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THE IMPACT OF THE APPLIED TYPOLOGY ON THE STATISTICAL PICTURE OF POPULATION AGEING IN URBAN AREAS IN POLAND – A COMPARATIVE ANALYSIS

Tomasz Klimanek[1], **Sylwia Filas-Przybył**[2]

ABSTRACT

The aim of the paper is to review and compare the processes of population ageing in Polish urban areas. The study presents a novel approach to the problem, because in addition to measuring this phenomenon according to the National Official Register of the Territorial Division of the Country (TERYT) classification, it also measures population ageing according to the classification for urban areas (LAU 2 units) – Degree of Urbanisation (DEGURBA). Several traditional demographic measures for population ageing were applied, such as the median age, parent support ratio, ageing index, elderly dependency ratio, share of people aged 65 and older, and total dependency ratio. Also, Chu's alternative measure of population ageing accompanied by a dynamic version of ageing index was computed. The values of these indicators for 2016 were compared with those for 2010. The authors carried out a more detailed analysis of the differences between the ageing of populations in urban areas according to the degree of urbanization (DEGURBA), and compared the outcome with the results of the TERYT-based measurement (the traditional administrative territorial division). The comparison of the outcomes of both the above-mentioned ways of measuring the phenomenon of population ageing showed discrepancies, namely the ageing process measured according to the DEGURBA typology proved to be less intensive than the same process assessed according to the TERYT typology. This indicates that there are differences between the statistical pictures of population ageing in urban areas depending on whether demographical and morfological aspects are taken into consideration or not.

Key words: TERYT classification, DEGURBA typology, urban statistics, urban ageing.

1. Introduction

One of the most important demographic problems encountered by every country in the world is population ageing. It is commonly defined as the increasing share of older persons in the population. According to *World Population*

[1] Statistical Office in Poznań, Poland. E-mail: t.klimanek@stat.gov.pl
[2] Statistical Office in Poznań, Poland. E-mail: s.filas@stat.gov.pl

Prospects: the 2017 Revision "the global population aged 60 years or over numbered 962 million in 2017, was more than twice as large as in 1980 when there were 382 million older persons worldwide. The number of older persons is expected to double again by 2050, when it is projected to reach nearly 2.1 billion". When one takes into account the rural-urban perspective it is worth pointing out that "the number of older persons is growing faster in urban areas than in rural areas. At the global level between 2000 and 2015, the number of people aged 60 years or over increased by 68% in urban areas, compared to a 25% increase in rural areas. As a result, older persons are increasingly concentrated in urban areas. In 2015, 58% of the world's people aged 60 years or over resided in urban areas, up from 51% in 2000. Those aged 80 years or over are even more." (United Nations, 2017).

According to *Population Projection 2014-2050* (GUS, 2014) the share of population aged 65 years and over in Poland will amount to 26.3% in urban areas in 2035 compared to 22% in rural areas. However, there will be a lot of regional variation in population ageing.

The urban perspective on different phenomena is of special importance for the Centre for Urban Statistics – a unit dealing with statistics related to cities, towns and urban areas in the Statistical Office in Poznań. It was established as part of the specialization strategy, implemented in Polish official statistics at the start of 2009. The main idea of the specialization strategy was to make each regional office responsible for conducting tasks for the whole country within specific fields. In other words, the regional offices were no longer limited to collecting data from a single province. Since its creation, the tasks of the Centre for Urban Statistics have focused on initiating surveys and formulating new methodological proposals for the statistical observation of cities and towns as well as conducting methodological studies aimed at delimiting and surveying areas that do not overlap with the country's administrative division.

One of the most up-to-date challenges for official statistics is to call for a more flexible approach to the perception of the city as an important spatial element, especially now that the shortcomings of spatial analyses based solely on units of administrative division (TERYT system) or statistical division (NUTS classification) can no longer be ignored. In this context, the grid concept (a network of grid squares, with a certain spatial resolution, e.g. 500x500 m, or 1x1 km) is especially relevant, making it possible to depart from the fixed administrative division and analyse phenomena both within urban structures (Dąbrowski et al., 2016; Filas-Przybył et al., 2016) and across administrative city borders – e.g. urban functional zones. For example, the 1x1 km grid network serves as the basis for the European classification of administrative units, which is used to determine the degree of urbanization – DEGURBA (Dijkstra and Poelman, 2014).

The purpose of the article is to compare the statistical picture of the ageing process of the urban population in Poland using two typologies. One of them is based on the definition of a town in the Act of 29 August 2003 on official names of localities and physiographic objects. The second typology used in this study is the European classification of administrative units based on the degree of urbanization – DEGURBA.

