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## Suburbanisation of the Rural Areas and the Implementation of Local Authorities' Own Responsibilities: Needs and Challenges

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### **Abstract:**

**Purpose:** The purpose of the study is to analyse population trends in the rural areas surrounding large cities and to identify the resulting new needs and challenges for the implementation of the own tasks of the authorities of these administrative units.

**Design/Methodology/Approach:** The study was carried out using statistical data made available by the Statistics Poland (SP), which enabled the study of value increments and the observation of trends, including changes in environmental infrastructure.

**Findings:** Rapid population growth and rejuvenation of the population living in rural peri-urban areas were observed. The dynamic population growth has created needs that must be met immediately by local authorities. Such needs include the fast implementation of investments related to the obligation to provide an adequate number of school and kindergarten places for the growing number of children, as well as environmental protection, e.g. through the collection and disposal of waste produced by the growing number of households.

**Practical Implications:** The results of the study seem to be of a significant practical importance - local authorities need to analyse current demographic trends, forecast future population levels and plan resources for investment to carry out their own responsibilities in response to changing community needs.

**Originality/Value:** The article introduces an element of novelty, as most studies describing the course and effects of suburbanisation omit the issue of changing the age structure of the population and its direct implications for local authorities.

**Keywords:** Local development, suburbanization, population growth, environmental protection.

**JEL classification:** H41, H52, H72, H75, J11, L95, Q01, Q58, R232.

**Paper Type:** Research article.

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## 1. Introduction

The spillover of urban functions into nearby rural areas is a phenomenon commonly observed worldwide (Brueckner, 2000; Burchfield *et al.*, 2006, Frenkel and Ashkenazi, 2008, Patacchini *et al.*, 2008, Boitier, 2018, Banski, 2019, Silva and Vergara-Perucich, 2021). In the areas of administrative units surrounding large cities, functions such as industrial, tertiary, commercial and also residential develop (Wang *et al.*, 2016; Abubakar and Doan, 2017; Szczepańska and Gerus-Gościewska, 2017). The latter function is directly related to the change in the demographic structure of the areas concerned - new residents move into the newly erected buildings, causing many changes and transformations (Żróbek-Różańska and Zadworny, 2016).

Each inhabited region must have its own administrator, who look after the interests of the inhabitants and also protect the area from degradation. To increase management efficiency, countries are divided into smaller administrative units, e.g. Germany has a four-tier structure, France is divided into five territorial tiers and Greece into three. Poland has a three-tier division - the country is divided into voivodeships (16 units), then into poviats (314 poviats and 66 cities with poviat rights) and *gminas* (2477). Each level has its own authorities, the most important of which is local government, i.e., *gmina's* authorities, which is obliged to manage the commune, among other things, by implementing their own tasks.

According to the Act on Municipal Self-Government, the *gmina's* own duties include satisfying the collective needs of the community, which are listed in detail in the Act. The implementation of these tasks becomes a challenge when the community is a subject to dynamic demographic changes, both in terms of the number of members and their age and needs. Some *gminas* lose residents through emigration, while others gain new residents. Dynamic population growth is observed among others in suburban areas. Rapid suburbanisation generates the need to adjust the quantity and quality of public services (Li *et al.*, 2019). This issue is topical and perspective, as suburban populations of the developed world are projected to grow further (Brade *et al.*, 2009, McManus *et al.*, 2012, Hesse and Siedentop, 2018).

This article presents an examination of several aspects of suburban rural areas management that are directly related to the growing population and the change in its age structure. Attention was paid to the local authorities' duties in the terms of:

- 1) environmental protection;
- 2) water supply, sewage system, sewage disposal and treatment, maintenance of cleanliness and order and sanitation, waste disposal and dumps;
- 3) public education.

