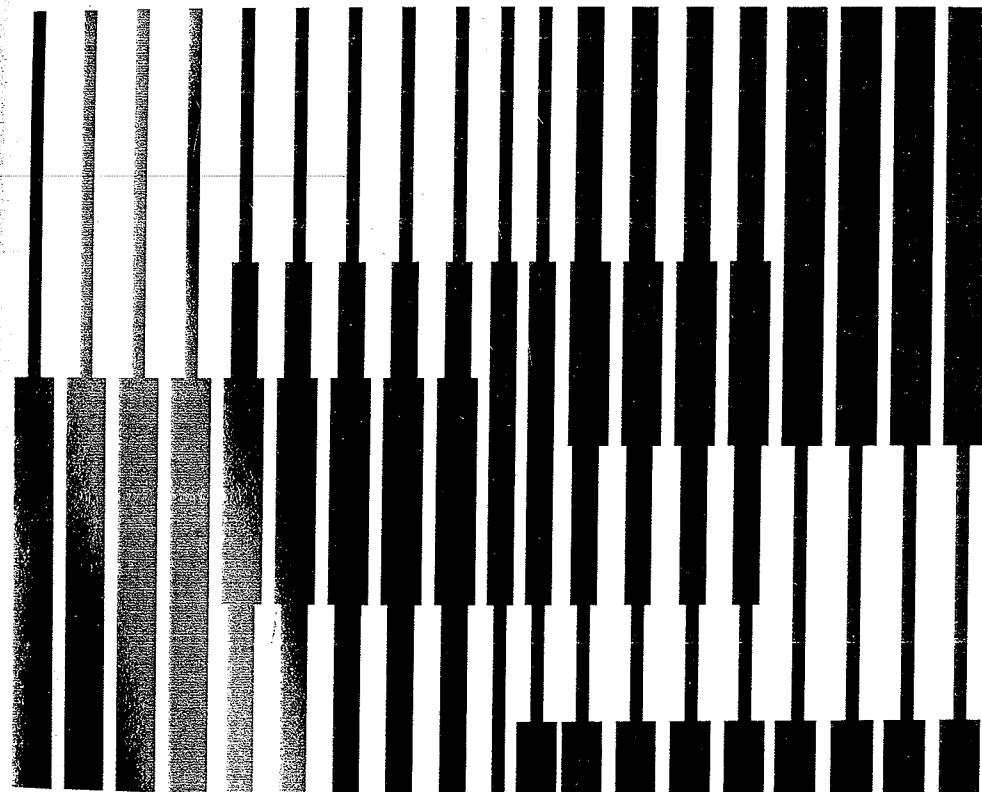


Editors: Tadeusz Marszał

URBAN REGIONS AS ENGINES OF DEVELOPMENT



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# STUDIA REGIONALIA

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Polish Academy of Sciences  
Committee for Spatial Economy and Regional Planning

## URBAN REGIONS AS ENGINES OF DEVELOPMENT

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Editor: Tadeusz Marszał



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must form articulated chains to attend all people directly or indirectly involved in that system.

There may be tourism, business or other activities based on traditional attractions or on technical, scientific, artistic, sports, leisure or just pleasure events, with information and infrastructure support activities. And of course we must have a very well developed transportation system not only connecting other cities or metropolises that we want to include in our area of influence. We need internal connections to grant good accessibility to all essential activity centers.

One of the main tasks for the governments throughout the world is to develop activities that will induce flows of people, information and money through the existing and future great continental and intercontinental corridors, creating functions for the population, whose concentration occurs mainly in the metropolitan areas. This population, if isolated, will not have reasons to be a part of the global world.

## BARTOSZ BARTOSIEWICZ IWONA PIELESIAK

University of Lodz

### HOW TO MEASURE TERRITORIAL COHESION OF A METROPOLITAN AREA – PROPOSAL OF A RESEARCH CONCEPT

**Abstract:** The study presents an original concept of research investigating metropolitan area cohesion developed by the authors, and conducted under the research grant on Cohesion of the Lodz Metropolitan Area. The concept presents a pattern of conduct and research tools that make it possible to determine most precisely and objectively the degree of cohesion of a metropolitan area, based on the strength of spatial linkages that exist between the core and the hinterland.

**Key words:** Territorial cohesion, metropolis, metropolitan areas, linkages.

#### 1. Concept of territorial cohesion

*Cohesion* is commonly understood as strict connectivity and compactness, resulting from combining various elements into a whole. In scientific research, planning and spatial policy this term refers to a variety of spheres – economic, social, environmental, infrastructural (particularly transport), planning, *etc.* Some sort of “a keystone” of these spheres is the territory in relation to which they are analysed, and so if a holistic approach to the issue of internal integration is aimed for, we should use the term territorial cohesion.

