Maciej Smętkowski, Bohdan Jałowiecki, Grzegorz Gorzelak

Metropolitan Areas in Poland – Diagnosis and Recommendations[1]

The aim of the paper is to identify and diagnose problems relating to Poland's metropolitan areas. In its first part, the authors offer a review of the most important features of metropolisation processes and indicate problems associated with such processes on the local and regional scales. This is followed by an identification of major urban centres in Poland, and a delimitation of their metropolitan areas. In the subsequent part of the study, the identified metropolitan areas are characterised in terms of their pertinent development problems. Finally, a set of conclusions and recommendations is proposed, with the aim of improving the functioning of the largest cities and their environment.

1. Contemporary metropolisation processes

Metropolisation is one of the key determinants of the modern development paradigm. Most of the largest cities in highly developed countries, and certain big cities in developing countries, have turned into centres of modern and highly efficient economy with the prevalent service sector (including research, consulting, finance, publishing and media). These centres, being the seats of global corporations, are also centres for international, sometimes global, decision making. At the same time, they are places where not only technological innovations, but new cultural patterns, lifestyles and values are initiated. Metropolises have good communication links with the outside world, and their cultural resources render them attractive destinations for tourists from all over the world, particularly 'business' tourists (cf. e.g. Sassen 1991; Castells 1998; Gorzelak, Smętkowski 2005; Jałowiecki 1999; Taylor 2003).

The notion of the metropolis still waits for its legal or statistical definition. It is commonly acknowledged that the term refers to a city with a population of at least one million inhabitants. In the case of regional metropolises, the population threshold is usually lowered to 500,000. In addition to the quantitative criterion, morphological and functional features are also taken into account. The morpho-

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[1] The paper is partly based on the report entitled: *Diagnosis of Development Problems in Metropolitan Areas and Recommended Delimitation of Metropolitan Areas in Poland*, prepared as part of the project *Diagnosing Local Governments in Selected Aspects of Their Operations and Supporting the Decentralisation Reform of Public Administration* – Measure 5.2 of the Operational Programme Human Capital, financed from the European Social Fund. One of the project's objectives was to prepare materials needed to develop an act on metropolitan areas, which was of particular importance in the context of the discussion on the number of metropolises in Poland.

logical structure of an agglomeration must comprise three mutually complementary areas: the city core; the suburbs, and the suburban zone. There is no strict delimitation in the case of the latter, and for this reason, depending on the size of the urbanised area, the suburban zone can extend over a radius ranging from a dozen to several dozen kilometres. Furthermore, a metropolis – along with its size and morphological complexity – must also have well-developed exogenous functions, with global interconnections to other metropolises. These ties act as factors fostering the influx of investments which are less risky in a broad labour market, in locations promising easy access to a wide spectrum of subcontractors and a varied range of services. We can say therefore that metropolises function as hubs of flows in transport and communication networks, and strands of contacts between production and trade enterprises on the one hand, and banks and other financial institutions on the other (cf. Bernié-Boissard, 2008).

Metropolises develop as an result of the concentration of population, which is concurrently spreading over a greater and greater area, which in turn leads to a fragmentation of individual components of space. In metropolises, the well-known process of a growing hiatus between the place of work and the place of residence can be observed, as these two are mutually incompatible. Various spheres of urban activity also become separated from one another. Retail trade, which has traditionally operated via outlets located linearly along streets, is now increasingly concentrated in the shopping malls, whereas the former locations are replaced by bank outlets, restaurants and entertainment venues. Residential districts, office districts, industrial zones, technological parks, cultural institutions, huge stadiums, university campuses, hospitals, railway stations and airports are dispersed over an area which is constantly growing. Individual residential districts become specialised, attracting residents with a varied social status, and frequently also different ethnic backgrounds. In the metropolitan suburbs, there are huge, decapitalising residential complexes built in the 1960s and 1970s; luxury apartment blocks are built in the central areas, while in the peripheries open and enclosed single-family housing intermingles with remains of rural development, industrial zones, logistics centres and shopping malls (cf. Jałowiecki 2000).

Metropolisation processes which are associated with the changes taking place in the economy, in the manner space is developed, in the society and its culture, involve the following phenomena, which occur concurrently:

- Concentration of economic growth and jobs (including top quality ones), in areas situated within a network of international linkages;
- Despecialisation of regional and urban economies as a result of a clear domination of the service sector, with interregional differences visible in the quality of employment rather than in the sectoral characteristics;
- Increased differences between the centre and the peripheries, and in the frequency and density of horizontal ties between metropolises;
- Growing inequalities between regions and cities, and within metropolitan zones;

- Increasing temporal and spatial disparities between individual centres. While residential, and mostly occasional mobility of some inhabitants is growing at a very fast pace, others are more and more attached to their places of residence and have few prospects for any positive change.

The metropolisation process is particularly well visible in countries which joined the mainstream of the global economy quite recently, such as the post-communist countries (cf. Gorzelak, Smętkowski 2009). Among the European members of the former Soviet Bloc, Poland is in a relatively favourable situation because not just a single city (as in the remaining countries from this particular group) but several have marked their presence Europe-wide (Gorzelak 2004). As a result, Polish strategic documents increasingly reflect the growing role of the metropolitan centres in the country's development and in making its ties with the international scene more robust, and at the same time they focus less on problems associated with the functioning of these complex territorial systems, especially in view of the absence of regulations governing the management of metropolitan areas. This question is to be addressed by the much expected law on metropolitan areas, whose development and adoption is still being delayed. This paper is intended as a contribution to the discussion on how many metropolitan centres can be distinguished in Poland, how the range of their direct impact can be delimited and what major limitations and problems are likely to be encountered in their development.

2. Metropolitan centres in Poland's settlement system

The structure of the settlement system in Poland is relatively balanced, which makes Poland a country with the highest degree of polycentricity of the settlement system in Europe (cf. ESPON 2004). The urban population accounts for approximately 61.2% of the country's population, and has remained at a relatively stable level since 1990; at the same time, it is markedly lower than in the majority of developed countries. There are 889 cities in Poland, but only 17 have a population of over 200,000, with more than 30% of Poles living in cities with a population between 20,000 and 100,000.

Table 1. Cities in Poland in 2006.

Cities by population	Number	% of population (Poland = 100%)
Total	889	61.2
Under 20,000	670	12.9
20,000–50,000	132	10.8
50,000–100,000	48	8.6
100,000–200,000	22	8.0
Over 200,000	17	20.9

Source: prepared by the authors based on GUS (Central Statistical Office) data.