The following arguments support the choice of these tasks:

- 1) The growing population means the need to provide services that cannot be postponed. Local authorities are obliged to provide water, collect and dispose of sewage and waste from its inhabitants. At the same time, this implies the need for adjusting the sophistication of infrastructure measures for environmental protection.
- 2) In Poland, according to the educational law, children aged 3-5 have the right to pre-school education, and a child aged 6 is obliged to undergo one-year pre-school preparation. In turn, from the age of 7 to 18 a child is subject to compulsory education. Local authorities have to establish and operate public kindergartens and primary schools. In practice, this means that they must ensure a place in a kindergarten for every child over 3 years of age, and then a place in a primary school if the child's parents/guardians express a wish to realise the right or obligation in educational institutions located within the administrative unit's borders. This is another task that cannot be postponed - recruitments to institutions are announced in spring and on 1 September schools and kindergartens have to be ready to provide places for all registered young residents.

The aim of the study is to analyse the trends concerning the population living in rural areas surrounding big cities and the resulting new needs and challenges in the implementation of selected own tasks of the authorities of those administrative units. The aim was realised on the area of functional urban areas (FUAs) of Eastern Poland and selected *gminas* which were characterised by the most dynamic population growth. The selected area made it possible to observe interesting tendencies which strongly influence the realization of local authorities' responsibilities. The obtained results may be generalized and referred also to other territorial units which experience dynamic population growth.

## 2. The Scope and Methods of Research

### 2.1 Spatial Scope and Data Sources

The research was conducted on rural *gminas* located within FUAs of 5 voivodship cities of Eastern Poland (Olsztyn - FUA O, Białystok - FUA B, Lublin - FUA L, Rzeszów - FUA R and Kielce - FUA K, Figure 1). The choice of this area was dictated by the fact that Eastern Poland received the greatest support from EU operational programmes and many distinct socio-economic transformations started here, including dynamic processes of suburban zone development. For detailed studies 6 *gminas* were selected, which were characterized by the highest population growth - Stawiguda (S), Głusk (G), Wólka (W), Juchnowiec Kościelny (JK), Konopnica (Ko) and Krasne (Kr).

Data for the study was taken from the SP Local Data Bank, in the following time ranges: 2010-2020 for the total population, number of children aged 0-14, population of working age, migration balance per 1000 people; 2020 for the old-age

dependency ratio; 2016-2020 for the natural increase; 1995-2020 for the population in the municipality of Stawiguda; 2010- 2019 for the number of children in pre-school education between 3 and 6 years of age; 2011-2019 for the number of pupils in primary schools; 2011-2020 for the number of full-time teachers employed in primary schools.

In order to analyse the spatial diversification of the degree of advancement of infrastructural measures for environmental protection in selected *gminas*, the following data from 2010-2020 were selected: the share of legally protected areas in the total area; treated sewage discharged per inhabitant/year; mixed waste from households per inhabitant/year; water consumption per inhabitant/year; length of the sewage system in relation to the length of the water supply system; length of the active sewage system per 100 km<sup>2</sup>; length of the water supply system per 100 km<sup>2</sup>. Due to the lack of data from 2020, for the variables: number of septic tanks; share of population using the sewerage network and share of population using the water supply network, data from 2010- 2019 were used.

**Figure 1.** Location of examined FUA on the map of Poland



*Source:* Own elaboration based on the map of Poland from the Geoportals service ([geoportals.pl](http://geoportals.pl)).

## 2.2 Method

The study was carried out by interpreting the increases in the tested values over time. The indicators used were calculated according to the following definitions:

- population growth rate - percentage change in the size of the population between 2010 and 2020;
- natural increase - difference between the number of live births and the number of deaths in a given period (average for 2016-2020);
- older age dependency ratio - ratio of older people (65 and over) to people aged 15-64 in 2020;

