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Original article

The suburbanisation process in a depopulation context in the Katowice conurbation, Poland

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ABSTRACT

The Katowice conurbation is an example of a typical old industrial region in Central and Eastern Europe, whose socio-economic transformation, initiated after 1990, has led to spatial and functional changes. The aim of this article is to present the suburbanisation process in the Katowice conurbation based on demographic changes and an analysis of migration flow. This process has been taking place in the area since the 2000s and takes on the shape of a multi-centre development of newly created individual and developed housing zones (both in the core and in the suburban area of the conurbation). Since 1990, the cities of the Katowice conurbation have been undergoing a process of shrinking. This process is manifested in the decline in number of urban residents in the years 1991–2016, amounting to 366 thousand people. Moreover, the cities face numerous social, economic and spatial problems. Since 1995, simultaneous with the shrinking of the cities of the Katowice conurbation, there has been an increase in the number of inhabitants in its suburban areas (since 2004, the trend has continued to be positive). Population increases have also been recorded in some inner-city zones of the conurbation. The suburbanisation process in the outer zone of the conurbation includes, in particular, the communes located north and south of the cities constituting its core, including the communes of Ożarowice, Psary, Mierzęcice in the north and Mikołów, Orzesze, Wyry in the south-west. On the other hand, the areas of intense inner-city construction development, located in the areas of the Katowice conurbation core, which are attractive in terms of environment and transportation, are undergoing so-called, "internal suburbanisation".

KEY WORDS: population change, depopulation, population migration, suburbanisation, Katowice conurbation, Poland

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1. Introduction

The political and economic transformation, which began in Poland in 1989, has led to significant changes in urban and rural areas as well as in the social attitudes of their inhabitants. An increase in wealth and the level of education in society was significantly associated with a desire to improve the quality of life. It referred to the population of cities, in which a trail of 19th and 20th century industrialization and urbanization was noticeable. Some of the housing stock has been modernized, which still makes it competitive, both in terms of price and transport accessibility, compared to the newly built developments. However, despite the modernization of housing and the revitalization of post-industrial areas of the cities, the outflow of people, especially from industrial and post-industrial cities, is recorded, including cities in the core of the Katowice conurbation. Many residents of this conurbation, who wished to improve their financial situation, emigrated to other, more attractive urban centres of Poland and abroad (see SITEK ET AL., 2013: 73). This applies primarily to young people of a mobile age, whereas people who found a good job, started a family and those who had already reached retirement age, mostly remained in their current place of residence or its close vicinity. Based on the observed construction work carried out in the cities of the Katowice conurbation and generally available statistical data, it can be concluded that a certain part of

society, especially people aged 30–45, are fulfilling their dreams of owning a home with a garden in a quiet, green, suburban area.

The aim of the article is to describe the migration flow in the Katowice conurbation, in particular the migration of people to the suburban zone as well as to identify the onset of the suburbanisation process in the context of demographic transformation in the Katowice conurbation. The spatial scope of the research covers the area of the Katowice conurbation, divided into its core, internal and external zones. In the inner-city depiction, on the other hand, the focus was on analysis of change in the population distribution in the eastern part of the Katowice conurbation. The time frame of the research covers the years 1980–2016.

The rationale for the selection of the research area is the migration specificity of the Katowice conurbation population. Comparative analyses of population migration to suburban zones of large Polish cities clearly reveal that the suburbanisation process in the Katowice conurbation is characterized by a much lower intensity (RAŹNIAK, 2007; WINIARCZYK-RAŹNIAK & RAŹNIAK, 2012; KRZYSZTOFIK ET AL., 2017; GAŁKA & WARYCH-JURAS, 2018). This is a phenomenon in terms of urban agglomerations in Poland. The development of suburban zones has been taking place in the vicinity of all major Polish cities since the early 1990s.

The article aims to reveal that this process has also been taking place in the Katowice conurbation, and the redistribution of the population in this post-socialist, polycentric urban region takes on the character of suburbanisation, but it occurs with a time lag in relation to other cities and their suburban zones.

2. Literature review

The impact of intensive industrialization and urbanization of the Katowice conurbation between 1945–1989 on changes in population and population structure of cities, towns and villages of this region is reflected in the results of numerous research. SPÓRNA (2012) published a full bibliography on this topic. Some of the most important articles presenting demographic changes in the Katowice region in the years 1945–1990 include the works of RUNGE (1999) and SZAJNOWSKA-WYSOCKA (1989).

The restructuring of the Katowice region's economy, which began in the early 1990s, contributed to negative demographic changes in the area. Detailed characteristics of demographic changes in the cities and towns of the Katowice conurbation in the period of system and economic transformation, in particular the numbers and structure of the population of the Silesian voivodeship (and thus the Katowice conurbation) was presented in the works of RUNGE (1999), RUNGE (2010) and SITEK ET AL. (2013). Detailed causes and effects of demographic problems of the towns and cities of the Katowice conurbation are found in the works of KRZYSZTOFIK ET AL. (2011, 2012).

The intensity and direction of population migration in the region constitute important elements of demographic change in its area, affecting a number of its inhabitants. For the Katowice conurbation area, these studies were initiated by SZAJNOWSKA-WYSOCKA (1989 – synthesis) and RYKIEL (1980), and in the field of international migration, by RUNGE (1991). The period of the 1990s and 2000s brought further changes in the population of the Katowice conurbation and its spatial redistribution. They were thoroughly described respectively by: RUNGE (1998, 1999), SZAJNOWSKA-WYSOCKA (1999), RUNGE & KŁOSOWSKI (2000a, b).

As emphasized by RUNGE (2003: 24), in relation to the former Katowice voivodeship, a favourable migration inflow to its area ended in 1982, and in 1991, a post-war maximum population (4.01 million inhabitants) was registered there, after which, a decline in the population began. These changes resulted from a decline in the number of births, emigration and the economic problems of the 1980s and 1990s.

In the context of settlement and population transformations in the Katowice conurbation and its surroundings in the early 2000s, the research on trends of migration changes continued, as a foundation for the study of suburbanisation processes in the Silesian voivodeship. Some of the first works include attempts to determine changes in the migration model in urban communes (RUNGE & KŁOSOWSKI, 2000) and rural communes (KŁOSOWSKI & RUNGE, 2002) of the newly established Silesian voivodeship. A continuation of this research was the analysis of migration in the cities and towns of this voivodship in the years 1977–2006 (KŁOSOWSKI & RUNGE, 2010b). The results of these studies did not provide an unambiguous answer to the question as to when the suburbanisation phase started in the suburban zone of the Katowice conurbation (mainly due to a diversified methodology and adopted generalizations). An extension of the above-mentioned research was a presentation of the diversification of net migration of the communes of the Silesian voivodeship for the years 1979–2008 by RUNGE (2010) (in the administrative division of 1999). The author proved that since the beginning of the 1990s, the migration trend in the village-city relationship

gradually reversed, in favour of an increase in population inflow to rural areas (1993).

An increased interest in population changes at the border of urban and rural areas of the Katowice conurbation was reflected in the works of DYSZY (2017), SPÓRNA ET AL. (2016) and KRZYSZTOFIK ET AL. (2017), whereas attempts to generalize demographic processes taking place in the Katowice conurbation after 1990 were undertaken by RUNGE ET AL. (2011a, 2014, 2015).

Studies of the suburbanisation process in the Katowice conurbation may be described as initial. This is mainly due to a time lag in the suburbanisation process, compared to other large agglomerations in Poland, in which this process had been taking place since the mid-1990s (KORCELLI, 1996; KOCHANOWSKA & KOCHANOWSKI, 1997; ŚLESZYŃSKI, 2006). One of the first articles on the suburbanisation process in the Katowice conurbation was the work on the location of new housing estates in 1990–2004 (PETRYSZYN & ZUZAŃSKA-ŻYŚKO, 2005). A continuation of these studies was the urban inventory of newly constructed housing areas (individual and developed) in the central part of Sosnowiec – which has the character of an inner-city suburbanisation zone (SPÓRNA & DRAGAN, 2013) or in Zabrze (KOMAN, 2017).