In the second part of the article both TERYT and DEGURBA classification were described in more detail. The definition of town/city used in the TERYT

classification and the description of DEGURSBA's densely, intermediate and thinly populated areas were introduced. The aim of the next part of the paper was to introduce, present formulas and to discuss some properties of population ageing measures used in the research. These were: median age, parent support ratio, ageing index, elderly dependency ratio, proportion of population aged 65 and over (% of total), total dependency ratio. Additionally, we computed Chu's alternative measure of population ageing (Nath and Islam, 2016) and dynamic version of ageing index proposed by Długosz (Długosz, 1998). The selection of these demographic measures was motivated partly by previous studies on this topic (GUS, 2015). The comparison of the statistical picture of population ageing from TERYT and DEGURBA perspective was presented in the fourth part of the paper. In order to track changes over time, the data for 2016 are compared with those for 2010 (assuming that in 2010 the DEGURBA classification was the same as in 2016), which, in both cases, come from the Local Data Bank maintained by Statistics Poland. Also, some discussion describing the significance of main findings in light of what was already known about the population ageing was provided at the end of this part of the paper. In the conclusions we included not only the main findings of the research but also possible directions of future works.

2. TERYT and DEGURBA typologies – comparison

Official statistics for cross-classification domains at different levels of territorial aggregation are calculated and presented in Poland on the basis of the TERYT register. It consists of four components: TERC – identifiers and names of territorial units, SIMC – identifiers and names of localities, BREC – statistical regions and enumeration areas, and NOBC – address details of streets, properties, buildings and dwellings. The TERC system contains identifiers and names of units that constitute the three-tier territorial division of the country: province, district, commune (municipality). The territorial code of every commune consists of 7 digits. The first two denote the province where the commune is located, the first four denote the district, while the last digit represents the commune type. Codes, commune types and their descriptions in the TERYT system are presented in detail on the Statistics Poland website https://bdl.stat.gov.pl/BDL/metadane/teryt/rodzaj.

In official statistics the town/city is defined as a unit of territorial division which has been granted town status by a municipal charter (cf. The Act on official names…, 2003 Article 2, Item 3). According to the regulation, this includes urban communes and towns in urban-rural communes. Analogically, rural communes and rural parts of urban-rural communes are classified as villages. However, spatial analyses based solely on the legal/administrative classification of territorial units in the TERYT register often result in a distorted picture of phenomena and processes taking place inside administrative units or between neighbouring units. What is needed, then, is an analytical approach based on the concept of 1x1 km grid and the DEGURBA classification.

DEGURBA – the European classification, based on the degree of urbanization, was first implemented in 1991 in order to characterize areas inhabited by respondents of official statistical surveys. This original DEGURBA typology distinguished between three kinds of areas: densely populated,

intermediate and thinly populated (Eurostat, 2011). Their definition was based on population size, population density and geographical contiguity of LAU2 units. However, even at that time it became obvious that the approach based on LAU2 units, whose area varied considerably across EU countries, leads to distorted results and limits the scope of comparative analyses between EU countries.

In 2010 Eurostat introduced a new regional typology, which originated from a method developed by OECD (Berezzi et al., 2011). The method was based on grid square cells of 1 km^2, which in combination with the results of another Urban Audit project, provided an opportunity to revise the definition, borders and number of cities according to the idea of a densely populated area used in the degree of urbanization classification.

The new typology of areas (Dijkstra and Poelman, 2014) based on their degree of urbanization introduces the following classification of LAU2 statistical units (the brackets on the left contain DEGURBA codes):

(1) densely populated area: (alternative name: city/large urban area)
   – at least 50% lives in high-density clusters;

(2) intermediate area (alternative name: towns and suburbs/small urban area)
   – less than 50% of the population lives in rural grid cells; and
   – less than 50% lives in high-density clusters;

(3) thinly populated area (alternative name: rural area):
   – more than 50% of the population lives in rural grid cells.

In the above, the following definitions are used:

- Rural grid cells: grid cells outside urban clusters.
- Urban clusters: clusters of contiguous grid cells of 1 km^2 with a density of at least 300 inhabitants per km^2 and a minimum population of 5000.
- High-density cluster: contiguous grid cells of 1 km^2 with a density of at least 1500 inhabitants per km^2 and a minimum population of 50000 (alternative names: urban centre or city centre).

Details of the methodology of establishing the DEGURBA typology can be found in the publications (Dijkstra and Poelman, 2014; Eurostat, 2011).