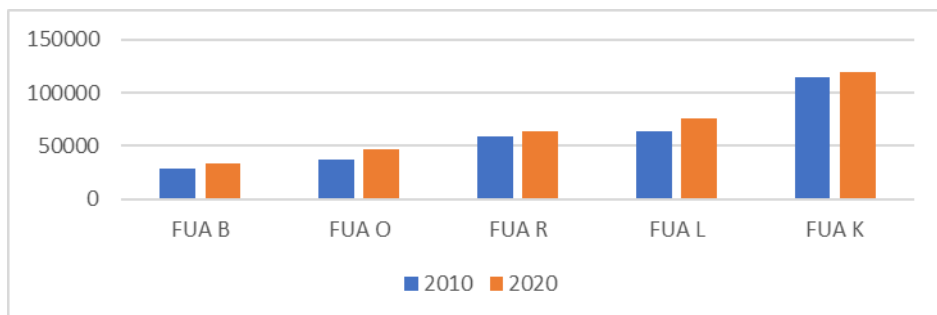
- net migration per 1000 population - represents the increase in population of an administrative unit/country as a result of migration per 1000 inhabitants of that unit/country (average for 2010-2020);
- population growth dynamics – population growth change over time;
- children in pre-school education (3-6 years) growth rate - percentage change between 2010 and 2020;
- primary school pupils growth rate - percentage change between 2011 and 2019;
- number of full-time primary school teachers growth rate - percentage change between 2011 and 2019.

Hellwig's (1968) index method was used to analyse the spatial diversity of infrastructural measures conducive to environmental protection in selected units. The following variables were selected as destimulants: number of septic tanks, weight of mixed waste from households per 1 inhabitant/year, water consumption per 1 inhabitant per year. The remaining analysed variables were treated as stimulants. The following class ranges were distinguished: Class 1 - high degree of advancement of infrastructural activities for environmental protection; Class 2 - medium degree of advancement of infrastructural activities for environmental protection; Class 3 - low degree of advancement of infrastructural activities for environmental protection; Class 4 – the lowest degree of advancement of infrastructural activities for environmental protection.

### 3. Results

In all the analysed units located within selected FUAs, an increase in the number of people was observed (Figure 2).

**Figure 2.** Population living in the rural areas of FUAs in 2010 and 2020



*Source:* Own study based on SP data.

In each of the studied FUAs there were units with high migration attractiveness as well as units with slower population growth. The highest population growth between 2010 and 2020 was observed in Stawiguda, where it amounted to 76% (Table 1).

The population has been increasing in this unit successively since 2000, reaching the highest increases in 2018 and 2019 (8% each compared to the previous year). This is related to the development of multi-family housing, which has significantly accelerated the settlement. This compares with a score of -1% for the country as a whole.

**Table 1.** Selected demographic trends in Poland and the surveyed units

	<b>Poland</b>	<b>S</b>	<b>G</b>	<b>W</b>	<b>JK</b>	<b>Ko</b>	<b>Kr</b>
Population growth rate	-1%	<b>76%</b>	36%	24%	17%	17%	15%
Children aged 0-14 growth rate	0,4%	<b>123%</b>	41%	15%	26%	15%	19%
Working age population growth rate	-9%	58%	28%	22%	10%	12%	11%
Natural increase	-37 889	85	52	67	43	22	27
Older age dependency ratio	28,2	15,1	19,1	17,7	19,2	23,6	21,6
Net migration per 1000 population	-0,1	<b>52</b>	28,1	16,9	14,2	15	11,8

*Source:* Own study based on SP data

Significant increases in the number of population aged 0-14 (up to 123%) and in the working age population were also observed. This is due to the fact that young families with children tend to move to the suburban zone (Żróbek-Różańska and Zysk, 2015), and this tendency appears to be in the development stage, as evidenced by the high natural increase (well above the result for the whole country) and the low level of the old-age dependency ratio. In addition to the natural growth, the status and age of the population is influenced by the migration attractiveness, which is reflected in the high value of the migration balance in the studied units (the average for Poland was -0.1).