Territorial cohesion is a multidimensional and ambiguous concept which causes much controversy and dispute<sup>1</sup>. In recent years this question is often brought up in discussions on the vision of further development of the European Union. The Polish government accepted a proposal that territorial cohesion is to be explained in two aspects – static and dynamic. In the first sense it is presented as an ideal state which is

<sup>1</sup> This concept appeared in a number of the EU documents – *the EU Treaty establishing a Constitution for Europe (2004)*, *the Community Strategic Guidelines on Cohesion (2006)*, the draft of the Treaty of Lisbon (2007), Cohesion Reports (2005, 2007), and the *Green Paper on Territorial Cohesion (2008)*. This issue was also referred to in scientific publications by Davoudi (2005), David (2007), Doucet (2006), Faludi (2004, 2005, 2006, 2007), Farrugia, Gallina (2008), Schön (2005), and others.

the result of efficient processes of exchange and flow in the economic sphere, ensuring economically and socially efficient allocation of resources.

Achieving this state, identical with the specified minimum level of development in the selected areas (access to public services, transport accessibility, *etc.*) and not with their standardisation, is the result of the proper shaping of space which offers optimal conditions for the development of individual territories. It is emphasized that the very process leading to strengthening territorial cohesion is, of course, characterised by enormous complexity, hence its implementation should take place not only on European level but also in the scale of individual countries, regions and local communities. The dynamic explanation of the analysed concept stresses the need for simultaneous stimulation of socio-economic cohesion (stimulation of economic efficiency and levelling social differences) within the framework of integrated management of the development of the European Union (Baucz *et al.* 2009).

## 2. Existing research approaches

The studies of territorial cohesion are currently focused on the macro scale. Due to the special interest the topic of this article evokes in the forum of the European Union, the analyses mainly concern international or interregional diversification. This approach was used, among others, to develop a selection of instruments for territorial cohesion study proposed by Dutkowski (2009). It incorporates six groups of indicators:

- polycentric settlement network (population of the capital of the region, population in very big cities – over 500 thousand inhabitants, population in big cities – from 100 thousand up to 500 thousand inhabitants);
- structure and dynamics of the population (life expectancy at the age of 60, balance of foreign migration, population of post-working age);
- status and protection of the natural environment and cultural values (CO<sub>2</sub> emission *per capita*, national protected areas – share in the total area, the world cultural and natural heritage – the number of objects per 10 million population, cultural capitals of Europe – candidates and nominees per 10 million population);
- provision of transport and telecommunication infrastructure (major international railway lines – the number per 10 million population, density of road network, motorways – share in the total road network, area of international seaports, international airports – the number per 10 million population, and broadband Internet access – number of connections per 100 people);
- availability of high-rank public services (global nodes and locomotives of Europe according to ESPON – the number per 10 million population, MEGA<sup>2</sup> according to

<sup>2</sup> Metropolitan European Growth Areas.

- ESPON<sup>3</sup> – the area per 1 MEGA, very big and big cities – the area per one city with a population exceeding 100 thousand);
- flow of people, goods and information as well as co-operation between territories (value of foreign trade, international passengers at airports, cities in the network METREX<sup>4</sup> – the number per 10 million population, Euroregions – the number of Euroregions co-managed by individual Member States per 10 million population).

Just as in the example shown, in favour of the seven components enabling assessment of the cohesion of an area are Farrugia and Gallina (2008). They consider, however, different areas:

- transportation system (domestic and international air traffic, road network with the division into highways, national and regional roads, anthropogenic CO<sub>2</sub> emission);
- energy consumption (energy consumption, GDP per unit of energy used, losses in energy transmission and distribution, the share of energy produced from unconventional sources);
- telecommunication (broadband Internet access, Internet users, major telephone lines – landline and mobile, cost of telephone calls – landline and mobile, subscribers of mobile telecommunication, television sets);
- education (access to education at primary, secondary and tertiary level);
- health care (expenditure on health care, access to hospital beds, availability of doctors, life expectancy at birth);
- other essential services (access to pure water, access to sewage system);
- the so-called “equality” (difference between availability of water and sanitation services in urban and rural areas, gender validation based on the Gender Empowerment Index<sup>5</sup>, diversity of incomes of the population measured by the Gini coefficient).