Application of DEGURBA classification requires an appropriate statistical and IT infrastructure to ensure regular updating of information for the delimitation of densely-populated, intermediate and thinly populated areas. It was assumed that information about changes in LAU borders would be updated annually (Eurostat, 2011). A more challenging problem is how to update the spatial distribution of the population. Censuses, which are the main source of data required for the DEGURBA classification, are conducted every 5 or 10 years. The choropleth maps below show the classification of LAUs (communes) according to the TERYT register and the DEGURBA typology.

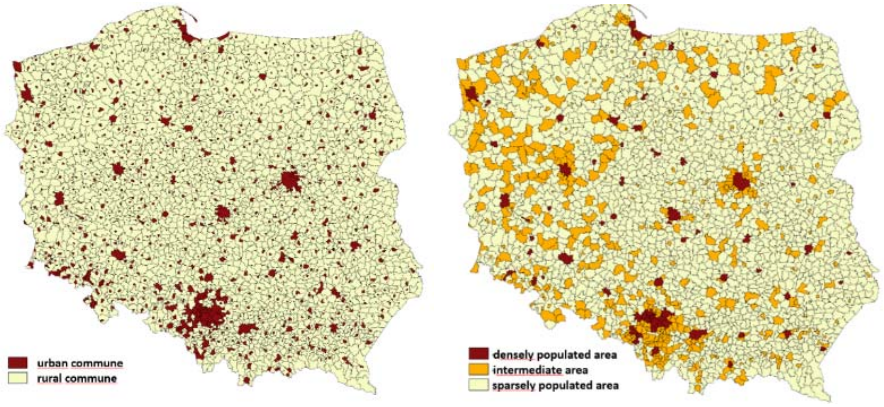

Figure 1. Classification of LAUs (communes) according to the TERYT register (left) and the DEGURBA typology based on data from Census 2011 (right)

A simple comparison of the number of towns according to the definition used in the TERYT register and the number of areas classified as urban according to the DEGURBA typology (densely populated and intermediate areas, codes 1 and 2, respectively) indicates significant discrepancies. There are 930 towns in the TERYT register, compared to only 601 urban units according to the DEGUBRA typology.

3. Population ageing measures

The problem of population ageing in Poland, its regional variation (Kurek, 2008, Stańczak and Szałtys, 2016; Podogrodzka 2016, Majdzińska, 2017), and the way it affects Polish towns (Kurek, 2008, Trzpiot and Ojrzyńska, 2014; Trzpiot and Szołtysek 2015; GUS, 2018) is becoming increasingly relevant in public awareness and discourse. The advancement in population ageing is measured by means of various indicators: either traditional ones, based on the threshold of population ageing and relations between basic age groups, or less common, alternative measures, which take into account changing mortality rates and life expectancy (Abramowska-Kmon, 2011).

In this study, the statistical picture of population ageing in Polish towns according to the TERYT and DEGURBA typologies was compared on the basis of median age and the following demographic measures:

1. Parent support ratio

$$PSR = \frac{L_{85+}}{L_{50-64}} * C \tag{1}$$

where:

PSR – parent suport ratio
L_{85+} – number of people aged 85 and over
L_{50-64} – number of people aged 50-64
C – constant (=100)

2. Ageing index

$$AI = \frac{L_{65+}}{L_{0-14}} * C \quad (2)$$

where:
AI – ageing index
L_{65+} – number of people aged 65 and over
L_{0-14} – number of people aged 0–14
C – constant (=100)

By 2045 *AI* is predicted to exceed 100 in all European countries, which will mean the elderly population will outnumber the youngest one (Kurek, 2008).

3. Elderly dependency ratio

$$EDR = \frac{L_{65+}}{L_{15-64}} * C \quad (3)$$

where:
EDR – elderly dependency ratio
L_{65+} – number of people aged 65 and over
L_{15-64} – number of people aged 15-64
C – constant (=100)

4. Proportion of elderly people

$$PEP = \frac{L_{65+}}{L} * C \quad (4)$$

where:
PEP – proportion of elderly people
L_{65+} – number of people aged 65 and over
L – total population
C – constant (=100)

According to UN data (Abramowska-Kmon, 2011), a population is considered young when the share of people aged 65 and over is below 4%. A population is classified as mature when this share ranges from 4% to 7%, and is regarded as old when it exceeds 7%[3].

5. Total dependency ratio

$$TDR = \frac{L_{0-14} + L_{65+}}{L_{15-64}} * C \quad (5)$$

where:
TDR – total dependency ratio
L_{0-14} – number of people aged 0-14
L_{65+} – number of people aged 65 and over
L_{15-64} – number of people aged 15-64
C – constant (=100)

[3] However, the UN scale seems to have now only historical meaning, as noted by Abramowska-Kmon.