The dynamic population growth causes the need for quick adjustment of the implementation of local authorities' own duties, including the infrastructure measures for environmental protection. An analysis of the spatial diversification of the infrastructure measures conducive to environmental protection in selected units (Table 2) showed that Krasne (with the lowest population growth and migration balance) has the highest level of infrastructure measures conducive to environmental protection (Class 1). Stawiguda (with the highest population growth and migration balance), similarly to Głusk (second in the ranking of population growth and migration balance), will have to reckon with the need to increase investment in infrastructure serving environmental protection (Class 3).

One of the most significant anthropogenic threats to the natural environment, both on a global, regional and local scale, is water pollution. Effective protection of water resources and economical water supply depends to a large extent on the condition of

the technical infrastructure related to sewage disposal and treatment, as well as waste management.

**Table 2.** The value of Hellwig's synthetic development index and the division into classes of the degree of advancement of infrastructural measures for environmental protection

	<b>S</b>	<b>G</b>	<b>W</b>	<b>JK</b>	<b>Ko</b>	<b>Kr</b>
The value of Hellwig's synthetic development index in 2010	0,39	0,26	0,56	0,33	0,13	0,75
Class in 2010	3	3	2	3	<b>4</b>	<b>1</b>
The value of Hellwig's synthetic development index in 2020	0,37	0,38	0,43	0,33	0,14	0,82
Class in 2020	3	3	2	3	<b>4</b>	<b>1</b>

**Source:** Own study based on SP data.

Septic tanks pose the greatest threat to surface water and, in the case of large concentrations of rural development, also to the first groundwater table. This is due to the fact that they usually do not maintain required tightness and wastewater from majority of septic tanks is not discharged to treatment plants. As can be seen from data presented in Table 3, the problem related to the use of septic tanks by inhabitants concerns mainly Stawiguda (where the number of septic tanks increased threefold), Konopnica (where a significant upward trend was also observed) and Głusk, where the increase in the number of septic tanks was not significant, but the number of no-outflow tanks is high.

It should be noted that with the exception of Konopnica, the proportion of the population using the water supply network oscillated around 80-100%, which means that local authorities must reckon with outlays necessary to modernize and maintain the capacity of the water supply network. At the same time, the length of the sewage network in relation to the length of the water supply network shows that apart from Krasne and Stawiguda, in the remaining units outlays connected with the development of the sewage network will be necessary.

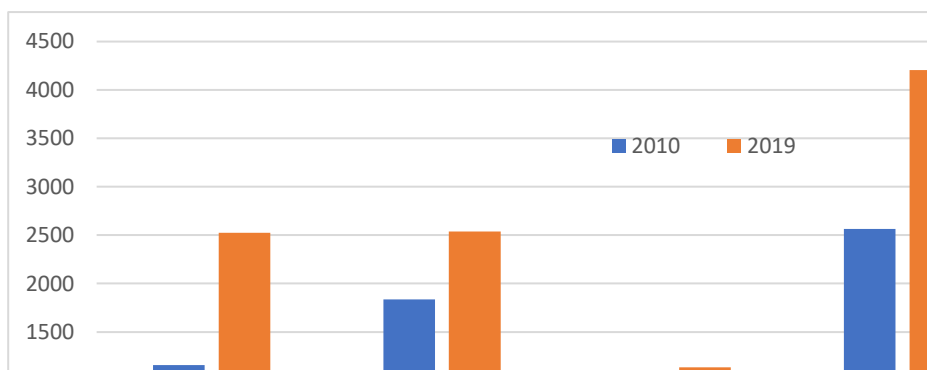
In all the studied units there was an increase in the production of mixed waste by households, the highest in Głusk (about 18 times), the lowest in Juchnowiec Kościelny (about 1.5 times). This means that all local authorities must budget for the increased costs of collecting, storing and disposing of mixed waste. Another aspect is the need to provide conditions for fulfilling the obligation of schooling and learning and the right to pre-school education for a dynamically growing group of children. This dynamics is well illustrated in Figure 3, which presents a comparison of the number of children aged 3-6 covered by pre-school education in the studied FUA in 2010 and 2019. The increase in the number of children for whom local authorities are obliged to ensure a place in kindergarten in the examined units was very high, and in Stawiguda it exceeded the value of 200%. The increase in the number of pupils attending obligatory primary schools was also high (Table 4).