Urban centres in Poland are not evenly spread across the country. The western regions are characterised by a greater urban density than the eastern ones. This is a consequence of historical processes involving the diffusion of urbanisation, which in Poland has progressed in the eastward direction. Contemporarily, the largest number of cities can be found in the voivodships (provinces) of Wielkopolskie (Greater Poland) and Dolnośląskie (Lower Silesia), and the lowest – in the voivodships of Podlaskie (Podlachia) and Lubelskie (Lublin).

The correlation between the rank and the size of individual cities in Poland follows Zipf's law on the linear relationship between the logarithm of rank and the size of an urban centre. In the case of the Polish settlement system, the fit is especially high for cities with a population over 10,000. For smaller cities, this correlation is lower, which can be explained by the minor differences between small cities and locations of a similar size, but which formally are not regarded as cities.
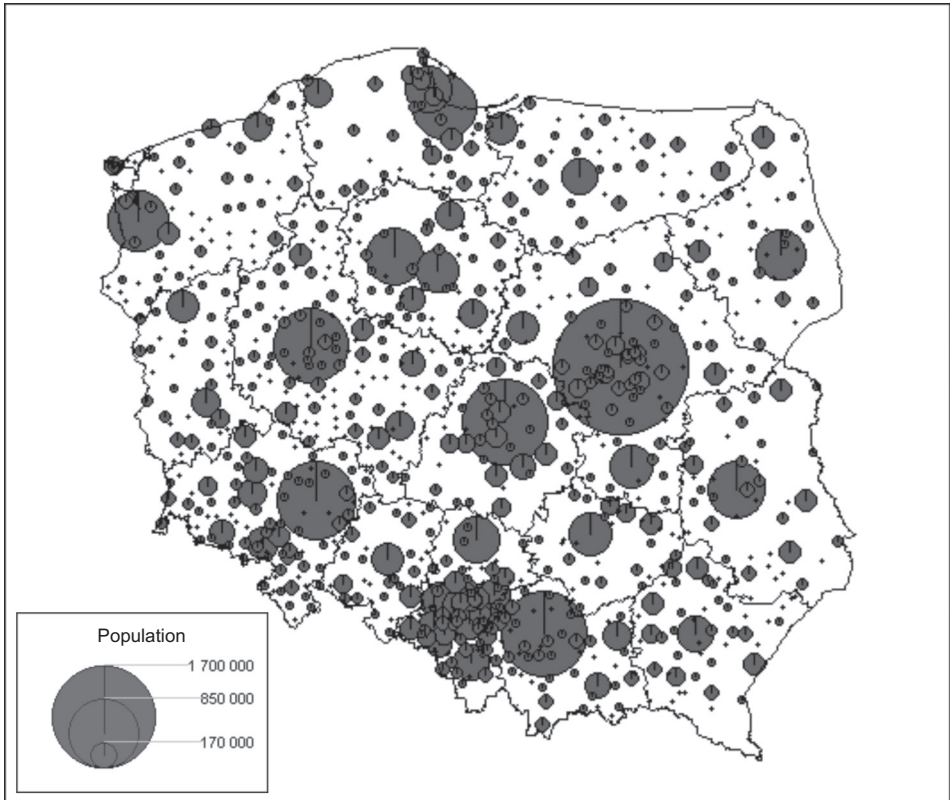

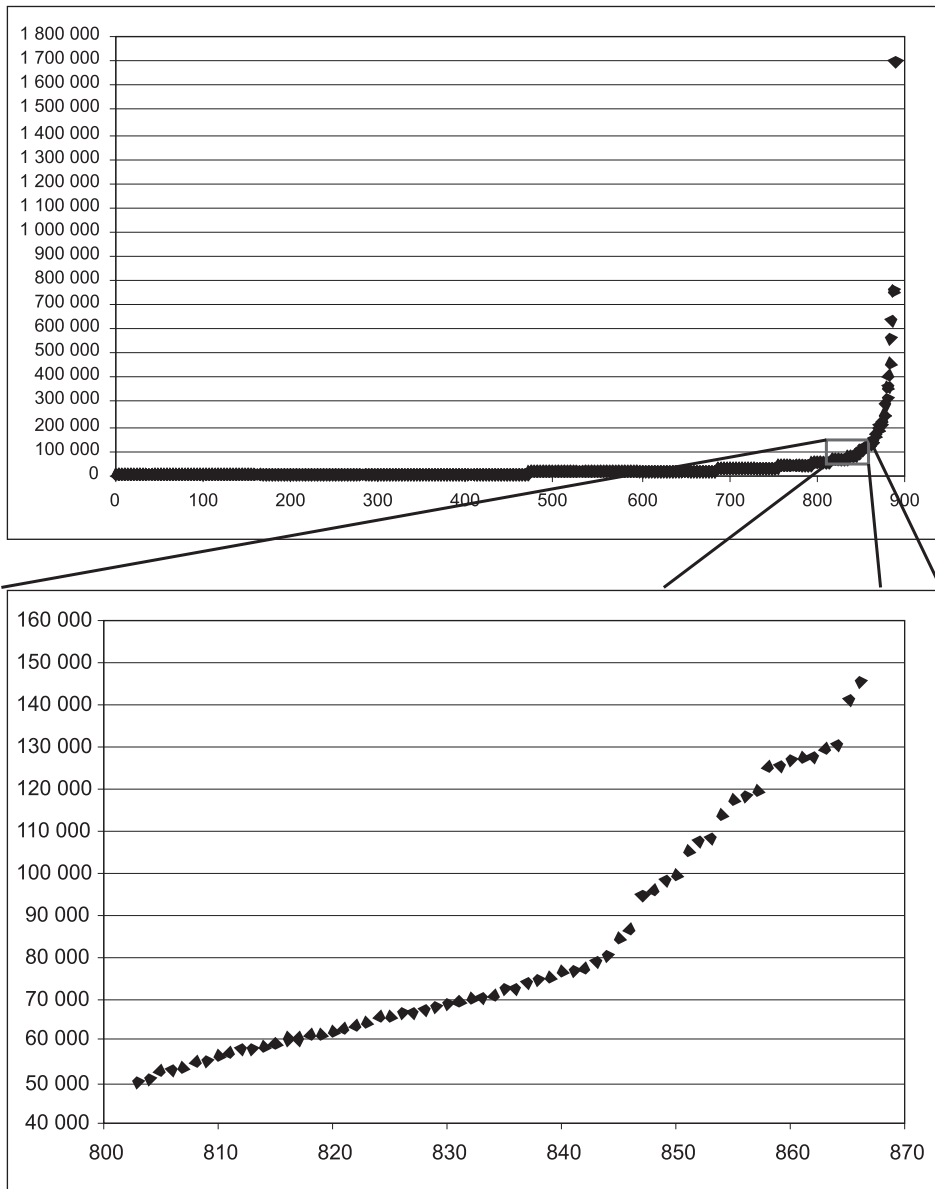Figure 1. Cities in Poland in 2006.