6. Chu's indices based on general formula (Chu, 1997)

$$I_{\alpha}^{P}(G:z) = \frac{1}{(\omega-z)^{\alpha-1}} \int_{G(z)}^{1} [G^{-1}(p) - z]^{\alpha-1}\, dp \tag{6}$$

where:

$G(a)$ – cumulative distribution function for age *a*

$G^{-1}(p)$ – the age of population corresponding to cumulative probability *p* value

z – critical value of peak age, here z = 65

ω – upper limit of age distribution, here ω = 90

For $\alpha = 1$ we have the so-called conventional peak ageing index

$$I_{1}^{P}(G:z) = \int_{G(z)}^{1} dp \tag{7}$$

For $\alpha = 2$ we have the so-called aged gap ageing index

$$I_{2}^{P}(G:z) = \frac{1}{(\omega-z)} \int_{G(z)}^{1} [G^{-1}(p) - z]\, dp \tag{8}$$

And for $\alpha = 3$ we have the so-called age distribution sensitive ageing index

$$I_{3}^{P}(G:z) = \frac{1}{(\omega-z)^{2}} \int_{G(z)}^{1} [G^{-1}(p) - z]^{2}\, dp \tag{9}$$

If we have, for example, data in the form of 5-year age groups, the discrete case general formula is the following:

$$I_{\alpha}^{P}(G:z) = \frac{1}{(\omega-z)^{\alpha-1}} \sum_{j} \left(x_j - z\right)^{\alpha-1} p_j \tag{10}$$

where:

x_j – is the mid-point of *j-th* age group

z – critical value of peak age, here z = 65. Age groups are then 65–69, 70–74, 75–79, 80–84, 85+. For 85+ age group ω = 90 was taken arbitrarily as the upper bound.

From the above mentioned indices we will use only I_{2}^{P}. The aged gap ageing index is the weighted proportion of old with weights which are differences between the corresponding age of these old and the critical age z.

7. Długosz's dynamic version of ageing index (Długosz, 1998; Długosz 2003)

$$W_{SD} = [U(0-14)_{t} - U(0-14)_{t+n}] + [U(>65)_{t+n} - U(>65)_{t}] \tag{11}$$

where:

W_{SD} – ageing index

$U(0-14)_{t}$ – share of population aged 0–14 in 2010

$U(0-14)_{t+n}$ – share of population aged 0–14 in 2016

$U(>65)_{t}$ – share of population aged 65 and over in 2010

$U(>65)_{t+n}$ – share of population aged 65 and over in 2016

Długosz's dynamic version of ageing index indicates the differences in the percentage share of the youngest and the oldest group in the period studied. It could be useful for building the typology of population based on the mutual

relation between the changes in the share of population in the age groups of 0–14 and >65. There are eight theoretical types (A-H) of population ageing (for example type A denotes population becoming younger due to the domination of an increase in the share of population aged 0–14 over the increase in the share of population aged>65, while type H denotes population ageing due to the domination of the increase in the share of population aged >65 over the increase in the share of population aged 0–14).

4. Statistical picture of population ageing in Polish towns – regional comparison and discussion

The impact of the typology used (TERYT vs DEGURBA) on the statistical picture of population ageing in Polish towns was evaluated taking into account the following assumptions:

- as regards the TERYT classification, the analysis included urban communes and towns in urban-rural communes (TERYT code = 1 or 4);
- as regards the DEGURBA classification, the analysis included urban areas (communes) characterized as densely populated or intermediate areas (DEGURBA code = 1 or 2);
- the selected territorial units (towns according to TERYT, urban areas according to DEGURBA) were characterized in terms of median age and selected measures of population ageing (parent support ratio, ageing index, elderly dependency ratio, proportion of elderly people, total dependency ratio, Chu's measure of population ageing and dynamic version of ageing index);
- analysis was based on official statistics from the Local Data Bank maintained by Statistics Poland;
- the analysis of population ageing was conducted for 2010 and 2016;
- the same DEGURBA typology was used for both reference years based on population counts established in the last census (NSP 2011) and LAUs updated in 2016.

Table 1. Classification of communes according to TERYT and DEGURBA in 2016

	Urban commune	Rural commune	Urban-rural commune	Total
Densely populated area	74	0	0	74
Intermediate area	207	84	236	527
Thinly populated area	22	1475	380	1877
Total	303	1559	616	2478

Source: Own elaboration.

According to the TERYT classification, there were 919 towns out of a total of 2478 communes, 303 of which were urban communes, while 616 were towns located in urban-rural communes. The number of urban areas according to the DEGURBA classification amounted to 601 (74 LAU2 were classified as densely populated areas and 527 were classified as intermediate areas).