A completely different approach is required for an examination of coherence in sub-regional scale. The territorial unit of that rank is the metropolitan area, defined as the area of a big city and its functionally connected immediate surroundings, determined in the concept of spatial development of the country<sup>6</sup>. In Poland, the theme of cities and their hinterland is gaining increasing attention both in the scientific community and among local authorities at different levels. Although the delimitation of metropolitan areas has still not been enacted through the legal acts, some administrative units have already made detailed analysis of the existing socio-economic situation, and started to develop and implement visions for further development.

In most of very big cities of Poland voluntary associations of cities and municipalities of metropolitan areas developed. Their activity varies. In some it is limited to signing

<sup>3</sup> The European Spatial Planning Observation Network and Territorial Cohesion.

<sup>4</sup> The Network of European Metropolitan Regions and Areas.

<sup>5</sup> The index takes into account the number of women in parliament and women legislators, senior officials and managers, and their estimated revenues.

<sup>6</sup> *The Act of 27 March 2003 on Spatial Planning and Development, Dz.U.2003.80.717.*

a document confirming their willingness to co-operate, while other signatories co-operate closely. This co-operation usually concerns investment in public transport infrastructure, joint organization of public transport or promotional activities aimed at attracting major investors to bring their capital to the region.

In general, despite practical and research initiatives, besides delimitation and a very general concept of future operations, included in the spatial zoning plans of the provinces (voivodships), in-depth analyses of potential development opportunities and the functioning of metropolitan areas have not been conducted yet. In particular, territorial cohesion is not addressed in the studies. Exceptions include at least three papers published in the last two years, in which the question of territorial cohesion in metropolitan areas was treated as the dominant subject of interest.

The first of these studies was conducted by a team from the Department of Regional Studies of Adam Mickiewicz University in Poznan under the guidance of Prof. P. Churski (Churski 2009). The authors undertook a multifaceted analysis of cohesion, diagnosing and characterising the issue on three fronts – economic, social and territorial – on the basis of the Wielkopolska region.

The advantage of the paper is a broad spectrum of topics of research undertaken and, most importantly from the perspective of the presented concept, the attempt to design a final method which would make it possible, in principle, to clearly and unambiguously determine the degree of territorial cohesion of the area. To do so, the authors used a multivariable analysis, common in spatial research, constructing a synthetic index calculated on the basis of a number of features describing territorial cohesion. Given the scale of study (regional focus) and a range of the analyses the adopted method seems to be correct. It also provides an important clue for the construction of the final method in the concept of testing the cohesion of the Lodz region.

The second study which should be considered in the context of the analysis of territorial cohesion is a research project carried out by a team from the Institute of Geography and Spatial Organization of the Polish Academy of Sciences, headed by Prof. T. Komornicki<sup>7</sup>. Although in this case the authors examine more closely the functional relationship of Polish metropolises, the research methodology is useful to indicate the characteristics for determining the cohesion of the subregional system.

As the third, special attention should be given to the approach outlined by the team led by Prof. Jewtuchowicz and Prof. A. Suliborski (Jewtuchowicz, Wójcik (2010); Suliborski, Przygodzki (2010)). The authors, analysing the integrity of the metropolitan area on the example of Lodz, focus mainly on economic issues dealing with, however, also social and environmental issues. Despite a relatively extensive analysis of the integrity level of the metropolitan area, this research did not address the issue of synthesis.

<sup>7</sup> Based on the unpublished conference papers *Functional Relationship between Polish Metropolises* by a team from the Institute of Geography and Spatial Organization of the Polish Academy of Sciences led by Prof. T. Komornicki.

### 3. The authors' research concept

As it has been indicated above, despite several attempts to analyse territorial cohesion, it is a relatively new theme for considerations and it has not got a research workshop. Hence the authors' attempt to contribute to the discussion on this topic.

In the case of a metropolitan area it is impossible to apply many of the aforementioned indicators used in international and interregional comparisons. Apart from the fact of adopting a municipality as the basic unit of study, calculating some of them would be unreasonable (e.g. global nodes, cultural capitals of Europe, access to hospital beds, etc.). Much data is aggregated at least at the regional level, so there is a problem of lack of primary information. In such a case, we tend to accept different types of internal linkages within the metropolitan area as an indicator of territorial cohesion.

Additionally, the study of internal integration of the core and the metropolitan hinterland should consider an extremely important, and possible to research in detail, aspect of co-ordination of the spatial policies of individual local government units.

Taking into account both the need to deepen the knowledge on territorial cohesion in metropolitan areas in Poland and real possibilities of obtaining data, the authors propose to conduct research in the following thematic groups.