Data source: GUS.

Figure. 2. Size (population – vertical axis) and rank (sequence – horizontal axis) of cities in Poland in 2006.

Source: prepared by the authors based on GUS data.

The above correlation implies that after a certain threshold is exceeded – which in the case of Poland means a population of some 90,000 – there is a speedy increase in the breaks between subsequent cities measured by the number of the population (Fig. 2). This could mean that cities above this threshold perform

a wider range of functions than smaller cities. This set of 38 urban centres[2] was divided into classes based on the number of population, using the 'natural break' method.[3] In consequence, five classes of cities based on the number of the population were produced. The highest class (A) includes Warsaw and the Silesian conurbation, which have populations far above 1.5 million inhabitants. Class (B) includes five cities with a population between 500,000 and 800,000: Kraków, Łódź, Poznań, Tricity (Trójmiasto), Wrocław. Class (C) is relatively the most varied, and consists of 11 cities with a population ranging from 150,000 to 450,000, divided into three subclasses: (+++) Szczecin, Bydgoszcz as well as Lublin and Białystok, (++) Częstochowa, Radom, Toruń, Kielce, and (+) Bielsko-Biała, Olsztyn and Rzeszów. Class (D) includes cities with a population in the 110,000–150,000 range, with Rybnik being the largest city and Tarnów the smallest. The population of the six smallest cities in class (E) oscillates around 100,000.

As a rule, functions performed by cities are distinctly correlated with their size expressed as the number of the population, and their rank in the settlement system. However, without attempting to examine the qualitative potential of big urban centres it is difficult to measure their significance in the settlement system, particularly in view of the differences between them related to the surface area of the city within its administrative borders, their dissimilar economic and population potential, and their direct surroundings with which they have strong functional ties. In view of the latter, the qualitative potential was measured for the nominal values of the indicators, and not for the data relativised by the population of a given urban centre. This was done because of the fact that the key feature that distinguishes any metropolis lies in the functions it performs for its external environment, both close regional and supraregional, be it national

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[2] Cities making up: a) the Silesian conurbation, i.e. former Central Silesian NUTS3 (Bytom, Chorzów, Dąbrowa Górnicza, Gliwice, Jaworzno, Katowice, Mysłowice, Piekary Śląskie, Ruda Śląska, Siemianowice Śląskie, Sosnowiec, Świętochłowice, Tychy, Zabrze), and b) Tricity (Gdańsk, Gdynia, Sopot) were considered together in the study.

[3] A set of elements is divided into classes based on the value of a given measure using the natural break employs an optimisation method which minimises the sum of variation coefficients for the identified intervals (classes). It is accepted that the lower sum of variations the more correct the division into classes (cf. e.g. Pasławski 1998:33). In effect, the produced intervals (classes) have a considerable degree of internal cohesion on the one hand, and on the other they are markedly different from the neighbouring intervals (classes) in terms of a given feature. Such a division is characterised by a relatively high stability over time due to low exposure to episodic value changes in individual elements of a given set. This means that a tendency to increase the indicator's value must be longer-lasting and significantly at variance from the tendencies observable for the entire set for a given element to be categorised in a different interval (class). In this case, the number of classes was determined using the iterative method, whereby the set was divided sequentially into 2, 3, 4 up to 10 classes. Then, the number of indications showing the boundaries of intervals which fulfilled the conditions of natural breaks in individual divisions was added up, and those of them which occurred five or more times were regarded as qualitative boundaries. The remaining boundaries which occurred at least four times were used for internal divisions of selected classes into subclasses.

or international, which are not directly dependent on the number of the city's population within its administrative boundaries.

The key metropolitan functions include control and management, manifested by the location in the city of the headquarters of enterprises which either control or participate in business processes that reach beyond a given local system. The lack of data about the spatial structure of enterprises' ties and linkages can to some extent be replaced by the assumption that larger companies still have stronger external ties than small and medium-sized companies[4] (cf. Smętkowski 2007) and, more importantly, that they have a significant share expressed in absolute numbers in the linkages of a given city with its external surroundings. These assumptions allowed us to make use of the information published by the *Polityka* weekly about the largest Polish companies in terms of revenues to illustrate the role of control and management functions performed by the biggest cities.[5]

Another important feature characterising a metropolitan centre is its research and academic potential, a factor which is of particular significance in contemporary knowledge-based economy. The qualitative dimension of foreign cooperation of Polish research teams can be assessed on the basis of their international cooperation, pursued as part of the Fifth and Sixth EU Framework Programme. Another way to measure the quantitative aspect of the research and academic potential, which more specifically takes into account the influx of university graduates to the local labour market, is the number of students enrolled in higher education institutions in a given city. For this reason, we adopted a simplified assumption that there existed a correlation between the number of students and the size of the research and academic potential.

Cultural functions performed by a given city are also quite significant in determining its status as a metropolis. Regrettably, such functions are difficult to measure; it is even more difficult to determine their regional and international dimension. For the sake of the analysis and based on the availability of data, the number of cinema seats was adopted as a simplified measure of this function. Although in reality this is a measure of the entertainment potential, we assumed that it is indirectly related to other cultural events such as festivals, concerts, exhibitions, theatre and opera performances.

To some extent, the number of users of the city's accommodation base can serve as a summary measure of the external attractiveness of a given city (which is a result of different functions including economic, research and cultural, and of tourism attractiveness). It should be borne in mind that even in an era of information economy which makes many operations possible via state-of-the-art information and communication technologies, face-to-face contacts are still

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[4] Obviously, this does not mean that some small and medium-sized enterprises cannot operate mainly to fulfil the needs of the external surroundings of the metropolis.

[5] To some extent, this corresponds to data about largest transnational corporations collected as part of the *World Investment Report*.

necessary (cf. Hall, Pain 2006). Naturally, this measure shows supraregional ties more distinctly than those occurring on a daily basis.

Table. 2. Indicators of selected metropolitan aspects of large urban centres in Poland.

Area	Indicator
Control and management functions	Revenues of companies from the *List of 500* of *Polityka* in 2007
Academic potential	Number of students in academic year 2006/2007
Cultural potential	Number of cinema seats in 2006
External attractiveness	Users of accommodation in 2006
Transport accessibility	Number of airport passengers in 2006

Source: prepared by the authors.

In addition to the above, the location of an airport and the number of passengers it handles was adopted as a supplementary measure to determine transport accessibility of a given urban centre since it can be justifiably expected that there is a two-way correlation between transport accessibility and the development of metropolitan functions.

