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TERRITORIAL COHESION OF A METROPOLITAN AREA – MEASUREMENT METHODS (THE CASE OF LODZ METROPOLITAN AREA)

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Abstract. *The paper presents a pattern of conduct and research tools that make it possible to determine most precisely and objectively the degree of territorial cohesion of metropolitan area, based on the strength of spatial linkages (e.g.: synthetic measures of transportation, social and ecologic linkages, as well as local spatial policies compliance and socio-economic situation) that exist between the core and the hinterland.*

Бартосевич Б. *Малі міста Центральної Європи: 20 років після трансформації у контексті функціонального та просторового розвитку. У статті представлено алгоритм проведення та засоби дослідження, що дозволяють найбільш точно і об'єктивно визначити ступінь територіальної єдності метрополітенського регіону, ґрунтуючись на силі просторових зв'язків (наприклад, синтетичні засоби перевезення, соціальні та екологічні зв'язки, а також місцева просторова політика відповідності, соціально-економічна ситуація), які існують між ядром і хінтерландом.*

Introduction. Choosing or establishing a territorial cohesion measurement method comes up against many problems, the most serious of which is the lack of agreement as regards terminology. With no precise, generally accepted definition of territorial cohesion, there have appeared numerous study approaches, depending first of all on the conception assumed by individual authors; one may take a scalar or vector approach to the study of cohesion. The literature of the subject presents mostly the former approach, not only because it is generally considered to be the prevailing one, but also due to an easier access to the descriptions of the phenomena and processes occurring in territorial units, systematically collected by specially constituted institutions (territorial administration offices, national statistical offices, the UN, World Bank). As regards the study of territorial cohesion based on relations (their types, range and strength), the data mostly comes from individual research projects. Considering its limited time and spatial range, it does not warrant conducting a full study on the chosen scale.

Internationally, the study of spatial cohesion has been conducted on a large scale for many years, under the auspices of the European Union. It is supposed to help identify regional disparities and optimize the activities which aim at eliminating them. A search for a universal, easy to interpret synthetic indicator – the European Spatial Cohesion Index (ETCI) was conducted within the framework of ESPON [Pielesiak 2012]. The project included the data concerning competitiveness, social cohesion and sustainable development; it was to be modeled on the Human Development Index (HDI). The ETCI was to be relatively simple, correctly constructed from the scientific point of view, and at the same time potentially usable in the development policy. In reality, these assumptions proved to be difficult to reconcile. The main obstruction in the project was the lack of statistical data, especially as regarded the regional level (the relatively easiest to obtain was the information regarding the economy) [*Spatial Scenarios* ... 2004, 2005, 2006]. Another problem was the fact that the index was sensitive to manipulation [Farrugia, Gallina 2008; Prezioso 2008].

Another territorial cohesion measurement method, different as regards the range of the studied phenomena, but also applied on the macro-scale, was presented by Farrugia and Gallina [2008]. In their studies, they took into account the descriptions of the transport system, energy networks, telecommunications, education, health care system, and other significant services, as well as various types of disparities, obtained from the World Bank and United Nations data bases. The algorithm of the cohesion measurement included the normalization of the partial indexes values, the calculation of the mean value for each of the seven main categories, the second normalization putting the value of each of the seven components within the range of $<0.1>$, and finally constructing the spatial cohesion measure, without grading the individual components.

Polish attempts to devise a territorial cohesion evaluation method are largely a response to the EU policy of strengthening the cohesion of the Member States. A significant work in this field was published by the Ministry of Regional Development in 2009. Its authors suggested considering the endogenous potential of

a given territorial unit, measuring the territorial influence of European Union policies, as well as defining the target value of territorial cohesion indicators.

The territorial cohesion measurement methods presented above refer to the macro-scale and may not be directly applied when we study this phenomenon on the sub-regional scale. At the same time, there is a lack of examples of research, which would be conducted in this particular way. As regards Polish studies of territorial cohesion in the sub-regional aspect, it is worth mentioning the significance of the project developed at the Poznan geographical centre [Churski 2009]. The space cohesion measurement on the sub-regional level was conducted taking into consideration the urban settlement system, the transport infrastructure and the flows it generated.