#### 1. Analysis of changes in land use of the metropolitan area.

Its purpose is to identify the areas where major changes in the zoning of space caused by urbanisation, especially in the new political and economic conditions, have taken place. The analysis would have to confirm the existence or absence of regional functional and spatial zones, which reflect the internal linkages of the metropolitan area.

Analysis of land use, particularly as a dynamic process (indicating change) is a very laborious research. The authors believe that there is no need to make a detailed picture of land use. It seems enough to indicate only the dominant forms of land use. For this reason, the method involves an analysis based on a square grid (side length of 500 m). A source of information on land use appropriate to our goals are aerial images. Their interpretation will be possible due to digital stereoscopic station, which makes it possible to assess vertical intensity of land development.

#### 2. Determining territorial cohesion of municipalities of the metropolitan area in the light of the spatial policy.

On the basis of the planning documents, such as studies of conditions and directions of spatial zoning, cohesion of spatial policies of local governments in the metropolitan area should be analysed, especially in the context of its continuity in the neighbouring administrative units. Particular attention should be paid to grasping the trend in changes, which will help to supplement the conclusions drawn from the implementation of the previous point (determining future trends in land use). The analysis should lead to identifying the areas which may adversely affect the develop-

ment of the metropolis and its hinterland (spatial conflicts in the border areas between various local self-government units) and indicating the directions of activities aimed at improving the existing state.

### **3. Determining territorial cohesion of the metropolitan area in the light of environmental linkages.**

The development of the metropolitan area significantly depends on local environmental conditions, which may be irreversibly degraded as a result of wrong decisions of spatial policy makers. Including an environmental theme aims at identifying the most valuable areas for the metropolis, which would need special protection, and the areas directly associated with them, the transformation of which could adversely affect the whole system.

The authors' idea is to identify the most valuable elements of the natural environment in Lodz Metropolitan Area, as well as determine key environmental relationships occurring within them. On the basis of the analysis of current land use it is planned to check which of the previously identified areas are undergoing, or will undergo in the near future, urbanisation pressures or other types of threats resulting from inappropriate land use. Moreover, the policy of individual municipalities in relation to these areas, both individually and synthesised for the entire area, will be assessed. In this way, the authors will be able to indicate threatened environmentally valuable areas and, possibly, further develop guidelines for spatial planning policy in those terms.

### **4. Analysis of socio-economic structure and its changes in the municipalities comprising the metropolitan area.**

The analysis is to determine the level of socio-economic development of individual municipalities and show their specificity in the context of the entire region. As a result of the research the areas in which the most profound effects of urbanisation and suburbanisation have been observed in the last 20 years should be delimited.

In pursuit of this objective the level of socio-economic development of individual municipalities will be analysed and their specificity will be shown against the background of the Lodz region. Thus the areas in which various manifestations of the processes of urbanisation and suburbanisation have been observed in the last 20 years will be delimited. A detailed analysis, especially with regard to the socio-demographic structure, will be carried out.

The collected material will enable the authors to analyse socio-economic development of individual municipalities. Evaluation of the level of socio-economic development of municipalities of the Lodz Metropolitan Area is necessary for determining the cohesion policy of the study area. This is because territorial cohesion is manifested in the increase 'of the level of territorial integration through its closure and reduction of the level of internal spatial imbalance' (Konecka-Szydłowska 2009). It should also be noted that

cohesion is understood not only in terms of the existing linkages, but also as exceeding a certain minimum threshold of development, not identified, however, with unification (Baucz *et al.* 2009).

### **5. Analysis of transport accessibility of the metropolis for the residents of its hinterland.**

Transport accessibility of the core of the metropolitan area can be analysed in two aspects. Linkages based on the operation of public transport, considering such elements as the spatial extent of public transport, service frequency, travel time to the city centre, *etc.*, can be studied. This should be complemented by the analysis of the operation of individual transport, including the measurement of time needed to reach the centre of the metropolis, the measurement of congestion on the main exit roads in the metropolitan core, and assessment of the quality of road infrastructure, which is a measure of travel comfort. It is also advisable to gather information on planned transportation projects (construction and modernisation of transport infrastructure, reorganisation of the transport system, *etc.*).

### **6. Identification of the strength and nature of social relationships in the metropolitan area.**

It is one of the most important and, at the same time, methodically most difficult aspects of the proposed research. In its framework the impact of the metropolis as a place of work, education, provision of basic and higher-order services and the leisure services (culture and entertainment) should be measured. The results obtained from the analysis of such linkages, apart from determining the impact zone of the city as one of the indicators of territorial cohesion, will help identify the key exogenous features of the metropolitan core.