The above indicators, intended to measure the qualitative dimension of metropolitan status, are far from perfect. However, in order to develop a better set of indicators, a wide-ranging study would need to be carried out to look at metropolisation processes specifically in individual cities, which could in effect result in a better measurement of such processes.[6] At the same time, it should not be expected that the produced classes of urban centres would significantly differ from the result shown below (Tab. 3). If they did, it would mean that either the above assumptions about mutual relationships are wrong or metropolitan processes described on the basis of the subject's literature have a different course in Poland than elsewhere.

For individual indicators, we applied a procedure similar to that used in the case of the size of cities measured by the number of their population. As a result, urban centres for each indicator were categorised under six classes.[7] Then, after adding up the ranks[8] of the four basic indicators, the procedure for dividing the composite indicator was repeated, producing in effect six classes of urban centres (Tab. 3):

- Metropolitan centres (7);
- Regional centres – class A (3) and B (7);
- Subregional centres – class A (7) and B (5);

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[6] It has to be borne in mind, though, that every attempt at generalisation will inevitably lead to a loss of some information capturing the specific local characteristics.

[7] The set showing passenger traffic in airports was divided into five classes due to the need to slightly modify the method applied (by making an iterative division of the set not into 2–10 classes but into 2–5 classes), owing to a smaller number of cities.

[8] Urban centres in the top category received six points, and those from the bottom category – one point.

- Supralocal centres (4).

At the top of the hierarchy of Polish cities in terms of their qualitative dimension, there are seven metropolitan centres which concurrently belong to the two highest classes in terms of size. Warsaw has a special place among them, being ranked the first in all of the adopted categories. Outside Warsaw, control functions are the strongest in Poznań and the Silesian Conurbation. In the latter case, this is partly due to companies from traditional sectors located in the Conurbation, which mine and/or manufacture goods with low added value. At the other end of the scale is Łódź, a city of the least importance on the business map of Poland.

The academic and cultural potential is similar in all cities belonging to this group,[9] while the differences between metropolitan centres are mainly manifested in their external attractiveness. In this regard, Kraków is in the same league as Warsaw, mainly owing to its tourism attractiveness, and this is reflected in a high number of passenger check-ins at the Balice Airport. The city with the lowest degree of external attractiveness is Łódź, which is also corroborated by the small passenger traffic at the Lublinek Airport.

The subsequent class is made up of regional centres which lag behind the cities in the top class in a number of aspects. Several subgroups can be identified within this broad category. Cities in the highest class, A, include: Lublin, mainly owing to its academic potential (a large research centre, centre for contacts with the East), Szczecin, owing to a high degree of its external attractiveness (airport and sea harbour, border location in close proximity to Berlin, but relatively a small number of headquarters of big companies), and Toruń (seat of some of the largest Polish enterprises, considerable cultural potential). The main cities in class B are the following: Bydgoszcz (airport, but few companies from the *List of 500*) and Rzeszów, an important academic centre which also has an airport. Białystok is in a similar situation, as a city with very few big companies, but a significant academic centre, with many contacts with Eastern neighbours. On the other hand, Bielsko-Biała, Kielce and Częstochowa owe their high position in the ranking to specific factors: the first due to its being the seat of the Fiat headquarters in Poland, the second due to a large number of higher education institutions (but with a relatively low rank), and the third as a major pilgrimage centre, with a huge potential to attract tourists. Olsztyn is the 'weakest' city in this class, and at the same time it is a city which is the most diverse in terms of the selected indicators, with a relatively high academic potential, high external attractiveness, but with a low cultural potential and lack of the headquarters of major enterprises (except Stomil).

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[9] The high cultural potential of the Silesian Conurbation was due to a large population and the adopted measure rather than provision of such services to the external environment.

Table 3. Classification of urban centres in Poland

Name	Population (in thousand)	Class of size	Class of quality	Control and management functions	Academic potential	Cultural potential	External attractiveness	Airport
METROPOLITAN CENTRES								
1 Warsaw	1,702.1	A	A	6	6	6	6	A
2 Silesian Conurbation	1,990.8	A	A	5	5	6	5	C
3 Kraków	756.3	B	A	4	5	5	6	B
4 Poznań	565.0	B	A	5	5	5	5	C
5 Tricity	748.1	B	A	4	5	5	5	C
6 Wrocław	634.6	B	A	4	5	5	5	C
7 Łódź	760.3	B	A	3	5	5	4	D
REGIONAL CENTRES – CLASS A								
1 Lublin	353.5	C+++	B	2	5	3	4	
2 Szczecin	409.1	C+++	B	1	4	4	5	D
3 Toruń	207.2	C++	B	3	3	4	4	
REGIONAL CENTRES – CLASS B								
1 Białystok	294.8	C+++	C	1	4	3	4	
2 Bielsko – Biała	176.5	C+	C	4	2	3	3	
3 Bydgoszcz	363.5	C+++	C	1	4	4	3	D
4 Częstochowa	245.0	C++	C	2	3	3	4	
5 Kielce	207.2	C++	C	2	4	3	3	
6 Rzeszów	163.5	C+	C	2	4	3	3	D
7 Olsztyn	174.9	C+	C	1	4	2	4	
SUBREGIONAL CENTRES – CLASS A								
1 Płock	127.2	D	D	5	2	1	2	
2 Włocławek	119.3	D	D	3	2	1	3	
3 Opole	127.6	D	D	1	3	2	3	
4 Gorzów Wlkp.	125.5	D	D	1	2	2	3	
5 Legnica	105.2	E	D	1	2	2	3	
6 Radom	225.8	C++	D	1	2	3	2	
7 Zielona Góra	118.1	D	D	1	2	2	3	E
Subregional centres – class b								
1 Kalisz	108.5	E	E	1	2	2	2	
2 Koszalin	107.7	E	E	1	2	2	2	
3 Słupsk	98.1	E	E	1	2	2	2	
4 Tarnów	117.0	D	E	1	2	2	2	
5 Wałbrzych	125.0	D	E	2	2	2	1	
SUPRALOCAL CENTRES								
1 Elbląg	127.0	D	F	1	2	1	2	
2 Rybnik	141.4	D	F	1	1	2	2	
3 Grudziądz	99.2	E	F	1	1	1	2	
4 Jastrzębie – Zdrój	94.7	E	F	1	1	2	1	

Source: prepared by the authors.