Measurement method. The study of the metropolitan area territorial cohesion is based on the assumption that it is determined by the relations among the basic administrative units (in the case of Poland, they are municipalities). It is also assumed that the measurement method should be universal, and it should be applicable for any metropolitan area, and it should have a module structure, which makes it possible to increase or decrease the number of the studied variables at any time, without constructing a new measure. This allows the researchers to extend the range of study or possibly verify the measurement indicators at each stage.

Based on these assumptions and in accordance with the inductive approach, the first stage of the measurement of territorial cohesion is the analysis of the directions and strength of the intra-metropolitan linkages (focusing on their identification and description). According to the chosen methodology, the analysis includes the following types of linkages: transport linkages (as regards transport infrastructure and the capacity and directions of private and public transport), social links (the scale and directions of commuting to work and services); ecological linkages (defining the continuity of the green corridors of a metropolitan area); spatial linkages (mainly studying the spatial policy coherence in individual units of the local administration of a metropolitan area); linkages resulting from the level of the socio-economic development.

The second stage involves establishing a concise measure for all types of the linkages under study. The method does not have to be the same; it depends on the specific character of the linkage and the preferred research approach.

The last stage, which is at the same time the object of discussion here, is the measurement of territorial cohesion based on the construction of a concise measure of this phenomenon. The author proposes three approaches to the aggregated measurement of territorial cohesion. All of them are based on the results of detailed studies conducted in Lodz Metropolitan Area, the third largest metropolitan area as regards the demographic potential (about 1.2 million inhabitants and 2,500 km²).

In the first approach, the author used the results of indicators calculated for individual types of linkages (a part of detailed analyses), such as: the spatial coherence indicator, territorial cohesion in the light of the socio-economic situation, and indicators of the social, transport and environmental linkages among municipalities.

The first of the indicators listed above was excluded from further analysis. Spatial policy coherence is a vital factor for the proper functioning of metropolitan areas and should be always taken into account when studying them. However, using this measure in the case of territorial cohesion measurement is not proper. The largest spatial policy coherence is observed in non-invested areas with predominant extensive functions, such as agriculture or forestry (occurring on the edges of metropolitan areas). In urbanized areas, including metropolitan areas, this coherence will usually be the smallest. We cannot assume that the higher or the lower the value of a phenomenon is, the larger or the smaller territorial cohesion a given area shows. It was decided then that this indicator, though very important from the point of view of introducing future spatial development metropolitan policy, does not reflect the scope of the phenomenon under study and should not be included in further study.

When establishing the indicators mentioned above, individual units of a metropolitan area were put into groups, depending on the values of the measures. In all cases, the typology identified municipalities with high or very high values of the indicators. Based on these values, the author divided the municipalities of the Lodz Metropolitan Area into five groups. The first one included those which were considered to be units with strong or very strong linkages, while the last, fifth group included municipalities which were not classified as such even once [Bartosiewicz 2012].

The second approach to studying spatial cohesion involves constructing an aggregated index by means of quantitative (statistical) methods. When constructing this measure, the author used the values of features which were used for establishing the indicators of individual types of linkages. Similarly to the previous approach, the measures concerning spatial policy coherence were excluded. In total, twelve features were taken into account (including three regarding social linkages, four - transport linkages, one – environmental linkages and three referring to the socio-economic situation): the number of the linkages among the municipalities as regarded commuting to work, the scale of commuting to schools in Lodz, the scale of journeys to Lodz cultural establishments, the evaluation of technical infrastructure development, the number of connections among the municipalities by public transport, the number of direct public transport connections to Lodz (on a typical working day), the mean time of traveling by public transport to Lodz, the number of environmental linkages among municipalities, population density, net migration rate per 1000 persons, unemployment rate, and entrepreneurship index [Bartosiewicz 2012].