In recent years, there has been an increase in interest in the suburban zone of the Katowice conurbation. According to DYSZY (2017), the suburbanisation process in the zone surrounding the core of the Katowice conurbation initiated in the communes north of its core: Bobrowniki, Psary, Świerklaniec, and then in rural communes located south of the core (Chełm Śląski, Gierałtowice, Kobiór, Wyry). The research is summarized by the statement that "rural areas located in the vicinity of an urban complex, such as the Katowice conurbation, are subject to explicit suburbanisation processes" (DYSZY, 2017: 28). ZUZAŃSKA-ŻYŚKO ET AL. (2016) when analysing the net migration of communes surrounding the core of the Katowice conurbation, revealed that a vast majority of the rural communes are characterized by constant positive net migration (in 1995–2011).

The research results of KRZYSZTOFIK ET AL. (2017) are particularly interesting. They show that in the years 1999–2013, the suburban zone of the Katowice conurbation was the only one in Poland that recorded a population loss (-0.4%), and additionally experiencing a population loss at its core (-10.6%). The second major difference in comparison to other Polish agglomerations was the outflow of the population from the agglomeration core. In the case of the Katowice conurbation, the outflow from the core to the suburban zone accounted for only 11.3% of the total (data for 1995–2011), which indicates a relatively weak development of suburbanisation processes. These statements are crucial in the context of future migration research in the Katowice conurbation and its area as well as for comparative research with other agglomerations.

The above studies are complemented by research on migration flows in Silesia (SOJKA, 2007) and international migration of the Silesian voivodeship inhabitants (SOJKA, 2009). It was also extremely valuable to define migration links of middle-sized towns of the Katowice conurbation in the years 1999–2011 (RUNGE, 2015) and to make an attempt to determine the causes and directions of the migration of older people in the Silesian voivodeship (PYTEL & SZKUP, 2013; PYTEL, 2014).

In national terms, the process of population migration in metropolitan areas is relatively well researched. These studies have been undertaken by SZYMAŃSKA & BIEGAŃSKA (2011). NOWOTNIK (2012), WINIARCZYK-RAŹNIAK & RAŹNIAK (2012), or GAŁKA & WARYCH-JURAS (2018). In the above-mentioned works, net migration indicators reveal that in the early 2000s, the Katowice conurbation area, in comparison to other Polish agglomerations, was characterized by the lower intensity of migration processes in the suburban area. This process is consistent with the general depopulation trend of the Katowice conurbation, which began in the early 1990s (ŚLESZYŃSKI, 2006, 2016; ZBOROWSKI ET AL., 2012; SPÓRNA ET AL., 2016).

3. Study area

The study area comprises the largest urban complex in Poland – the Katowice conurbation (Fig. 1). Its genesis dates back to the nineteenth century and was based on a dynamic development of industry (mining, metallurgy) and the railway (HARTSHORNE, 1934; GWOSDZ, 2004). The development of the conurbation, including its socio-economic diversification, was also influenced by its border location and economic migrations. After 1945, when the whole area was located within the borders of the Polish state, it was subject to further industrialization and urbanization (SPÓRNA, 2012). On the other hand, political and economic changes initiated after 1989, contributed to significant changes in the spatial and functional structure of the cities, towns and suburban areas of the Katowice conurbation.

Currently, the Katowice conurbation constitutes one of the largest urban complexes in Central and Eastern Europe, with a distinct polycentric functional

and spatial structure. The economic structure of the Katowice conurbation has been subject to transformation since 1990, as manifested by the heterogeneity of the economic functions of the cities and towns of the region, defined as trans-industrialism (KRZYSZTOFIK ET AL., 2016).

The Katowice conurbation is located in southern Poland, within the most urbanized province of Silesia. Together with the Rybnik conurbation, the Bielsko-Biała and Częstochowa agglomerations, it forms an intertwined settlement structure (RUNGE ET AL., 2011b), which borders, in the south-west, the Ostrava-Karviná agglomeration in the Czech Republic.

The Katowice conurbation covers an area of 3329 km^2 with the size of the population amounting to 2.445 million people in 2016. It consists of 50 communes, including 30 urban communes, 3 urban-rural communes and 17 rural communes. According to the delimitation proposed by KRZYSZTOFIK (2007), the Katowice conurbation is divided into the core zone (16 urban communes), the inner zone (12 urban communes and one town, included in the urban-rural commune of Sośnicowice, and the external zone (21 communes and one rural area of the urban–rural commune of Sośnicowice). There are 33 cities and towns in the Katowice conurbation. The cities with a population exceeding 150,000 residents include: Katowice (298.1 thousand people), Sosnowiec (205.9 thousand people), Gliwice (182.2 thousand people), Zabrze (175.5 thousand people), and Bytom (169.6 thousand people). In general, the structure of the Katowice conurbation includes 9 cities of over 100,000 people (Fig. 1).

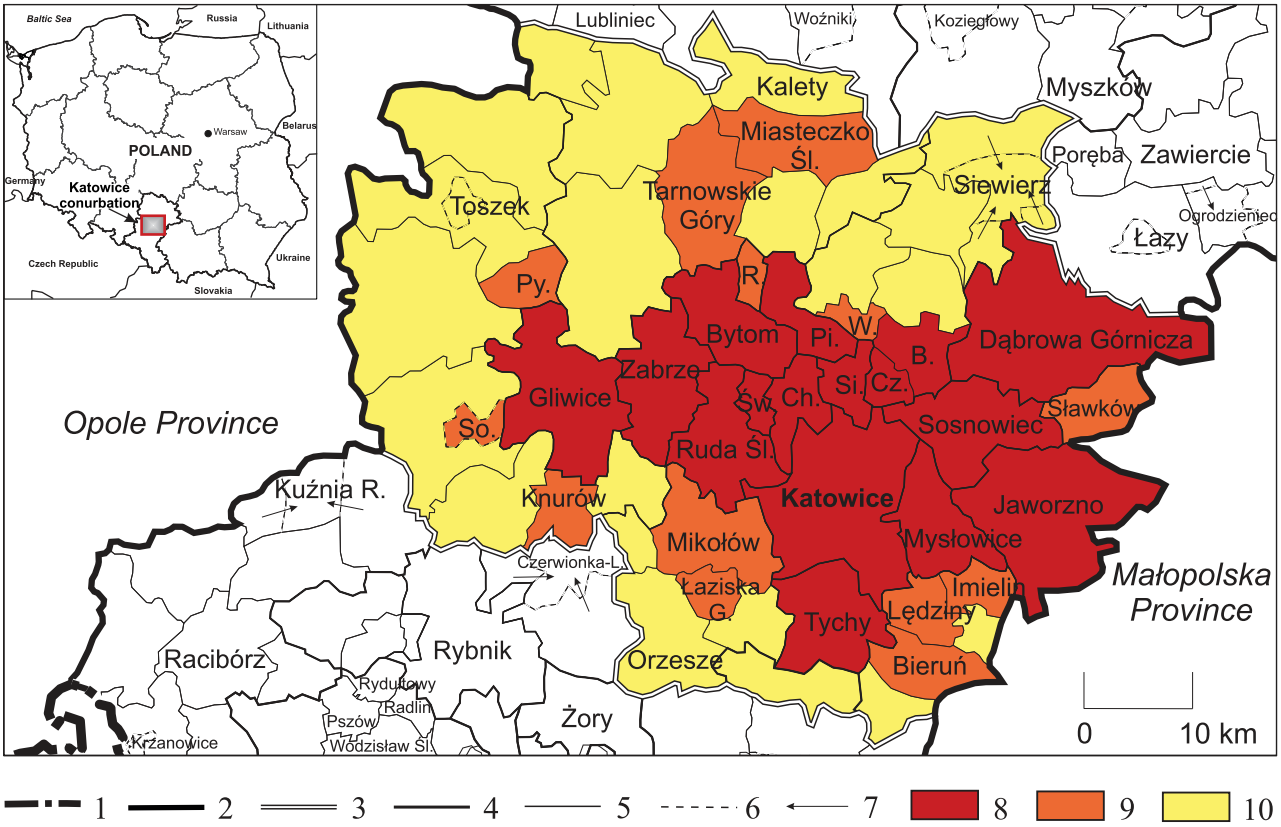


Fig. 1. The area of the Katowice conurbation, Poland (Source: own elaboration based on Krzysztofik, 2007;, Runge et al., 2011b; Spórna, 2012)