The range of impact of the remaining urban centres was defined as subregional even though some of these cities were the capitals of small provinces, viz. Opole (Opolskie voivodship), Gorzów Wielkopolski and Zielona Góra (Lubuskie voivodship). Most of these cities are predominantly industrial in character: Płock (petrochemistry), Włocławek (e.g. plastics), and Legnica (Legnica-Głogów Copper District). The situation in another subgroup – class B (Kalisz, Koszalin, Słupsk, Tarnów and Wałbrzych) – is similar, and furthermore low academic and cultural potential values indicate that the cities' emphasis falls on the satisfying of local needs of the inhabitants. In addition to that, external attractiveness of the cities in this group is usually low.

The last class includes four cities (Elbląg, Rybnik, Grudziądz, Jastrzębie-Zdrój), with the lowest values recorded in most of the examined features. The impact of these cities is supralocal in character, but as a rule it is strongly constrained by the close proximity of cities with a higher rank. In all probability, the significance of this group of cities does not markedly differ from that of cities with lesser population but a more favourable location, i.e. influencing a larger area.
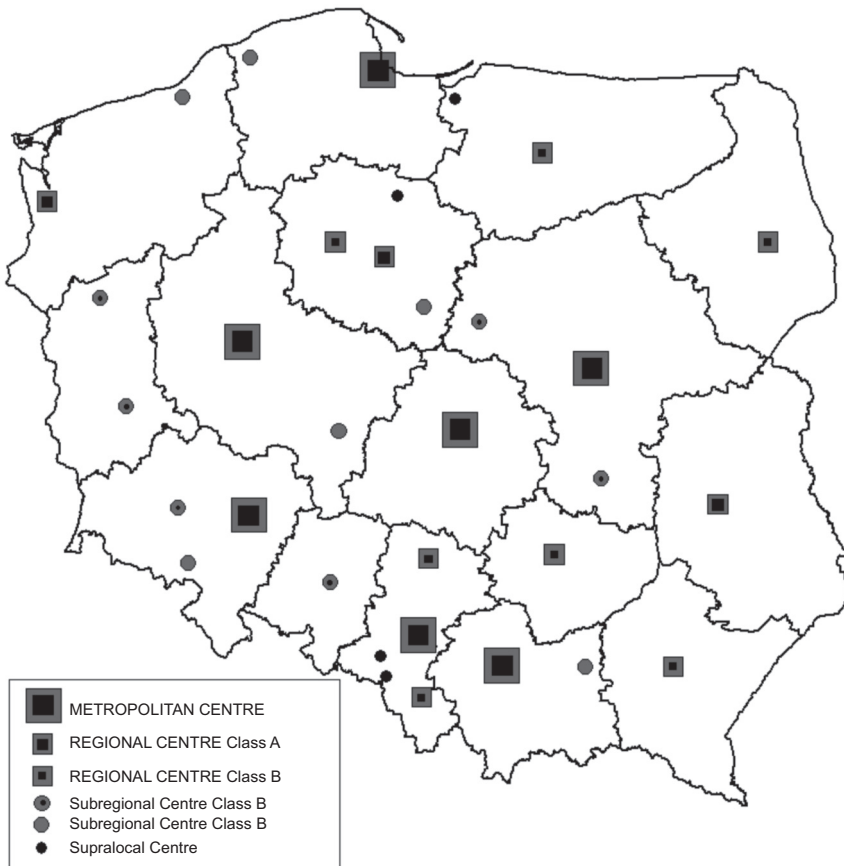

Figure 3. Classification of major urban centres

Source: prepared by the authors.

Based on an analysis of the distribution of the analysed urban centres (Fig. 3) and their varied functions as compared to the number of the population, we may notice potential 'backwashing' of certain functions from some lesser cities by a group of cities categorised as metropolitan centres. In particular, this applies to Radom (Warsaw), Tarnów (Kraków), Elbląg (Tricity), Rybnik and Jastrzębie-Zdrój (Silesian Conurbation). This phenomenon is visible at a lower level of the hierarchy, e.g. Grudziądz (Toruń), but also in the top category of cities, e.g. Łódź (Warsaw).

For the urban centres from the highest, 'metropolitan' class, we delimited the extent of their metropolitan areas, that is municipalities (*gminas*) which are permanently and closely tied with the central city. The exercise was carried out using a modified methodology proposed by Smętkowski (2007). Put simply, the adopted procedure was as follows:[10]

- Based on the conventional local development model, summary indicators showing the condition and development dynamics of Polish municipalities were determined;
- Municipalities were identified in the key classes with regard to their development level, measured by municipal own revenues per capita and development dynamics, which took into account exogenous factors such as the influx of companies with foreign shareholdings and inflow of population, as well as endogenous factors related to the development of local enterprise;
- General principles were established, as well as operational principles for assigning municipalities to individual metropolitan areas.

The general principles included (Smętkowski 2007):

- The principle of maximum distance: only municipalities situated up to 50 km from the centre of the metropolis can be included in the metropolitan area;
- The principle of continuity: only municipalities which neighbour on the metropolitan centre directly or via other municipalities belonging to the metropolitan area can be included in the metropolitan area;
- The principle of vicinity: all municipalities directly neighbouring on the metropolis were included in the metropolitan area regardless of whether they fulfilled other criteria or not;
- The principle of cohesion: also those municipalities which neighboured solely on municipalities belonging to the metropolitan area although they did not fulfil other criteria were included in the metropolitan area;
- The principle of separation: a given municipality may only be included in one metropolitan area, and if zones of impact of different metropolises overlapped, then the distance from the municipality to such a metropolitan centre was the decisive factor.

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[10] A complete description of the process is provided in the report: *Diagnosis of Development Problems in Metropolitan Areas and Recommended Delimitation of Metropolitan Areas in Poland*.

The above principles were adopted for a number of reasons. The principle of maximum distance was directly informed by the theory of spatial interactions, which took into account the relationship between distance and intensity of ties. The 50-km radius from the city centre should roughly correspond to a one-hour drive to the core of the metropolis. This theory also implied the principle of separation, ascribing municipalities to one metropolitan area only. On the other hand, the principle of vicinity expanded the reach of the metropolis to include municipalities which did not fulfil the adopted criteria but were very likely – due to their location – to increase the volume of ties with the metropolitan centre. This principle has a forecasting role, by indicating areas which relatively have the greatest future potential in terms of development dynamics (among the analysed cities, the principle was ultimately only applied to Łódź and Kraków). In a similar way, we can explain the principle of cohesion. At the same time, the principle of continuity, which looks at the metropolitan area as a cohesive area that excludes municipalities that fulfil the adopted criteria but are not indirect neighbours of the metropolitan centre, seems the most controversial.

Following the assumption that the identified metropolitan areas were primarily supposed to perform specific tasks and functions (including the provision of public services), we decided to adopt a number of operational principles and additional criteria, aimed to limit the area to municipalities with the strongest ties with the metropolis on the one hand (which should facilitate the management of the area), and on the other – to allow for a broadening of the metropolitan area in justified cases.