When constructing the index, the author followed the same procedure as Farrugia and Gallina [2008]. The output data was normalized, and next, on the basis of the values of features obtained for individual study units, the arithmetical mean was calculated, treated as the final measure (in Polish literature this approach is known as Perkal's index). In the light of these results, individual units of the metropolitan area were divided into four groups, on the basis of the values of the arithmetical mean and standard deviation.

Due to the choice of features, the territorial cohesion measured in the above way corresponds to the results obtained by applying the first of the presented methods.

The last procedure is an extension of the second among the proposed approaches to measuring territorial cohesion. The 12 output features presented above were aggregated according to type of linkages (transport, environmental, social, the level of socio-economic development), and next the Perkal's index¹⁷ was calculated for each of them. In this way, contrary to the previous method, each type of linkage was given the same status. Values calculated this way were summed up, producing a territorial cohesion index [Bartosiewicz 2012].

Conclusion. In the study of territorial cohesion, the author initially considered using graph and gravitation analysis methods. However, eventually, wishing to retain the maximum amount of information about the studied phenomena, as well as taking into account the difficulties in applying these methods for all the studied issues, the author used other procedures. Firstly, on the basis of a statistical analysis of the indicators of four linkage types, he made a simple typology of municipalities, identifying units with the highest index values, based on the statistical measures of dispersion, and considered to be the most coherent with the metropolitan core. Secondly, he referred to the structure of the aggregate measure of linkages on the basis of 12 representative features, illustrating the power of relations and internal socio-economic disparities in the studied area. Next, the variables used earlier were used again to construct module indexes, referring to social (1), transport (2), and ecological (3) linkages, as well as the socio-economic differences in the scalar aspect (4). Finally, their values were summed up [Bartosiewicz 2012].

Each of the approaches mentioned above concerns a similar, though not identical range of area featuring the strongest links with the metropolitan core and with one another. In order to establish the range of the area showing the highest level of territorial cohesion, the author put together the results of the three measurement methods discussed above.

Like in the first method (constructed on the basis of the linkage indicators) the author took into account only the municipalities with high or very high level of territorial cohesion.

The results regarding Lodz Metropolitan Area show that the region delimited by means of the presented method, does not fully correspond to its actual delimitations. Through the analysis of actual linkages, the proposed method sheds a new light on the approach to delimiting a metropolitan area. At the same time, due to its module construction, it makes it possible to add other types of relations at each stage of the analysis, which help to define more precisely the degree of spatial cohesion; its universal character may lead to comparative studies concerning the degree of cohesion (it is a tool ready to be used for any metropolitan area).

¹⁷ It does not concern environmental linkages, where in further analysis a normalized value of only one output feature of the studied phenomenon was used.

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EXPERIENCES OF SETTLING MANAGEMENT IN RUSSIA DURING SOVIET AND POST-SOVIET PERIODS

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Abstract. *For the Soviet period an exaggerated idea of state's possibilities in settling management was typical. In reality the attempts to stop the growth of the largest cities or to develop the small cities were seldom successful. However the rural settlement pattern was by far more affected by the state policy. A campaign of the 1960/70-s aimed at the "elimination" of small villages has triggered the reduction of the number of settlements. During the post-Soviet period the state obviously has fewer possibilities, but very often more ambitions.*

Алексєєв А.І. Досвіди управління розселенням в росії у радянський та пострадянський періоди. Для радянського періоду було характерне перебільшене уявлення про можливості держави в управлінні розселенням. Насправді спроби зупинити зростання найбільших міст або розвивати малі міста рідко були успішними. Однак система сільського розселення зазнала суттєвішого впливу державної політики. Кампанія 1960-70-х років, спрямована на «знищення» невеликих сіл, викликала скорочення кількості населених пунктів. У пострадянський період держава, очевидно, має менше можливостей, але дуже часто більше амбіцій.

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