1 – boundary of Poland, 2 – province boundaries (NUTS 2), 3 – Katowice conurbation boundaries, 4 – poviat (NUTS 4), 5 – commune (gmina, NUTS 5), 6 – boundaries between city in urban-rural commune and rural area, 7 – rural area in urban-rural commune, 8 – core of conurbation, 9 – inner zone of conurbation, 10 – outer zone of conurbation; Normal text – city, B. – Będzin, Ch. – Chorzów, Cz. – Czeladź, Pi. – Piekary Śląskie, Py. – Pyskowice, R. – Radzionków, Si. – Siemianowice Śląskie, So. – Sośnicowice, Św. – Świętochłowice, W. – Wojkowice

4. Materials and methods

In order to implement the research aims, the authors used statistical data presenting the number and dynamics of the total population (source: LOCAL DATA BANK OF THE CENTRAL STATISTICAL OFFICE, STATISTICAL YEARBOOK FOR THE KATOWICE VOIVODESHIP) and unpublished data on the number of the population obtained from the PESEL database, data for 2004 and 2014 (Ministry of the Interior and Administration). This data was complemented with data on migration flows of the analysed

communes obtained from the Central Statistical Office and from the Demography Database portal (sheet "2g – Internal migrations of the population to a permanent residence, according to the communes of the previous and current place of residence").

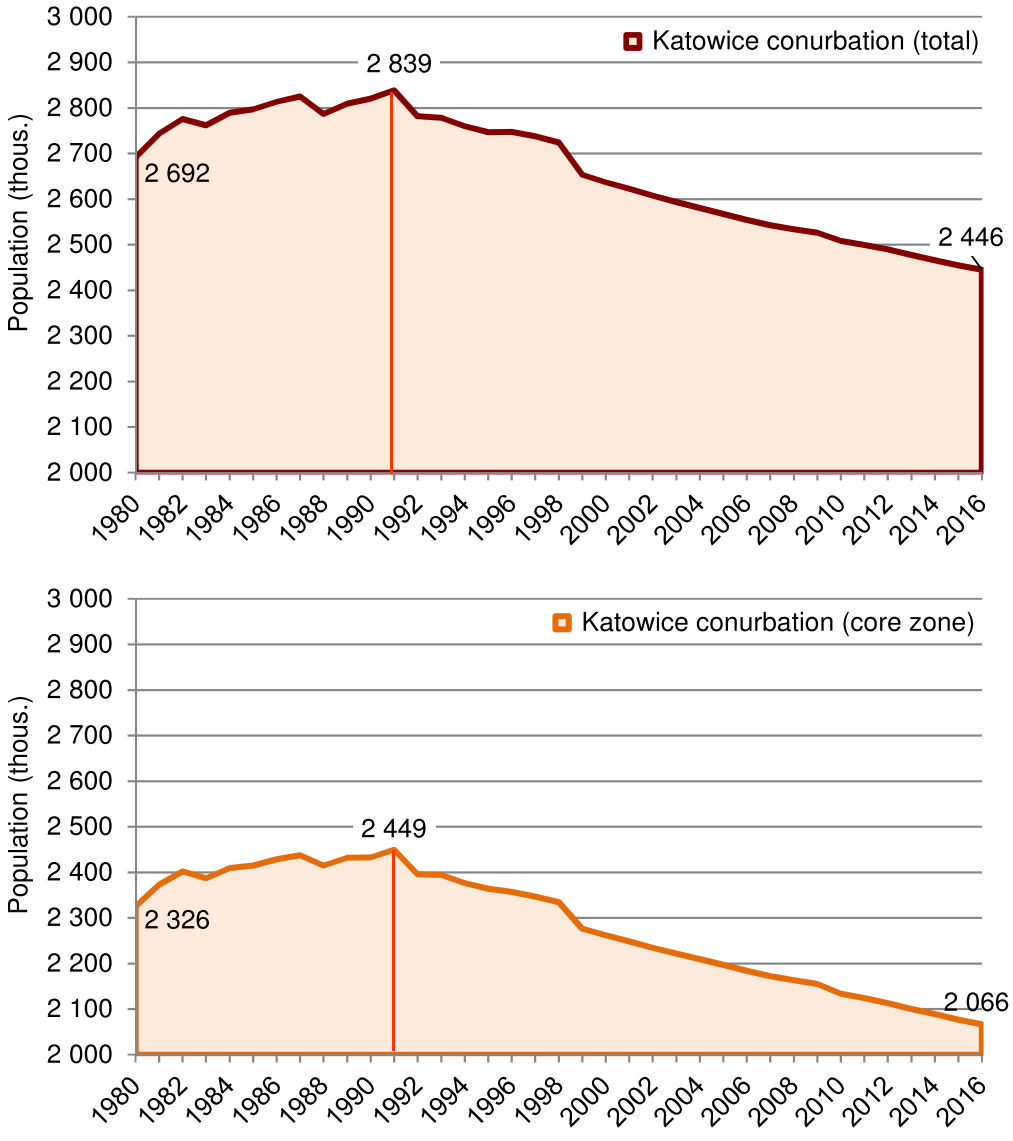
The work involved statistical and cartographic methods. In order to present demographic changes and changes in the migration flow in the adopted research periods, statistical measures for an index of dynamics, and absolute values were applied. The results obtained were presented in tabular and graphical form (the cartogram and cartodiagram method). Figures were prepared using GIS techniques with MapInfo Pro and Quantum GIS software (QGIS). Statistical data from the PESEL database, after its completion and complementation with the address database (geocoding process), was assigned to designated research fields (a regular hexagon with the area of 1 km^2) using the MMQGIS extension in the QGIS program.

5. Results

5.1. Population changes in the communes of the Katowice conurbation

Since 1991, the Katowice conurbation area has been subject to the process of depopulation. In fact, this has been recorded for the first time since the beginning of its rapid industrialization and urbanization in the nineteenth century and the continuation of this process in 1945–1989. The end of a favourable trend in the migration flow and in the natural flow from the cities of the Katowice conurbation resulted from the restructuring of industry, which was initiated in the early 1990s.

A decrease in the number of inhabitants of the Katowice conurbation in the years 1990–2016 amounted to nearly 375,000 people. It mainly concerned the cities of the core of the conurbation, which, in this period, experienced a loss in population of 366 thousand (Fig. 2).



