ABSTRAKT

Podstawowym celem badawczym było określenie intensywności procesów migracyjnych na obszarach metropolitarnych, a także ukazanie skali procesów dezagraryzacyjnych, zachodzących na terenach ościennych o zanikających funkcjach rolniczych. Przedstawiono dynamikę zmian w zakresie liczby gospodarstw rolnych zlokalizowanych na obszarach podmiejskich w latach 1996-2010. Dokonano także analizy przepływów ludności w relacji miasto – wieś. Badaniami objęto 4 obszary aglomeracyjne: Warszawę, Kraków, Wrocław i Poznań. Uwzględniono wszystkie gminy graniczące bezpośrednio z wymienionymi miastami. Do badań wykorzystano dane pochodzące z trzech ostatnich Powszechnych Spisów Rolnych oraz dane z zasobów Banku Danych Lokalnych GUS. Posłużyły one do konstrukcji liniowych modeli tendencji rozwojowej oraz indeksów dynamiki. W każdym z obszarów aglomeracyjnych obserwowały się wyraźny spadek liczby gospodarstw rolnych, przy czym zjawisko to najsilniej uwidocznioło się wśród gmin zlokalizowanych wokół Warszawy i Krakowa. Świadczy to o zdynamizowaniu procesów urbanizacyjnych w odniesieniu do największych ośrodków krajowych. Szczegółowa analiza danych wskazuje na koncentrację kapitału i związane z tym odchodzenie od funkcji rolniczej w gminach położonych w sąsiedztwie głównych szlaków tranzytowych. Analiza przepływu ludności wskazuje na przewagę migracji w kierunku gmin podmiejskich. Poza elementem dostępności komunikacyjnej priorytetem w wyborach osadniczych jest również atrakcyjność krajobrazowa i walory przyrodnicze gmin ościennych. Opracowane dla poszczególnych gmin modele tendencji rozwojowej opisujące poziom napływu ludności z miast do gmin ościennych jednoznacznie wskazują na narastanie skali zjawiska. Największe napływy zaobserwowano w latach 2008-2010.

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