Table 2. Comparison of population ageing measures in towns and urban areas for 2010 and 2016

Demographic measure	YEAR			
	2010		2016	
	Urban areas (DEGURBA)	Towns (TERYT)	Urban areas (DEGURBA)	Towns (TERYT)
Median age	39.0	39.3	41.1	41.5
PSR – formula (1)	5.8	5.7	9.4	9.4
AI – formula (2)	97.0	100.4	120.3	125.7
EDR – formula (3)	19.1	19.3	25.5	26.1
PEP – formula (4)	13.8	13.9	17.4	17.8
TDR – formula (5)	38.8	38.5	46.7	46.9
I_2^P – formula (10)	0.049	0.050	0.059	0.060
W_{SD} – formula (11)	x	x	0.033	0.036

Source: Own elaboration.

Between the two reference years all measures of demographic ageing increased. This is true for urban areas defined according to the DEGURBA classification and for towns listed in the TERYT register. In 2016 half of the population living in urban areas was older than 39 years. The change in median age reflected by the index calculated in reference to the base year 2010 was 105.4 and was lower compared to that for towns in the TERYT register, where median age in 2016 was equal to 41.5 years, which is over 2 years more than in 2010.

Parent support ratios for both reference years, regardless of the classification, are below 10%. This means that the generation of parents (people aged 85 and over), which requires direct support and care, accounted for less than 10% of the subsequent generation of “children” (people aged 50-64). In this case, the values of the *PSR* measure for urban areas are almost the same as for towns. One particularly worrying trend is the intensity of change in the *PSR* indicator, which is the highest of all measures of population ageing presented. In 2016 *PSR* for urban areas increased by 62% relative to 2010, in the case of towns, the increase was even higher – as much as 65%.

The ageing index also underwent significant changes: 24% in the case of urban areas and 25% in the case of towns. Moreover, between the 2 reference years the indicator exceeded the level of 100, which means that both in urban

areas and in towns, the population aged 65 and over outnumbered the youngest age group (0–14 years).

The second most dynamically growing measure of population ageing was the elderly dependency ratio, which in the case of urban areas rose by 33.5% between 2010 and 2016 and by 35.2% in the case of towns. This means the growing burden of supporting the post-working age population by people of the working age.

The proportion of elderly people in 2010 already amounted to the level of almost 14%, only to sky rocket in 2016 to 17.4% in urban areas and 17.8% in towns. In terms of the terminology adopted by the UN, this means that the urban population in Poland in 2010 could already be classified as old (above the threshold of 7%).

Despite an increase of more than 20% in over the reference period, the total dependency ratio in towns was more or less similar for both classifications and in 2016 was equal to 46.7 and 46.9 for urban areas and towns respectively. Interestingly, in 2010 it was slightly lower in towns (38.5 compared to 38.8 in urban areas).

Chu's alternative measure of ageing – the aged gap ageing index – also increased significantly between 2016 and 2010. Defined as a normalized sum of the proportion of old groups in the population (over 65), its dynamics (20% between 2010 and 2016) shows a significant increase of old groups in the population. It is also a quite worrying trend as far as the intensity of change is concerned.

The values of the dynamic version of the ageing index for both TERYT and DEGURBA classification are similar. They indicate that the process of ageing in Polish towns could be synthetically described as representing type H, i.e. population ageing due to the domination of the increase in the share of population aged >65 over the increase in the share of population aged 0–14.

Table 3. Measures of population ageing in urban areas by commune type in 2016

	Urban areas in total (DEGURBA)	Urban communes (densely populated areas)	Urban-rural communes (intermediate areas)	Rural communes (intermediate areas)
Median age	41.1	41.8	39.8	38.5
PSR – formula (1)	9.4	10.6	7.9	7.7
AI – formula (2)	120.3	133.9	99.3	78.4
EDR – formula (3)	25.5	27.5	22.1	19.5
PEP – formula (4)	17.4	18.6	15.3	13.5
TDR – formula (5)	46.7	48.1	44.3	44.3
I_2^P – formula (10)	0.059	0.064	0.050	0.045
W_{SD} – formula (11)	0.033	0.031	0.036	0.021

Source: Own elaboration.