An attempt to define territorial cohesion in the light of the internal linkages of the metropolitan area is part of the traditional stream of spatial research, referring to the theory of the economic base of a city and the concept of a nodal region. Successful implementation of this project depends greatly on the collection of primary data. Most of it is not included in any statistics, so extensive fieldwork is necessary.

Part of the analysis may be carried out by using aerial or satellite photographs of the area, as well as detailed topographic maps (1:10,000). In order to determine the cohesion of spatial policy, it is necessary to list various planning documents of local self-government units (studies of the conditions and guidelines for spatial planning and spatial development plans), both contemporary and historical ones. These documents reflect most accurately the objectives of spatial policy of individual municipalities. In conducting analysis of socio-economic development of level local territorial units, regional statistics and data from the municipal administrative offices are required. Collecting information about time tables of public transport which serves the metropolitan area (train, tram, bus) and private carriers will cause relatively few problems.

A much more difficult task would be to investigate the flows of individual vehicles, so the authors propose the measurement of traffic, possibly along the major county roads leading towards the core of the metropolis (in case of roads sufficient data will be available from General Measurement of Traffic). The research on transport should be supplemented by the measurement of individual travel time from all the settlements of the analysed area its core.

The spatial extent of the impact of educational institutions in the metropolitan area can be defined by collecting information on the number and places of residence of children and young commuters to kindergartens, primary and secondary schools and higher education institutions located within the Lodz Metropolitan Area. It is also possible to determine other social ties by surveying customers of the most important service centres in its core (direction and frequency of travel to particular locations). The authors are aware, however, that this is an extremely time-consuming activity and does not give a full picture of the existing linkages.

The scope of the proposed research entails a large amount of knowledge of the cognitive character. It can be successfully applied in practical solutions. From the standpoint of the final effect of the study of cohesion of the metropolitan area, three objectives can be determined.

#### **7. Delimitation and verification of the originally delimited boundaries of the metropolitan area.**

For several years work was conducted in Poland on the introduction of the so-called Metropolitan Act. In 2009, these works took on a specific nature, but unfortunately they were not finalised. Regardless of that, the law sanctioning the joint management of the strongly urbanised areas at supra-municipal level will be adopted sooner or later. For instance, co-ordination of spatial policy or the system of public transport within the metropolitan areas is required, so it is important to define the boundaries within which such an area should operate.

For the purpose of preparing spatial development plans of voivodeships metropolitan areas have already been delimited, but different approaches should be confronted with the results of empirical research. This is especially important for those areas where the delimitation was based on districts, not on municipalities, which are more appropriate for this purpose.

#### **8. Formulating guidelines for documents sanctioning common spatial policy of the metropolitan area.**

Establishment of institutionalised metropolitan area involves the development of documents sanctioning common spatial policy and socio-economic development. Most likely they will adopt a similar form to that currently used for spatial development plans, strategies or studies. Determination of the degree of territorial cohesion will identify the key issues and challenges facing potential institutions that will be

responsible for spatial and economic integration of the metropolitan area. For these entities an access to knowledge about the existing situation and conclusions drawn from this diagnosis will be needed.

#### **9. Identification of the areas of underdevelopment of the transport system in the metropolitan area.**

By analysing transportation linkages in the light of current socio-economic situation and the observed changes in land use of the metropolitan area, it is possible to identify areas characterised by poor transport services in relation to the existing needs. Along with the characteristics of the transport accessibility, this goal leads to defining the basis for building a common, more efficient metropolitan transportation system.

Implementing the presented research scheme, which is currently deployed in studies of the Lodz Metropolitan Area, has great cognitive value and, at the same time, important practical potential. This scheme does not, however, lead to determining the degree of territorial integrity expressed with one synthetic measure. Hence, the hardest task, according to the authors, is to develop the final method (measurement) which would make it possible to determine the strength of the relationship of a local territorial unit with the core of the metropolitan area.

The difficulty in constructing or adapting the existing methods results from a high complexity of the analysed issues. The simplest solution seems to be an application of one of numerous methods of multivariate analysis as it was made in the study of cohesion concerning the region of Wielkopolska. However, high diversity of indices obtained during the analyses, their quantitative and qualitative nature and various weight reduce their usefulness. The second of the potential methods is the method of graphs, which also serves the analysis of linkages and coherence. Unfortunately, its application can only indicate the direction of the existing relations, without specifying the size of this phenomenon.

The authors hope that arousing the discussion on the proposed research approach they will receive valuable guidance for the implementation of this concept and the construction of the final method, which will enable researchers to objectively and comparably determine territorial cohesion of the metropolitan area.

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