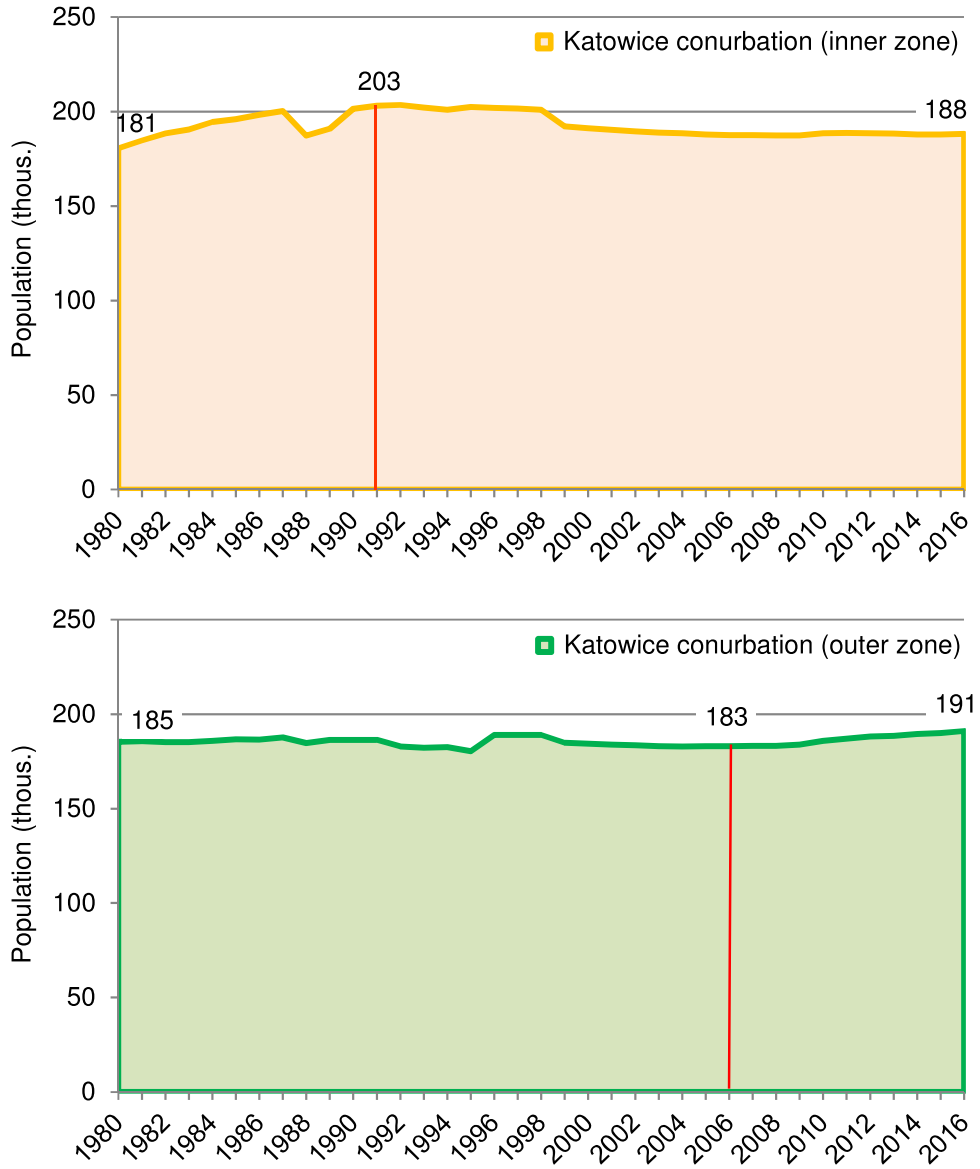


Fig. 2. Changes in the population of the Katowice conurbation (total), its core, inner and outer zones in the period 1980–2016 (Source: own elaboration based on Local Data Bank of the Central Statistical Office; Rocznik Statystyczny Województwa Katowickiego 1981,–1995, WUS, Katowice)

Until the mid-1990s, migration of the inhabitants of the core of the Katowice conurbation did not significantly contribute to an increase in the population of the suburban areas of the conurbation. A continuous population increase of the external zone of the Katowice conurbation has been recorded only since 2006; this increase, by 2016, amounted to only 8,000 people. A similar case resulted from the analysis of population changes in the areas of the Katowice conurbation which are exclusively rural – a steady increase in population from 2003, by 10.6 thousand people (Fig. 3). However, it should be borne in mind that rural areas of the Katowice conurbation have a fluctuating increase in population size. Their population changed from 164.5 thousand in 1991 to 177.7 thousand in 2016.

In addition to the natural decrease, the depopulation of the Katowice conurbation is affected by negative net migration. Its negative value, both for the entire conurbation as well as for the core cities, has been observed continuously since 1993 (3–10 thousand people per year). This is an extremely unfavourable situation, compared, for example, to 1980 and 1981, when the annual migration of core cities amounted to nearly +18 thousand people. Rural areas have experienced a positive net migration of up to 1.5 thousand people annually since 1995 (Fig. 4).

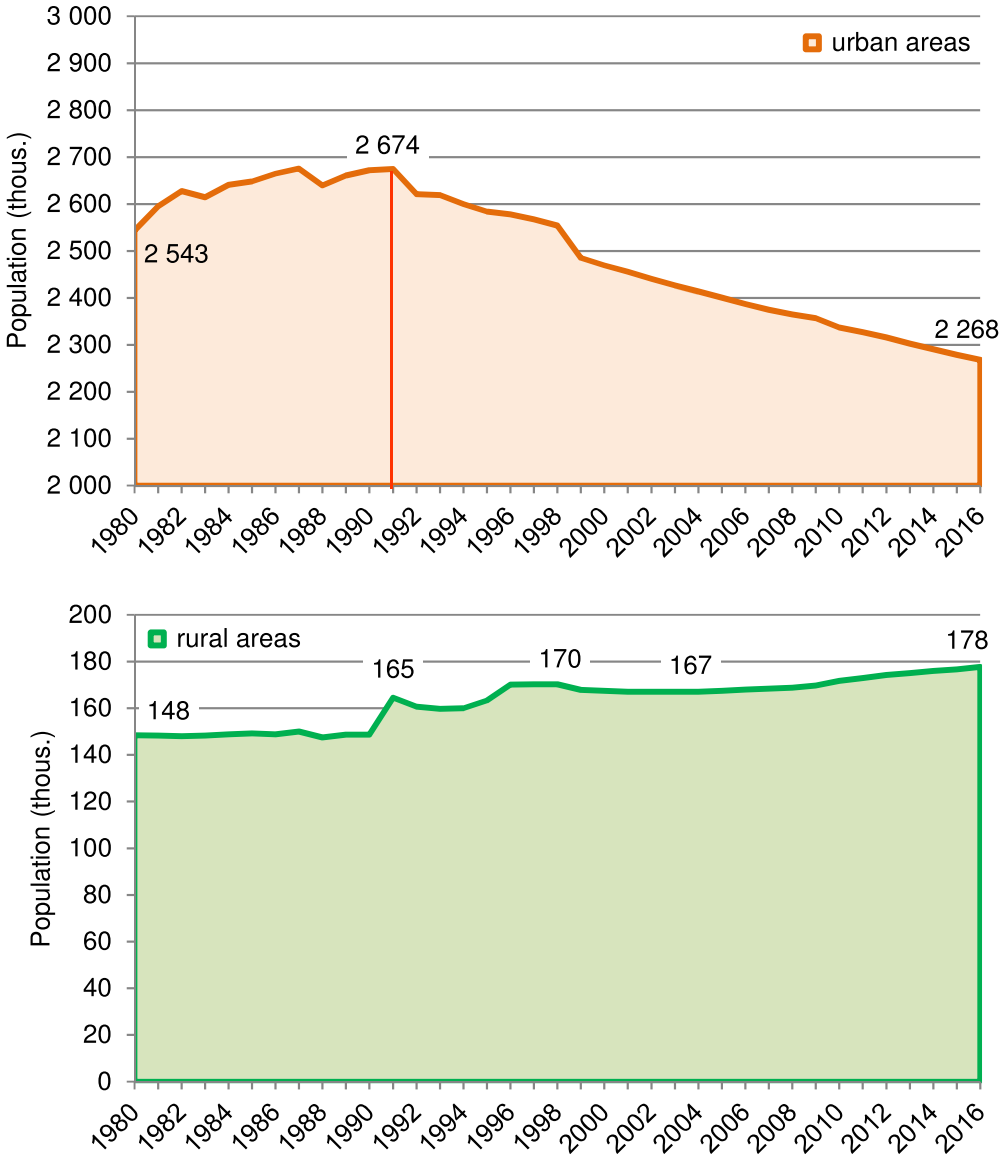


Fig. 3. Changes in the population of urban and rural areas of the Katowice conurbation, 1980–2016 (Source: own elaboration based on Local Data Bank of the Central Statistical Office; Rocznik Statystyczny Województwa Katowickiego 1981,–1995, WUS, Katowice)