The first operational principle was to make an additional division of municipalities into those situated less than 35 km from the centre of the metropolis and municipalities lying at a greater distance from the metropolitan core. Secondly, we took into account the current regional administrative division, and decided to restrict the range of metropolitan areas to the boundaries of the voivodship in which a given central city was located. As regards additional criteria applied to municipalities not included in top classes in terms of level of development and development dynamics, they were: a) basic – related to the location in the transport corridor and the size of a given municipality, b) functional – related to the inflow of residents from the central city to the municipality, share of the population living in the municipality and working in the central city, capacity of public transport connections between the municipality and the central city; c) morphological – related to the cohesion of a given metropolitan area and location of important infrastructure components in the municipality which were used by the central city.

Due to the method adopted for delimiting metropolitan areas, two groups of municipalities were distinguished – the first making up the hard metropolitan core (or potential core in the case of the polycentric Silesian conurbation) (Fig. 4), and the second, supplementary one, consisting of municipalities situated in close proximity to the metropolitan centre, which could potentially be incorporated into the metropolis after they have satisfied the aforementioned criteria.

The latter group included all the municipalities situated up to 50 km from the centre of a given city. Our diagnosis of development problems outlined below relates only to the former group of municipalities, i.e. those located not more than 35 km from the centre of the metropolitan city, which fulfilled all the basic criteria.
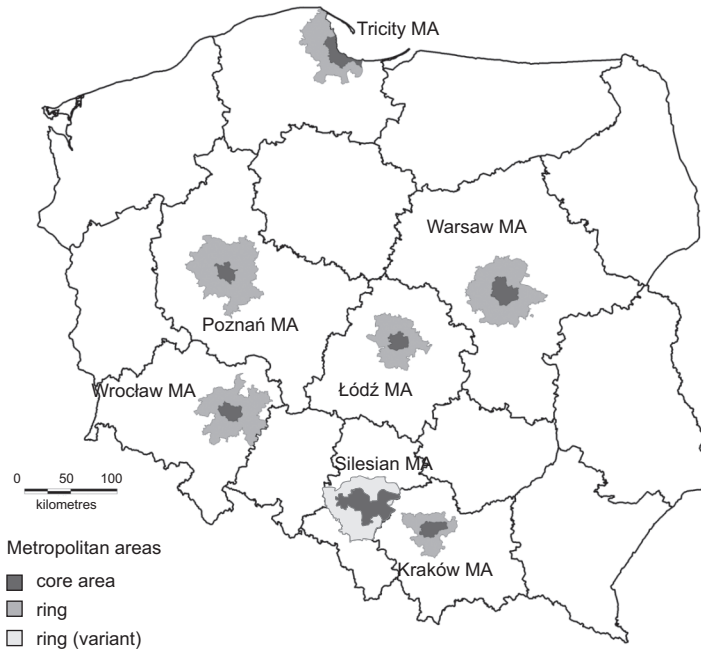

Figure 4. Metropolitan areas of the biggest urban centres in Poland*

* basic municipalities

Source: prepared by the authors.

3. Diagnosis of the condition of metropolitan areas in Poland

In December 2006, the aggregate population of the metropolitan areas living in an area of 20,000 km² (6.4% of the country's total area) was 10,548,000 (9,829,000 without the municipalities surrounding the Silesian Conurbation), which accounted for about 27% of Poland's overall population (Tab. 4). Due to the fact that these areas also incorporate rural municipalities, the application of such units in analysis would allow for a different interpretation of demographic processes occurring in Poland, related inter alia to changes in the urbanisation index and migration flows between cities and rural areas. Furthermore, it should be observed that the identified metropolitan areas are situated in the most densely populated regions of the country.

Among the metropolitan areas identified in our study, the most populous of them are Warsaw and the Silesian Conurbation, each with a population of over 2.5 million. Each of the remaining metropolitan areas has about 1 million inhabitants, with very slight differences between them (1,095,000 Łódź; 950,000 Wrocław). Metropolises significantly differ in terms of the area they occupy: four of them take up an area of over 3,000 km^2: Warsaw, Silesian Conurbation, Poznań and Wrocław, and the latter two have about two times smaller population density (270 and 304 persons per km^2, respectively) than the remaining metropolitan areas. Low population density in these two suburban zones is due to such factors as the relatively large areas of municipalities located in their vicinity. The remaining metropolitan areas occupy from 1,500 km^2 (Kraków) to 2,100 km^2 (Łódź), but despite their small area the population density in the Łódź MA and Tricity MA is distinctly lower than in the Warsaw metropolis (722 persons per km^2).

The migration dynamics in metropolitan areas and their constituent parts is much more varied. The greatest influx of residents has been recorded in the Warsaw MA, but also the Poznań, Wrocław, Tricity and Kraków MAs have a positive migration balance. An increase in the number of the population as a result of migration is particularly well visible in suburban zones (outside Warsaw), Poznań and Tricity (which, coupled with the negative migration balance in the core cities should probably be linked to most intensive suburbanisation processes). Both these processes are easily noticeable in the Łódź MA, but they manifest weaker dynamics, which, together with population ageing processes, ultimately leads to a decrease in the number of inhabitants of the metropolitan area. The Silesian metropolis is also losing in population at a relatively fast pace (industrial restructuring, environmental pollution), while the negative migration balance (-4.7 per mil in 2002–2006) is comparable to the scale of the positive migration balance in the Warsaw MA. At the same time, it can be surmised that owing to the imperfect character of current migration statistics related to underestimated migration mobility of the population, the actual scale of analysed phenomena is much greater.

Despite being stagnant in terms of their population, the core cities still remain the dominant economic centres of their metropolitan areas. This is reflected in a much higher number of registered businesses, also in the relative ratio of their number per capita, than in the external zones. This advantage is particularly well visible in the case of companies with foreign shareholdings: their number per 10,000 population is from two times (Łódź MA, Poznań MA) to four times (Kraków MA) bigger in the metropolitan centre than in its direct surroundings. This in turn is transposed (albeit to a lesser extent) to higher own per capita revenues of core cities as compared to those in the ring of municipalities surrounding the city, despite transfers related to commuting to work to the metropolitan city.

Table 4. Basic information about metropolitan areas (MA) in 2006.