The results presented in the tables above clearly indicate how strongly the levels of population ageing measures in urban areas are affected by the inclusion of areas with intermediate population density according to the DEGURBA classification. The median age, which in densely populated areas amounted to 41.8 years, was lower by 2 years in urban-rural areas classified as intermediate, and in the case of rural communes classified as intermediate areas, was lower by as much as 3.3 years. In many cases these are the communes which have been experiencing an intensive influx of migration for permanent residence from neighbouring big cities. These migration flows consist mainly of young families with small children, who could expect to buy a flat at much lower prices in nearby communes surrounding the big city than in the city itself. This is particularly evident in the case of the other measures shown in the table above. The parent support ratio, equal to 10.4 in densely populated areas, did not exceed 8 in areas with intermediate population density. This difference is particularly large in the case of the ageing index, which is over 130 in densely populated areas but as low as 78.4 in rural areas classified as intermediate. Similar relations can be observed in the case of the elderly dependency ratio, the proportion of elderly population, the total dependency ratio, Chu's ageing index and the dynamic version of the ageing index.

The ageing process shows high regional differentiation. Below are presented the choropleths for selected measures of population ageing in Polish towns on the level of NUTS2 (provinces). The arrangement of the maps for every presented measure of population ageing (the choice of the median, parent support ratio and Chu's ageing index is due to the limitation of space in the paper) is as follows: first, regional differentiation of the selected measure of population ageing in Polish towns is compared between the general TERYT and DEGURBA approach and also for 2010 and 2016. Then, DEGURBA approach is analysed in more detail by presenting separate choropleths for urban areas from the perspective of different commune types (DEGURBA code 1, DEGURBA code 2 for urban-rural communes, DEGURBA code 2 for rural communes). This arrangement also includes a comparison of spatial distribution for 2010 and 2016.

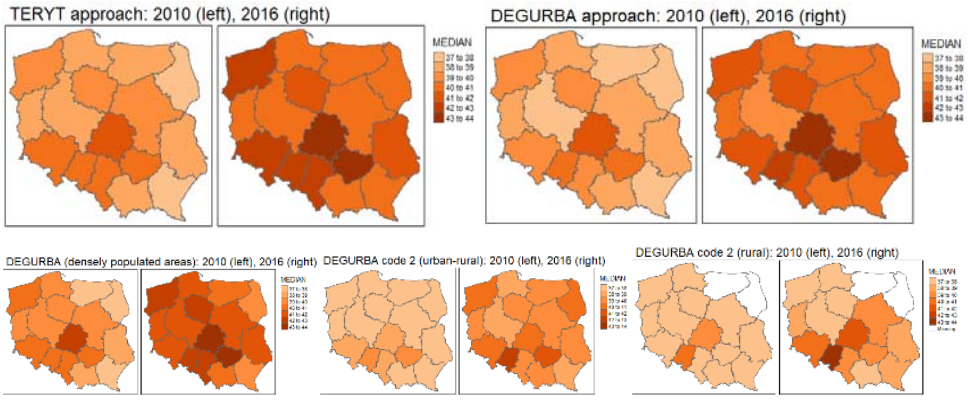

Figure 2. Median age of population in Polish towns according to TERYT and DEGURBA typologies

Source: Own work.

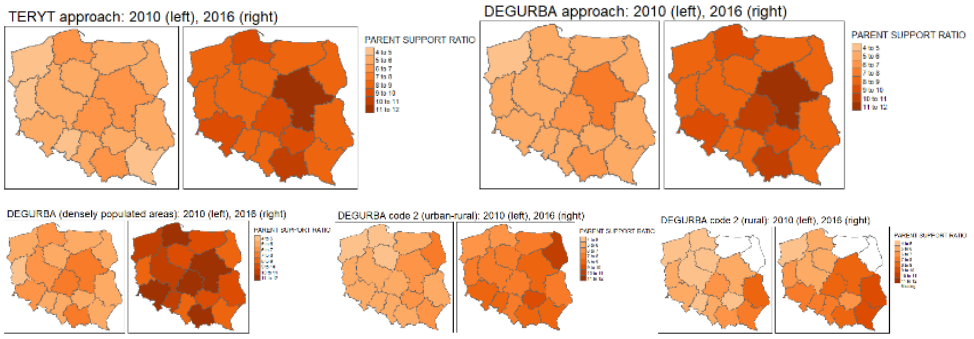

Figure 3. Parent support ratio of population in Polish towns according to TERYT and DEGURBA typologies

Source: Own work.