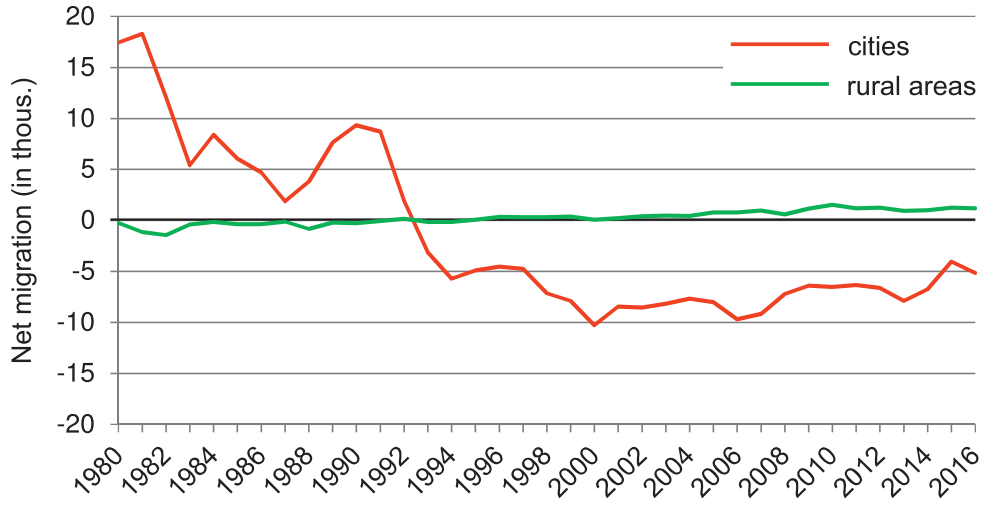


Fig. 4. Net migration for cities and rural areas of the Katowice conurbation, 1980–2016 (Source: own elaboration based on Local Data Bank of the Central Statistical Office; Rocznik Statystyczny Województwa Katowickiego 1981,–1995, WUS, Katowice)

When analysing changes in the population of the Katowice conurbation communes in the years 1980–2016, a change in the development trend of their population is clearly noticeable.

Until the end of the 1980s, most of the cities and towns of the Katowice conurbation (except for Chorzów, Dąbrowa Górnicza, Sławków and Bytom) saw an increase in population, in the case of Mysłowice and Tychy, amounting to 18 and 15%, respectively. A population decrease (up to 8%) was observed in rural communes, located north of the core of the conurbation (Fig. 5A).

The period of 1990–2000 brought about a deepening of negative demographic trends in the Katowice conurbation. A slight increase in the population (up to 2.8%) was recorded by only 7 communes outside the core of the Katowice conurbation (Fig. 5B).

When analysing demographic data for the years 2000–2016, it is clearly visible that in the Katowice conurbation, there is a distinct zone of communes with a predominant population loss. Above all, the negative depopulation trend takes place in the core towns and cities of the Katowice conurbation (see Fig. 5C, D). In particular, this process applies to the cities (Katowice, Gliwice, Zabrze, Bytom, and Sosnowiec).

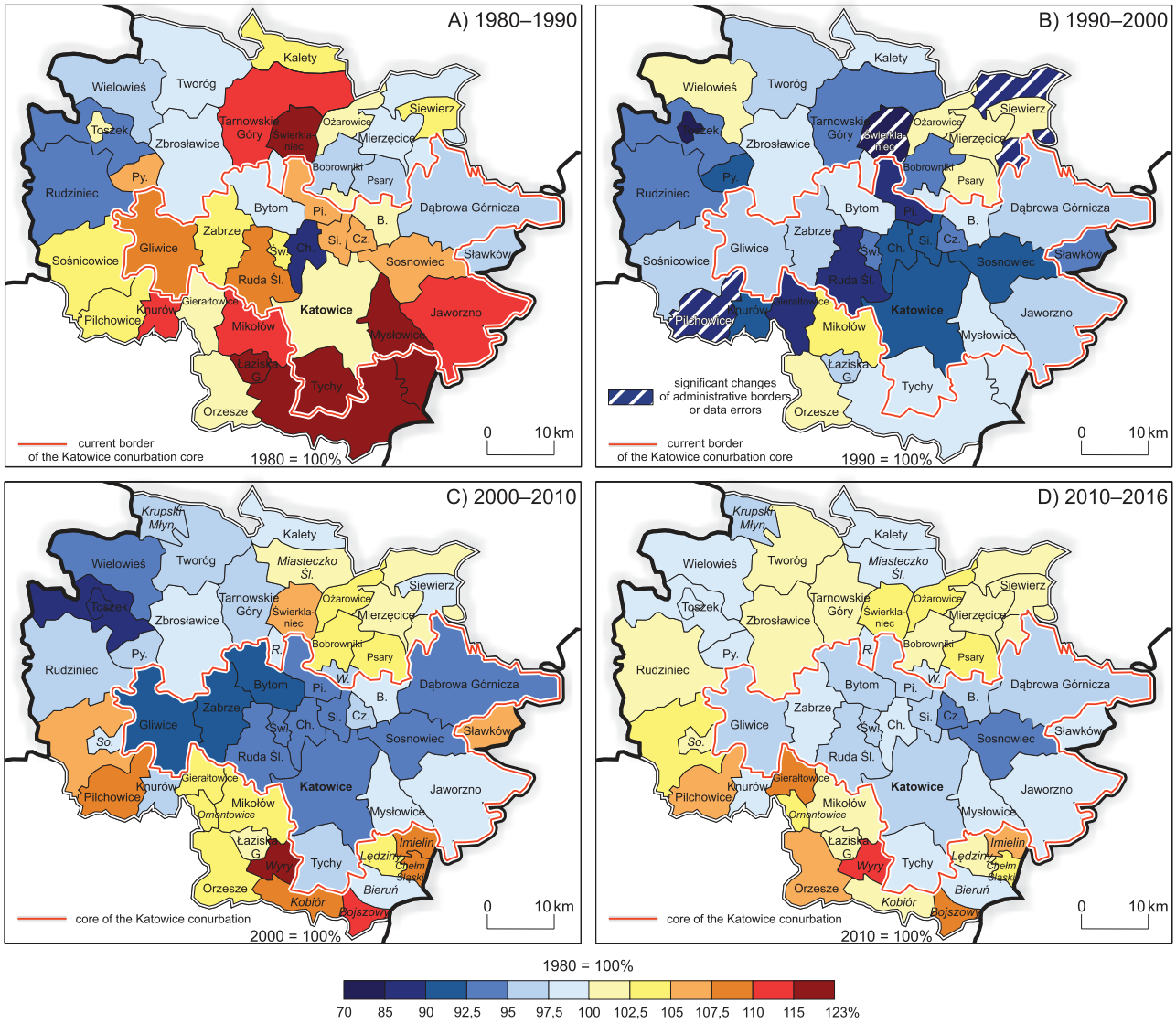


Fig. 5. The dynamics of population changes in the commune of the Katowice conurbation in the period 1980–2016 (Source: own elaboration based on Local Data Bank of the Central Statistical Office; Rocznik Statystyczny Województwa Katowickiego 1981,–1995, WUS, Katowice)

The second outlined zone is the area of population growth, which is observed mostly in the communes surrounding the core of the Katowice conurbation. The area comprises rural communes located in the immediate vicinity of core cities and they are divided into two zones: north and south. The northern zone includes the following communes: Świerklaniec, Bobrowniki, Ożarowice, Psary, and Mierzęcice, while the southern zone – the communes surrounding the core of the conurbation: from Sośnicowice in

the west to Chełm Śląski and Imielin in the east (13 communes) (Fig. 5C, D). In these zones of the Katowice conurbation, there is a gradual increase in population, which is a consequence of new housing development (mainly single-family housing).

It is worth mentioning that the cities with the largest decline in the number of inhabitants during the years 1990–2016, not related to administrative changes include: Katowice (-68.7 thousand people), Sosnowiec (-53.5 thousand), Bytom (together with Radzionkow, -46.7 thousand), Gliwice (32 thousand), Ruda Śląska (31.9 thousand), while population increases in this period was recorded by Mikołów (2.9 thousand), Orzesze (2.3 thousand) and Bojszowy (2,000, from 1991).