**Table 3.** Selected data related to the state and protection of the environment (km2, %)

	<b>S</b>	<b>G</b>	<b>W</b>	<b>JK</b>	<b>Ko</b>	<b>Kr</b>
Septic tanks number 2010/2019	115/ 366	1771/ 1779	697/ 602	1150/ 506	2282/ 3144	505/ 243
Length of the active sewage system per 100 km2 2010/2020	57/ 63	0/ 135	105/ 120	55/ 81	10/ 62	262/ 334
Share of population using the sewerage network [%] 2010/2019	80/ 96	0/ 30	37/ 43	55/ 68	3/ 16	72/ 92
Length of the water supply system per 100 km2 2010/2020	75/ 65	232/ 370	200/ 215	94/ 116	129/ 146	246/ 301
Share of population using the water supply network [%] 2010/2019	86/ 100	94/ 97	88/ 100	91/ 93	47/ 52	80/ 93
Length of the sewage system in relation to the length of the water supply system [%] 2010/2020	75/ 81	0/ 36	52/ 56	52/ 69	8/ 42	106/ 107
Mixed waste from households per inhabitant/year [%] 2010/2020	103/ 186	7/ 128	39/ 154	168/ 254	42/ 115	92/ 170

*Source:* Own study based on SP data.

**Figure 3.** Number of children aged 3-6 in preschool in 2010 and 2019



*Source:* Own study based on SP data.

**Table 4.** Increases in the number of children with the right or obligation to educate in Poland and surveyed units (%)

	<b>Poland</b>	<b>S</b>	<b>G</b>	<b>W</b>	<b>JK</b>	<b>Ko</b>	<b>Kr</b>
Increase in the number of children in pre-school education	21%	<b>236%</b>	<b>146%</b>	90%	<b>110%</b>	<b>154%</b>	56%



Increase in the number of children in primary school education	40%	<b>135%</b>	81%	46%	70%	70%	52%
Increase in the number of teachers' positions	55%	<b>123%</b>	78%	70%	<b>94%</b>	84%	67%

*Source: Own study based on SP data.*

The increase in the number of pre-school and school-age children means that local authorities are obliged to create additional departments and hire new teachers. In the examined units, the number of teachers' posts has doubled over the last 10 years. At the same time, in a situation when the accommodation base is fully used, the growing number of children requires investments consisting in construction of new school and kindergarten facilities, which are costly and must be provided for in the local budget, e.g. extension of a primary school in Stawiguda is planned to cost around 1 million euro.

#### 4. Conclusions

The spill-over of urban functions, including housing, into nearby rural areas is a phenomenon observed practically all over the world. This process means many new challenges to be faced by local authorities obliged to carry out tasks responding to the new needs of their inhabitants.

Many rural peri-urban areas all over the world are experiencing a dynamic increase in the number of inhabitants, who need, inter alia, water supply and also produce significant amounts of sewage and municipal waste, which have to be collected and disposed of. The provision of these services requires local authorities to secure and commit financial resources to the development of appropriate infrastructure so that the increased activity of the dynamically growing population does not lead to degradation of the natural environment.

The results of the study show that suburban areas are seemingly influenced mainly by people of a certain age. The majority of the new residents seems to be relatively young families with children. As a result, local authorities are obliged to increase the number of places in educational institutions, which means financing investment in the development of educational infrastructure as well as employing more teachers.

The findings are of practical importance. They confirm that local authorities need to constantly analyse current demographic trends, forecast future population levels and plan resources for investment to implement their own tasks in response to the changing needs of the community. The importance of forecasting the age structure of the population, which affects the need for investment in such spheres as education, is also presented.

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