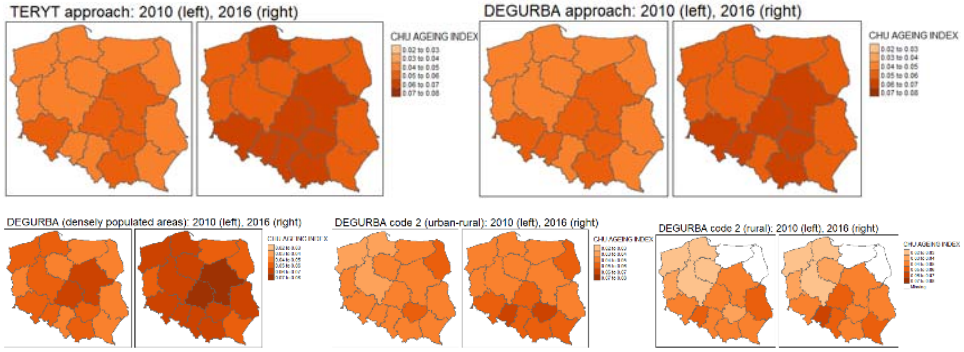

Figure 4. Chu's ageing index of population in Polish towns according to TERYT and DEGURBA typologies

Source: Own work.

The results presented in the choropleths given above (Figure 2 - Figure 4) exhibit a number of patterns. First, there is quite a significant spatial differentiation in the value of calculated demographic ageing indicators for the urban population. The cities of the central and southern provinces of Poland are the most affected by demographic ageing. In the case of the median age, high values in 2016 were observed for the urban population in Zachodniopomorskie province. Secondly, we can clearly see the acceleration of the demographic ageing process, especially in the oldest age groups between 2010 and 2016, which is reflected primarily by a huge increase in parent support ratio and Chu's index. The decomposition of urban areas according to the DEGURBA classification shows that densely populated areas (DEGURBA code = 1) are most severely affected by

demographic ageing. These processes also dynamically occur in urban areas, which are made up of urban-rural and rural communes, but their intensity is significantly lower.

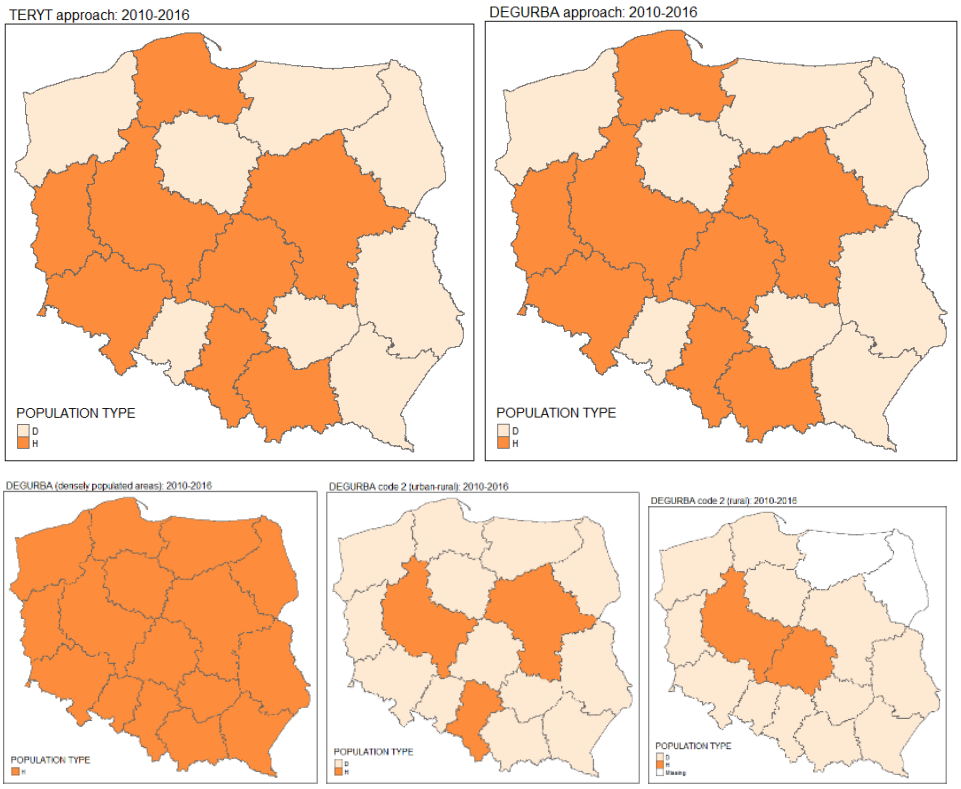

Figure 5. Population types according to Długosz's dynamic version of the ageing index

Source: Own work.

It is also worth referring to the types of population that can be obtained using Długosz's dynamic index of ageing. It turns out that regardless of whether we use the TERYT classification or the DEGURBA classification, in the period 2010-2016, the population living in cities/urban areas for a given province is of type D, i.e. the population is getting younger owing to the fact that the decrease in the share of the population aged >65 is greater than the decline in the percentage of the population aged 0-14 or of type H, i.e. population ageing is due to the increase in the population aged 0-14 (the same membership in both classifications). In the case of densely populated areas there is always an H-type population, for urban areas which are formed by urban-rural communes in three provinces, there is a H-type population (Wielkopolskie, Śląskie and Mazowieckie provinces), with respect to the rest, we are dealing with a population of type D.