Zones of impact of metropolitan centres	Surface area	Population (in thousand)	Population density	Migration balance in per-mils 2002-2006	REGON in the private sector per 1,000 population*	Companies with foreign shareholdings per 10,000 population	Own revenues per capita	Unemployment rate
Warsaw MA	3,663	2,642.2	722	4.36	149	74	3,337	5.1
– core city	517	1,702.1	3,293	0.62	166	99	4,251	4.4
- basic municipalities	3,146	940.1	299	6.47	120	29	1,683	6.3
Kraków MA	1,544	1,075.2	697	1.20	119	21	1,736	4.4
- core city	327	756.3	2,314	0.63	133	28	2,054	4.0
- basic municipalities	1,217	318.9	262	0.49	86	7	983	5.4
Łódź MA	2,128	1,095.4	515	0.16	114	16	1,495	8.7
- core city	294	760.3	2,582	-0.27	119	19	1,721	7.7
- basic municipalities	1,834	335.1	183	1.87	102	10	981	10.9
Poznań MA	3,793	1,025.8	270	1.87	135	33	1,768	5.4
- core city	261	565.0	2,162	-1.89	151	43	2,066	5.4
- basic municipalities	3,532	460.9	130	4.59	116	20	1,402	5.4
Tricity MA	2,077	1,049.3	505	1.26	114	26	1,923	4.2
- core cities	415	748.1	1,803	-0.74	123	31	2,265	3.8
- basic municipalities	1,662	301.2	181	2.38	91	12	1,073	5.2
Wrocław MA	3,123	950.4	304	1.17	118	33	2,439	6.1
- core city	293	634.6	2,167	0.13	135	42	2,969	5.5
- basic municipalities	2,830	315.8	112	0.21	85	16	1,373	7.2
Silesian MA	3,659	2,709.9	741	-4.75	89	11	1,543	7.6
- core cities	1,216	1,990.8	1,637	-4.26	91	12	1,622	7.8
- basic municipalities	2,443	719.2	294	-0.01	83	7	1,325	7.3

* excluding companies with foreign shareholdings.
Source: prepared by the authors based on GUS data.

The situation in the local labour markets of the metropolitan areas is good, with the unemployment rate indicating that the proportion of registered unemployed to the working age population does not exceed 6.1%, with the exception of the Łódź MA and the Silesian Conurbation MA. On the other hand, unemployment is a more serious problem in those municipalities which are situated in close proximity to the analysed cities, but which were not categorised as metropolitan municipalities. As a rule, the unemployment rate in those municipalities is one and a half to two times higher than in the core city, and 2–3 percentage points higher than in the municipalities having stronger links with the core city. The strongly industrialised surroundings of the Silesian Conurbation and the Łódź MA, where many cities have not been able to overcome the earlier collapse of their traditional economic base, are exceptions to this rule.

Based on the studies and research conducted so far, we can identify the following problems and limitations obstructing the development of metropolitan areas in Poland:
- Spatial chaos/disorder both in the metropolitan centre and its suburban zone due to the lack of local spatial development plans (master plans);
- Inefficient transport system which does not ensure functional cohesion of the metropolitan area and impedes the development of a network of linkages with other urban centres and the region surrounding the city;
- Underdeveloped, low-quality public transportation, particularly in the suburban zone;
- Disorganised water supply and sewage disposal;
- Growing pressure on the natural environment as a result of urban sprawl in cities which are centres of the metropolitan area.

These problems affect individual metropolitan areas to varying degrees (Tab. 5). For instance, local spatial development plans, which were drawn up pursuant to the Spatial Planning and Development Act of 27 March 2003, cover a mere 1% of the Poznań metropolis and 3.2% of the Warsaw metropolis, as compared to about 26.7% in the Kraków metropolitan area. In addition to that, the density of public transportation connections in suburban areas is very low, which is accompanied by a poor quality of railway service. On the other hand, the core cities have about 2 km of public transportation lines per km^2 of their area (the lower value for Tricity is due to the significant role of the fast city rail, SKM, in the transport services available in this metropolis).

As regards water supply and sewage disposal, a considerable share of the population, especially in suburban zones, still remain outside the sewage treatment system (32.9%–63.8%), and some of sewage treatment plants are not equipped with modern installations for nutrient removal. Furthermore, there is an observable shortage of sewage networks in suburban areas as they account only for some 40% of the water network (and only 20% in the vicinity of Łódź).

Table 5. Selected development problems indicators of development problems in metropolitan areas in 2006.*

Impact zones of metropolitan centres*	% of area with valid spatial development plans	Length of public transportation lines per km²	Number of sewage treatment plants	% of population covered by the sewage treatment system	Including % of population served by facilities with increased nutrient removal	Ratio of sewage network to water network	% of area covered by various forms of landscape conservation and protection	% of area covered by landscape protection
Warsaw MA	3.2%	0.45	44	52.7	84.1	0.57	48.1	42.6
- core city	0.9%	2.53	5	50.4	98.7	0.86	23.3	23.2
- suburban zone	3.5%	0.11	39	56.9	60.6	0.44	52.1	45.7
Kraków MA	26.7%	0.49	35	75.4	23.9	0.55	19.1	18.9
- core city	5.2%	2.00	7	91.9	21.4	0.97	14.8	14.6
- suburban zone	32.5%	0.09	28	36.2	39.0	0.35	20.2	20.0
Łódź MA	12.4%	0.57	18	87.1	11.9	0.35	20.1	19.2
- core city	12.4%	3.00	1	97.2	0.0	0.74	5.7	5.7
- suburban zone	12.4%	0.19	17	64.7	51.6	0.18	22.2	21.3
Poznań MA	1.0%	0.17	48	78.4	75.2	0.46	16.4	14.1
- core city	3.7%	2.06	3	95.1	81.0	0.83	0.2	0.0
- suburban zone	0.7%	0.03	45	58.0	63.5	0.37	17.6	15.1
Tricity MA	6.4%	0.35	15	90.6	88.9	0.59	37.7	37.7
- core city	8.2%	1.43	3	100.0	88.3	0.84	26.6	26.3
- suburban zone	6.0%	0.08	12	67.1	90.9	0.43	40.5	40.5
Wrocław MA	13.1%	0.19	26	83.3	63.9	0.48	4.8	4.4
- core city	3.8%	1.99	4	99.9	59.9	0.67	6.3	2.3
- suburban zone	14.1%	0.00	22	50.0	79.8	0.39	4.6	4.6
Silesian MA	18.9%	1.01	106	75.1	73.2	0.54	10.2	9.6
- core city	18.3%	2.19	49	80.8	77.2	0.71	3.9	3.2
- suburban zone	19.3%	0.41	57	59.2	57.7	0.37	13.5	12.8

Source: prepared by the authors based on GUS data (BDR – Regional Data Bank).

Table 6. Evaluation of fulfilment of their tasks by local authorities in metropolitan areas* in 2007.