5.2. Migration flow in the Katowice conurbation as an indicator of the suburbanisation process

Demographic changes initiated after 1990 in the Katowice conurbation, were primarily caused by negative migration flow (SPÓRNA ET AL., 2016). The positive value of the net migration coefficient is also one of the first indicators of the development of suburban zones in the vicinity of cities. For the Katowice conurbation, this indicator takes on different values, both in dynamic and spatial terms (Fig. 6A–D).

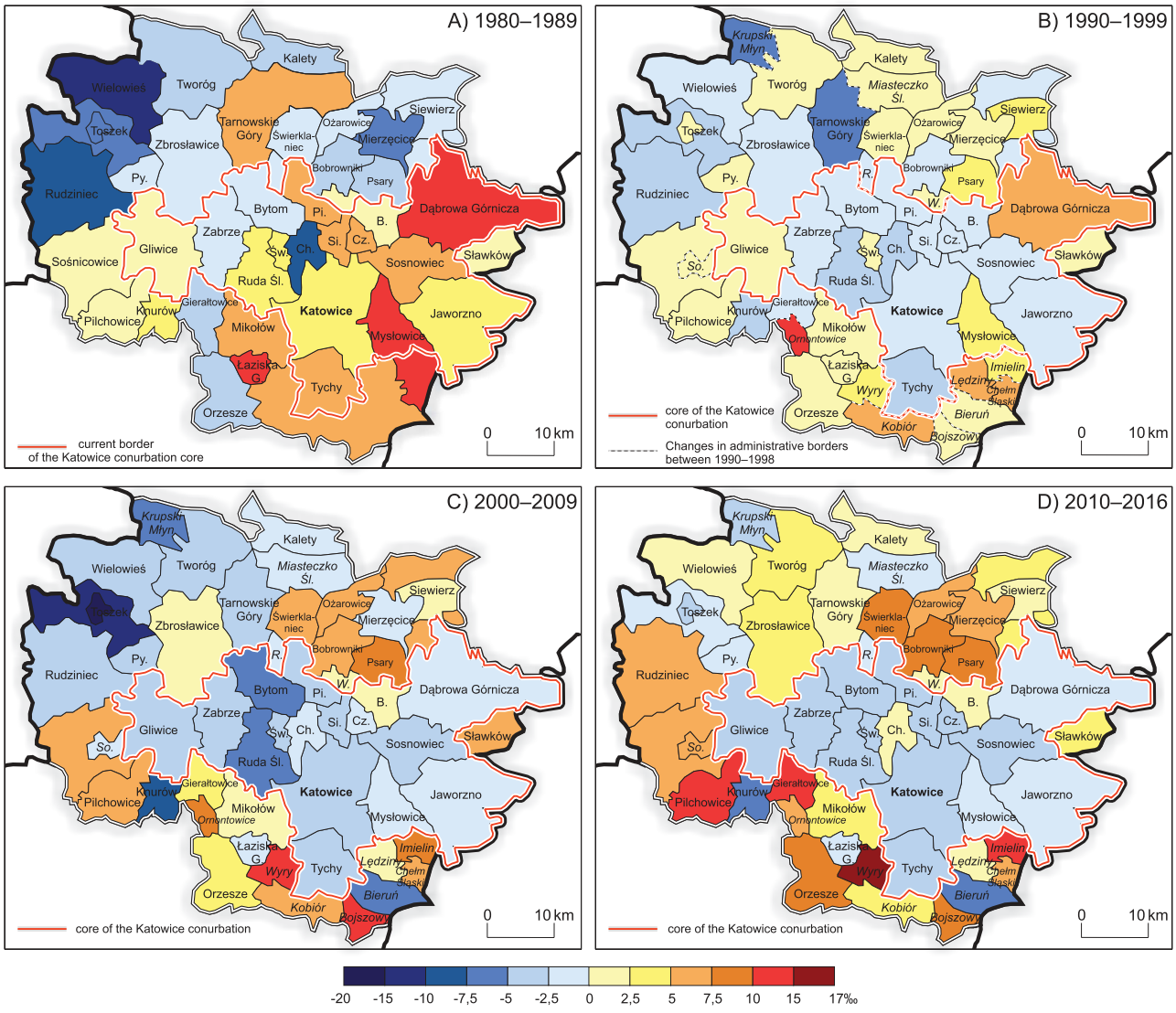


Fig. 6. Net migration coefficients (aggregative) for the communes of the Katowice conurbation for the periods A) 1980–1989, B) 1990–1999, C) 2000–2009, D) 2010–2016 (Source: own elaboration based on Local Data Bank of the Central Statistical Office; Rocznik Statystyczny Województwa Katowickiego 1981,–1995, WUS, Katowice)

* – 6B) In the administrative division of 1990; with the exception of Tychy, Tarnowskie Góry, Mysłowice – (significant changes of administrative borders);
** – 6D) The calculated coefficients do not include data on foreign migration for 2015 – The Central Statistical Office did not publish this: "The reason for the lack of inclusion of data for 2015 is its incompleteness and therefore data on international migration for 2015 will not be presented" (CSO, 2015)

Until 1989, the majority of communes, including the cities and towns of the Katowice conurbation, had positive net migration (Fig. 6A). The years 1990–1999 marked a period of negative net migration in the cities of the core of the Katowice conurbation and a gradual increase in the population inflow to the communities surrounding the core. In particular, this phenomenon has been observed after 2000 and it concerns communities located to the south and north of the core of the Katowice conurbation (Fig. 6C, D).

In order to examine the quantitative phenomenon of migration in the area of the Katowice conurbation communities, aggregate net migration values for the two time periods were presented.

In both periods, 1990–1999 and 2000–2016, it can be observed that the outflow of people from the core cities of the Katowice conurbation was not compensated, not even to 50 percent, by the inflow of people to the suburban conurbation zone (Fig. 7A,B). Katowice alone, in 1990–2016 lost 23 thousand inhabitants as a result of emigration; whereas, the commune with the largest population inflow were – Psary, which increased by 2.2 thousand newcomers in the same period (Fig. 7). In total, in 1990–2016 (within commune borders from 1990), due to emigration from the core of the Katowice conurbation, its population decreased by 131.7 thousand people, and the population surrounding the core (internal and external zone) increased only by 1.8 thousand people. When analysing this indicator only for rural areas, the increase amounted to 12.4 thousand people. This proves the occurrence of the initial phase of the suburbanisation process in the zone surrounding the core of the Katowice conurbation.

The highest positive net migration in the years 1990–2016, with the exception of Dąbrowa Górnicza (2.8 thousand people) and Mysłowice (0.6 thousand), was observed in the communes located in the vicinity of the core of the conurbation, i.e. Psary (2.2 thousand), Orzesze (2.1), Mikołów (1.9), Wyry (1.9), Pilchowice (1.6), Ornontowice (1.3), Bobrowniki (1.5), Świerklaniec (1.5), Imielin (1.4), Ornontowice (1.3), Bojszowy (1.3), Gierałtowice (1.1), and Lędziny (1.1). Positive values, below one thousand people, were also recorded by the following communes: Sośnicowice – rural area, Chełm Śląski, Sławków, Ożarowice, Kobiór, Mierzęcice and below 0.5 thousand in the communes of Siewierz (rural area and the town), Zbrosławice, Wojkowice, Tworóg, Kalety and Sośnicowice – town.

It should be highlighted that the scale of the migration process to the suburban communes of the Katowice conurbation is much smaller compared to the suburban zones of other Polish cities (e.g. the suburban area of Warsaw, Cracow or Poznań).