In the case of rural communes in two provinces, we have an H-type population (Wielkopolskie and Łódź provinces); as regards the rest, we have a population of type D.

One of the first comparisons of the two classifications was conducted in Poland by Filas-Przybył (2012), who analysed such characteristics as province area per one town/urban area, area of towns/urban areas per one town/urban area, urban population per one town/urban area, the share of urban population in the total population of the province. The study revealed that the largest number of towns according to the TERYT classification can be found in Wielkopolskie province (109); according to the DEGURBA typology, Śląskie province is the most urbanized region of the country (92 urban units). The biggest urban density was found to exist in Śląskie province, where the proportional share of the province area per one town was equal to 173.7 km^2 (TERYT) and 134.1 km^2 (DEGURBA). It turned out that regardless of the classification used, Śląskie province was also the most urbanized province. This was reflected by the size of an average town both in terms of area and population, which was almost twice as big as the average town size in Poland (TERYT). However, according to the DEGURBA typology, the largest average town in terms of size was found in Wielkopolskie province, while in terms of population – in Zachodniopomorskie province. Regardless of the classification, the smallest average town in terms of area, which was a third of the size of the average town in Poland according to the DEGURBA typology, was found in Warmińsko-Mazurskie province.

In the light of current research on the ageing of the urban population, taking into account the territorial aspect and the results presented in this paper, it seems that the way of looking at the towns/urban areas presented in this article should be developed. On the one hand, we have an approach where urbanity essentially determines only the formal status, on the other hand, we have the DEGURBA classification, coming from population density and the fact of population clustering (kilometre grid clusters), which certainly better reflects urbanization processes than the legal acts or administrative decisions assigning the formal city status.

5. Conclusions

The article provides a comparison of the statistical picture of the ageing process of the urban population of Polish towns according to two typologies – TERYT and DEGURBA – based on selected measures of population ageing for 2010 and 2016. In 2016 all these measures in urban areas identified according to the DEGURBA classification were found to be in general slightly lower than those obtained for the population of towns listed in the TERYT register. This represents a less advanced stage of population ageing in urban areas delimited not on the basis of legal or administrative city/town status but based on a more objective criterion of the degree of urbanization. Such findings, among other things, are the result of the inclusion of some rural communes in areas classified as urban according to the DEGUBRA typology. It is worth noting that in recent years these communes have experienced an intensive influx of migration for permanent residence from nearby big cities. Moreover, these migration flows consist mainly of young families with small children, who decide to move out of flats rented in big cities or shared with their parents. These migration flows have a considerable

influence of relations between basic age groups that are the basis for calculating classical measures of population ageing. To a certain degree, the same can be true in the case of urban-rural communes classified as urban areas according to DEGURBA. Of the 616 communes of this type, 236 were classified as urban areas, while the remaining 380 – as thinly populated areas.

It should also be noted that the traditional typology of towns according to the TERYT register makes it more difficult to conduct an in-depth and multidimensional analysis and evaluation of socio-economic phenomena that take place in space. It is therefore recommended that this traditional typology should be complemented by the approach described in this article, which is based on the 1x1 km grid and the DEGURBA classification, making it possible to increase the scope and depth of analysis, also as regards population ageing processes (see Table 4). Given the dynamic changes currently taking place in the demographic structure, it is necessary to apply increasingly sophisticated analytical methods, which rely on a modern statistical infrastructure supported by spatial (geocoded) statistics.

Table 4. Selected aspects of applying TERYT and DEGURBA classifications for the analysis of different phenomena

Aspect	TERYT	DEGURBA	Both TERYT and DEGURBA
Urbanity conceptualisation	Only formal	Selected demographic (population size) and morphological (population density) aspects	Complex formal, demographic and morphological aspects
Possibility of decomposition	Into urban, urban – rural and rural communes, by town size	Into densely populated areas, intermediate areas, thinly populated areas	Multidimensional analysis (by TERYT communes' categories, town size, DEGURBA codes)
Relevance for units facing demographic changes of high dynamics	Poor	Better	Better
Quality of statistical information infrastructure needed	Low	High	High

Source: Own work.

Obviously, the comparative analysis of the impact of the typology used for the statistical picture of population ageing described in this article includes certain limitations and simplifications. It seems, however, that the results are promising and indicate directions for future research, including the extension of the scope of

such studies to take into account how the migration of young generation for permanent residence affects the measures of population ageing, and the application of methods of multivariate statistics for identifying similar patterns of population ageing in towns.

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