Impact zones of metropolitan centres*	Overall assessment	Aesthetics and cleanliness	Water provision	Sewerage and sewage treatment	Road repairs and constriction	Development of local and outer transport	Land for development	Development of education	Health care
Warsaw MA	3.12	3.25	4.00	3.77	2.85	3.16	3.10	3.30	2.78
- core city	3.14	3.28	4.12	4.02	2.90	3.31	3.16	3.27	2.66
- suburban zone	3.08	3.19	3.75	3.24	2.74	2.84	2.97	3.36	3.03
Kraków MA	3.22	3.29	4.09	3.76	2.73	3.45	3.15	3.38	2.93
- core city	3.21	3.23	4.15	4.08	2.74	3.44	3.12	3.35	2.77
- suburban zone	3.24	3.44	3.94	2.96	2.71	3.47	3.22	3.45	3.33
Łódź MA	3.03	2.86	3.95	3.65	2.72	2.96	2.95	3.19	2.56
- core city	2.96	2.78	3.96	3.78	2.79	2.94	2.93	3.12	2.41
- suburban zone	3.26	3.12	3.92	3.23	2.49	3.02	3.01	3.42	3.04
Poznań MA	3.29	3.41	3.97	3.74	2.73	3.17	3.24	3.45	3.02
- core city	3.27	3.32	3.95	3.87	2.66	3.37	3.20	3.33	2.7
- suburban zone	3.31	3.51	3.99	3.60	2.81	2.95	3.28	3.58	3.37
Tricity MA	3.55	3.59	4.11	3.88	3.31	3.65	3.50	3.59	3.26
- core city	3.56	3.58	4.28	4.12	3.31	3.80	3.46	3.49	2.89
- suburban zone	3.53	3.61	3.75	3.38	3.31	3.34	3.58	3.80	4.03
Wrocław MA	3.36	3.34	4.02	3.71	3.02	3.15	3.35	3.41	2.92
- core city	3.43	3.28	4.00	3.86	3.10	3.20	3.38	3.37	2.76
- suburban zone	3.25	3.44	4.05	3.47	2.89	3.07	3.30	3.47	3.18
Silesian MA	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
- core city	3.23	3.25	4.02	3.86	2.79	3.35	3.12	3.42	3.13
- suburban zone	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

* Based on Smętkowski's delimitation (2007).
Source: prepared by the authors based on CBOS data (2007). CBOS – Public Opinion Research Centre.

On the other hand, an uncontrolled process of urban sprawl may endanger protected areas, especially in the Warsaw and Tricity agglomerations where the share of such areas in the total area is the highest (about 40%). In most cases, these are protected landscape areas, particularly exposed to threats related to unrestrained urbanisation due to a relatively weak protection regime.

The problems outlined above are also reflected in the opinions expressed by inhabitants, who usually are most critical about these particular areas of local authorities' operations (Tab. 6).[11] In the overall assessment, the Łódź metropolis was ranked as the last (e.g. poorest opinion on cleanliness and overall aesthetics), and Tricity as the first (e.g. best opinions on the development and maintenance of roads). On the other hand, underdeveloped sewage networks raised some concern in the direct vicinity of Kraków, whereas the condition of public transport and its development caused some dissatisfaction in the suburban zones of Warsaw and Poznań, which could indirectly point to the highest traffic intensity in those particular metropolitan centres. Lack of land for development was viewed as the most acute problem in the suburban zones of Warsaw and Łódź. On the other hand, in nearly all situations the condition of the education and health care sectors was seen as better in suburban areas which, paradoxically, could imply that access to these services in metropolitan centres might be more difficult.

4. Conclusions and recommendations

In Poland's settlement system, the highest, 'metropolitan' class of cities can be clearly distinguished; it includes six cities with a population over 0.5 million (Warsaw, Kraków, Łódź, Tricity, Wrocław and Poznań) and the polycentric Silesian Conurbation. For each of these cities, a metropolitan area can be delimited, which comprises municipalities having close ties with the city or the central area. For each of them, a functional metropolitan area can be delimited, which consists of municipalities having strong ties with the central city or central area. Metropolises which are delimited in this way usually provide attractive locations for businesses and offer good living conditions, attracting new residents. An increase in the number of the population is accompanied by an expansion of the metropolis' area, mainly as a result of suburbanisation – not only concerning dwellings but also services. Commuting to work, to shopping malls and cultural institutions – all these take longer. Municipal infrastructure networks (power, water, sewage) are being developed. Waste management covers more and more areas. All this calls for a new way of managing increasingly bigger and complex urban organisms and their expanding direct hinterland. Apart from the obvious benefits, this generates a number of problems and limitations to growth related to threats to spatial order owing to a chaotic and uncontrolled development of

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[11] Results based on CBOS surveys for a different delimitation of metropolitan areas, which did not restrict the boundaries of the metropolitan area to 35 km from its central city.

the metropolis, creating bottlenecks in the transport system which aggravate its functional cohesion, popularisation of individual transport in view of the lack of efficient public transportation, and increasing pressure on the natural environment, even to the point of its degradation.

Unquestionably, increased territorial cohesion, also as a result of an effective and efficient model of metropolitan areas management, could not only ensure better access to and higher quality of public services, but also encourage faster economic development and increased competitiveness of these areas.

Among benefits for the economy which are related to enhanced functional ties within a metropolitan area, the following could be listed:
- Increased territorial cohesion should produce economies of scale as a result of increased supply and sale markets for enterprises;
- Better functional ties may foster specialisation of centres of growth within the metropolitan centre and thereby improve its complementarity, which in turn should produce beneficial effects as a result of a more diversified economy;
- Cooperation between local authorities and better integration of actions should improve the effectiveness of their activities.

Secondly, in the morphological dimension related to spatial planning, extending the range of impact of the metropolitan centre can lead to improved availability of land for residential development and business activity, which should not exert any adverse influence on the natural environment, provided the principle of concentrated dispersion is observed and mass transport networks (mainly railway networks) are concurrently developed.

Thirdly, the emergence of a polycentric settlement network and supplementary centres of economic growth within the metropolitan area can help strengthen development diffusion processes and also curb negative effects of 'backwashing' resources from outer regional hinterland to the metropolis, which in turn should:
- Bring down unemployment in the metropolis' regional hinterland by facilitated commuting to work;
- Encourage structural transformation in the metropolis' regional hinterland, thus creating an alternative for employment in agriculture.

As a result, well-managed metropolitan areas can experience an increase in the population and level of economic development. In addition to that, improvements in the accessibility and quality of public services can be expected, accompanied by a simultaneous reduction of negative impacts on the natural environment, which altogether should foster sustainable development.

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