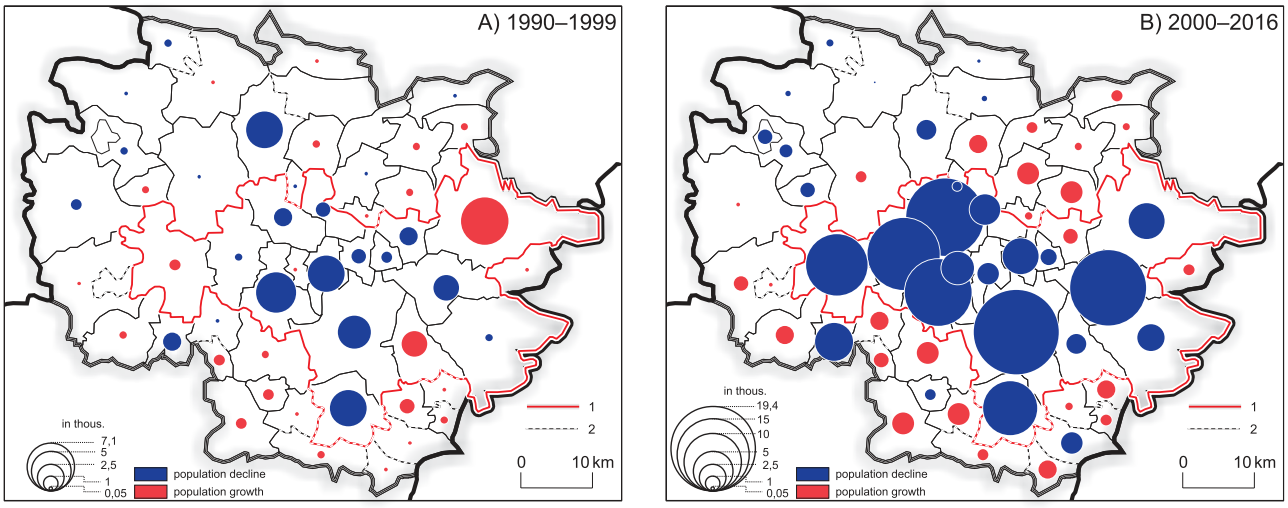


Fig. 7. Net migration for the communes of the Katowice conurbation (aggregate) in the periods A) 1990–1999 and B) 2000–2016 (Source: own elaboration based on Local Data Bank of the Central Statistical Office; Rocznik Statystyczny Województwa Katowickiego 1981,–1995, WUS, Katowice)

5.3. Inner-city population changes in the Katowice conurbation as an indicator of the suburbanisation process

One of the manifestations of inner-city redistribution of the Katowice conurbation population is the zoning changes in populations in the area of its communes. They occurred mainly in urban areas up to 1990 and in areas of new housing development constructed after 2000.

The areas subjected to the depopulation process are primarily the downtown areas of cities and areas with dominant multi-story buildings from the 1960s, 1970s and 1980s (constructed from

pre-fabricated elements) (Fig. 8). When analysing this process using the example of the central-eastern cities and towns of the Katowice conurbation, it is apparent that urban areas of cities and the most urbanized and industrialized area forming today's core of the Katowice conurbation are undergoing depopulation. The areas of multi-storey buildings built before 1990 for workers employed in mining and metallurgy and their families are also depopulating (Sosnowiec–Środula, Zagórze, Będzin–Syberka, Dąbrowa Górnicza–Mydlice, Os. Augustynika, Czeladź, Jaworzno–Warpie). In the years 2004–2014 only, the population decline in these areas exceeded 50 people per 1 km^2, and in extreme cases over 650 people per 1 km^2 (Fig. 8).

Another group consists of areas with a growth in the number of inhabitants. These areas are located in several zones, including:
– the surroundings of the most invested areas of cities (city centres), but still within their administrative borders, both in the proximal and distal zones, including the city border with the surrounding rural area (e.g. Będzin). These areas can be referred to as the "inner-city" suburban zone, occurring within city limits;
– areas in the close vicinity of city centres, in unused areas (e.g. Sosnowiec, the district of Sielec – see SPÓRNA & DRAGAN, 2013, or in Będzin – the district of Górki Małobądzkie);
– polycentric areas of wasteland (post-industrial areas, post-agricultural areas).

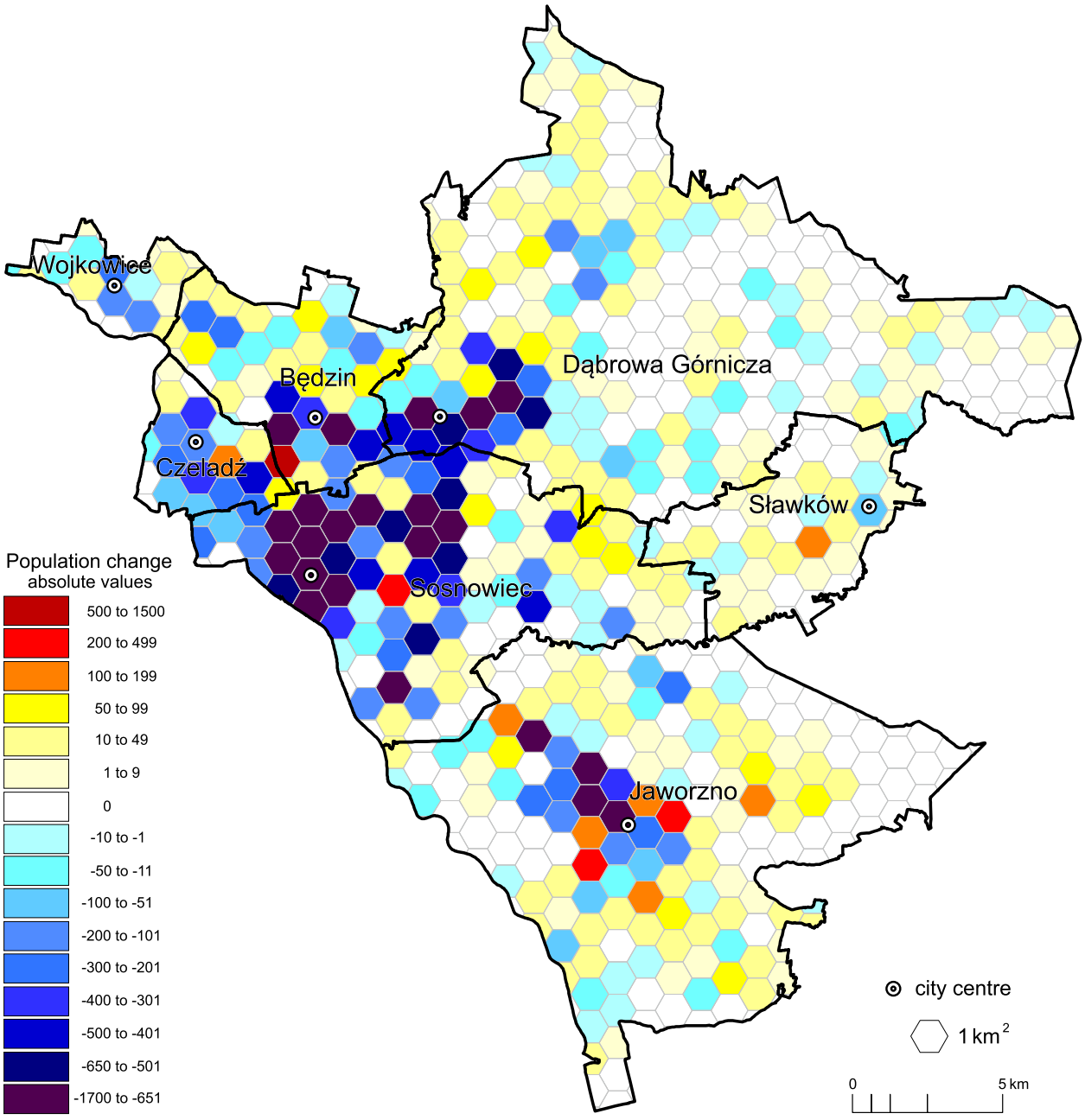


Fig. 8. Inner-city population changes in the eastern part of the Katowice conurbation in the period 2004–2014 (Source: own elaboration based PESEL)

Areas subject to population increases due to their good transport accessibility, competitive price per 1 m^2 of land compared to rural areas (removed from conurbation cities) and access to green areas constitute convenient migration destinations for urban populations. In this case, the areas of inner-city population increase are subject to the "internal" suburbanisation process. An increase in population density in these areas derives from new housing investments, both private as well as those constructed by developers.

An increase and a decline of the population within the Katowice conurbation is polycentric and refers to its complex, multi-centre spatial and functional structure.

6. Discussion

The analysis of the changes in population and migration flow of the Katowice conurbation communes in 1980–2016 reveals that changes in these indicators were influenced by the political and economic transformation that began in 1990.

The cities of the Katowice conurbation are still experiencing a decrease in inhabitants (nearly 400,000 people in total in 1991–2016), small and medium-sized towns of the inner zones are characterized by stabilization of the population, whereas overall, the external zone of the conurbation has recorded a continuous population increase only since 2006. This trend is impacted by negative net migration in the Katowice conurbation, occurring since 1993, while the very rural areas have recorded positive values of this indicator since 1995.

The depopulation of the Katowice conurbation falls within the observed negative demographic changes in other regions of traditional industry (see Ivan & Horák, 2011; Rechlowicz & Tkocz, 2013; Spórna & Kurpanik, 2013; Vaishar, 2002) or agglomerations of Central and Eastern Europe (Karachurina & Mkrtchyan, 2015; Sedlakova, 2005; Steinführer & Haase, 2007; Turok & Mykhnenko, 2007).

The Katowice conurbation is specific due to its strong migration links within its core. The migration flow from the core of the Katowice conurbation to the suburban zone in the years 1990–2012 amounted to only 11%, while migrations within the core accounted for as much as 44% of the total (see Krzysztofik et al., 2017). This is related to the development of the "internal" suburbanisation in the Katowice conurbation area and the predominance of this process over suburbanisation in the traditional suburban area (Runge, 2016). Apart from the period of the socialist deglomeration of the core of the Katowice conurbation, which took on the form of centrally controlled suburbanisation in this zone (e.g. the construction of housing estates and satellite towns – Nowe Tychy), the years 1995–2008 may be assumed as the initiation of the suburbanisation process in the suburban zone of the Katowice conurbation. Due to the fact that the redistribution of the population in the suburban area of the conurbation was diverse in terms of its space and time, it is impossible to determine the exact year, but only the period in which the process began. The scale of the suburbanisation processes in the zone surrounding the core of the conurbation is also smaller as a result of the presence of inner-city suburban zones in the core.

In Poland, development of suburban zones has become noticeable especially after 1990. However, the intensity of the demographic processes in the suburban zones of Polish cities is much higher than in the suburban area of the Katowice conurbation (Kupiszewski et al., 1998; Kurek et al., 2014; Śleszyński, 2006; Raźniak, 2007; Gałka & Warych-Juras, 2018). The delay of the suburbanisation processes in the Katowice conurbation is connected with the economic problems of its inhabitants resulting from the restructuring of industry (the 1990s). The shrinking process of the Katowice conurbation cities, caused by their economic problems, was manifested mostly by a decrease in the number of inhabitants, but also by social, spatial, infrastructural and urban problems. The impact of these negative processes was reflected by the migratory behaviour of the population, i.e. international emigration and migration to other urban centres of Poland (Krzysztofik et al., 2011, 2012; Sitek et al., 2013).

Runge & Kłosowski (2011) researched the dynamics of the population and migration processes in urban agglomerations of the Silesian voivodeship for the years 1978–2008. These studies showed that, in terms of the core – the suburban zone of the agglomeration, the suburbanisation process in the Katowice conurbation was virtually unnoticeable. In contrast, since 1993, the population increase in the suburban area of the Bielsko-Biała agglomeration is distinct.

The study of the process of suburbanisation against the background of progressive depopulation and "shrinking" of the Katowice conurbation cities poses a difficulty, and therefore a scientific challenge. The administrative changes of cities and towns (in the 1990s) make it difficult to study this process as well. Research on the suburbanisation process in a polycentric urban region has also been undertaken in the Ruhr area.

The results reveal that the suburbanisation process in this region was initiated much earlier than in the Katowice conurbation (the 1960s and 1970s) (BASTEN, 2017; BRAKE ET AL., 2001). At that time, the beginning of the de-urbanization processes was observed in the majority of European urban agglomerations (VAN DER BERG ET AL., 1982; FIELDING, 1989; MUSTERD ET AL., 1991; EVERAERS & MUSTERD, 1994; CHESHIRE, 1995; TUROK & MYKHNENKO, 2007).

7. Conclusions

The suburbanisation process in the Katowice conurbation requires further, in-depth research. Understanding the multifaceted mechanism of its development in a polycentric urban region is extremely important from the point of view of the region's development and spatial planning. It also poses a difficult research challenge.

Currently, the suburbanisation process in the Katowice conurbation is still poorly researched. Its demographic aspect (population changes of cities and rural areas) is documented in the most comprehensive way.

In view of statistical data on changes in the total population of communes and migration, one may be tempted to assume that the suburbanisation process in the Katowice conurbation is its initial phase. This is evidenced by low values of population dynamics in suburban municipalities or net migration coefficients. Publicly available data, as a result of its aggregation to the area of the entire commune, makes it impossible to examine the changes in population in the inner-city aspect. When using the NSP or the PESEL database, it is possible to determine areas of population increase/decline within cities, and thus present the process of so-called "internal suburbanisation" (LORENS, 2005).

The lack of development of a traditional suburban zone in the Katowice conurbation was influenced by migrations of urban residents from the conurbation in the 1990s to places of previous residence (return migration), migrations to other more attractive urban centres, international migrations, and migrations to attractive natural areas (the southern part of the Silesian voivodship, Beskid Śląski). The spatial and functional layout of the conurbation is also significant – polycentricity is conducive to the creation of local suburban zones in the vicinity of previously urbanized areas, mostly on post-agricultural wasteland.

Since the 1990s, and with a special intensity after 2000, the largest increase in population and migration inflow has been observed in the communes surrounding the core of the conurbation that is in: Świerklaniec, Bobrowniki, Psary and Wyry, Kobiór, Bojszowy, Orzesze, Ornontowice and Imielin.

The Katowice conurbation is a specific polycentric urban region in which two processes are currently underway. One of them is the process of depopulation, initiated in the 1990s, whereas the other one is a polycentric process of suburbanisation.

Simultaneous to the observed real decline in population, including one of its causes, which is negative net migration balance, in the Katowice conurbation area, there are zones with high population dynamics.

The suburbanisation process is manifested in the Katowice conurbation in two spatial forms. The first one is the suburbanisation of the suburban zone of the Katowice conurbation, which comprises the communes located in the external zone, directly adjacent to the cities of the core of the Katowice conurbation, including Ożarowice, Psary and Mierzęcice in the northern zone and Mikołów, Orzesze and Wyry in the south-western zone.

The second form of suburbanisation is the so-called "inner" suburbanisation, taking place within limits of the Katowice conurbation cities. Areas of intense inner-city construction development are located in the close vicinity of city centres, on unused areas with good transport accessibility. These areas are affected by the so-called "internal suburbanisation".

The review of the literature on demographic changes and migration flow in the Katowice conurbation indicates that researchers are increasingly interested in the subject, also in the context of the development of the suburban area. It may be said that when considering Polish literature, the process of suburbanisation in a polycentric urban region is a phenomenon that has only just been recognized. On the other hand, the suburbanisation process has been relatively well researched in Poland in relation to large monocentric agglomerations (JAKÓBCZYK-GRYSZKIEWICZ, 1998; KAJDANEK, 2012; ŚLESZYŃSKI, 2006), or European agglomerations (STANILOV & SÝKORA, 2014; PHELPS, 2017). This article initiates the indication to the phenomenon of the suburbanisation process in the Katowice conurbation and, to some extent, it bridges the existing research gap.

Further research on the suburbanisation process in the Katowice conurbation should be focused on identifying the migration directions of the population (in relation to core – rural area and core city – other core city), motivations for these migrations, and studying inner-city demographic changes that may indicate the "internal" suburbanisation process.

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