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CONCEPTUAL APPROACHES AND APPLIED ASPECTS OF SPATIAL AND FUNCTIONAL ANALYSIS OF METROPOLISATION PROCESSES IN THE REGION

Abstract. The features of metropolisation as the dominant tendency of economic space organisation are considered in the article, its objective conditions and factors are defined. Conceptual approaches to spatial analysis of metropolis processes in the region are generalized. The results of the evaluation of the integral functions of metropolis cities are provided in terms of organizational, administrative, economic, innovative and creative, representative and tourist, cultural, scientific and educational, transport and logistics and socio-demographic structure. Spatial analysis of centro-peripheral interactions in the region, such as the dependence of the adjacent territory on the level of major metropolitan cities, the complexity and diversity of their functional status has been conducted. Priority areas of balanced spatial development policy are proposed.

Keywords: metropolisation; city metropolis; agglomeration; urbanization; regional metropolis; metropolis area; metropolis functions; spatial analysis; spatial development policy.

JEL Classification: R11, R12, R13, R58

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КОНЦЕПТУАЛЬНІ ПІДХОДИ ТА ПРИКЛАДНІ АСПЕКТИ ПРОСТОРОВО-ФУНКЦІОНАЛЬНОГО АНАЛІЗУ МЕТРОПОЛІЗАЦІЙНИХ ПРОЦЕСІВ У РЕГІОНІ

Анотація. Розглянуто особливості метрополізації як домінуючої тенденції організації економічного простору, визначено її об'єктивні передумови та чинники. Узагальнено концептуальні підходи до просторового аналізу метрополізаційних процесів у регіоні. Представлено результати інтегрального оцінювання розвитку метрополійних функцій міст у розрізі організаційно-управлінської, економічної, інноваційно-креативної, туристично-репрезентативної, культурної, науково-освітньої, транспортно-логістичної і соціально-демографічної складових. Здійснено просторовий аналіз центрально-периферійних взаємодій у регіоні, а саме встановлено залежність розвитку прилеглої території від рівня розвитку головних міст-метрополісів, складності та різноманітності їх функціонального статусу. Запропоновано пріоритетні напрями збалансованої політики просторового розвитку.

Ключові слова: метрополізація; місто-метрополіс; агломерація; урбанізація; регіональна метрополія; метрополійний простір; метрополійні функції; просторовий аналіз; політика просторового розвитку.

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КОНЦЕПТУАЛЬНЫЕ ПОДХОДЫ И ПРИКЛАДНЫЕ АСПЕКТЫ ПРОСТРАНСТВЕННО-ФУНКЦИОНАЛЬНОГО АНАЛИЗА МЕТРОПОЛИЗАЦИОННЫХ ПРОЦЕССОВ В РЕГИОНЕ

Аннотация. Рассматриваются особенности метрополитанизации как доминирующей тенденции организации экономического пространства, определены ее объективные предпосылки и факторы. Обобщены концептуальные подходы к пространственному анализу метрополитанизационных процессов в регионе. Представлены результаты интегрального оценивания развития метрополитанских функций городов в разрезе организационно-управленческой, экономической, инновационно-креативной, туристически-репрезентативной, культурной, научно-образовательной, транспортно-логистической и социально-демографической составляющих. Осуществлен пространственный анализ центрально-периферийных взаимодействий в регионе, а именно установлена зависимость развития прилегающей территории от уровня развития главных городов-метрополитанов, сложности и разнообразия их функционального статуса. Предложены приоритетные направления сбалансированной политики пространственного развития.

Ключевые слова: метрополитанизация; город-метрополитан; агломерация; урбанизация; региональная метрополитан; метрополитанское пространство; метрополитанские функции; пространственный анализ; политика пространственного развития.

Introduction. Relevance of the research of metropolis processes is due to objective factors and preconditions.

Firstly, priority of polycentric regional development model formation is given nowadays, which means increased functional role of cities (new powerful regional development centers) and establishment of metropolis habitats across the country, allows reducing regional disparities and negative effects of excessive concentration of resources in the capitals or individual world cities.

Secondly, establishment and development of metropolis functions of separate cities do not only contribute to balance of regional development in Ukraine, but also provide connectivity of the regions to the global relations and processes through

transfer of metropolitan pulses of development, arising out of international communication, organizational and information links on the surrounding area (metropolis areas).

Thirdly, referred above requires decentralization of power and increase of authority at regional and local units support to direct international connections and increased presence in foreign markets, along with the growing role of social and spatial centers in the regional integration. This will provide national public and economic space with powerful cores of high innovative potential (regional poles of economic growth) and hence will increase the competitiveness of the country and the region.

Brief Literature Review. The research of certain aspects of the metropolisation process impact on the economic space

organization, including demographic, socio-economic and institutional problems of regional metropolis and urban agglomerations were explored by such scholars as I. Bystryakov, O. Denysenko, M. Dnistrianskyi, T. Mazur, M. Nazaruk, Y. Palekh, G. Pidhrushnyi, U. Sadova, Z. Siroych, Y. Stadnitskyi, H. Steblyi, A. Topchiev, V. Chuzhykov, L. Shevchuk, S. Schultz, etc.; and foreign scientists E. Hlezer, G. Gorzelak, O. Druzhinin, V. Zmitrovych, C. Edans, R. Ledry, T. Markovskiy, T. Marshall, E. Soyva, R. Florida et al. However, at present, particularly important issues remain regarding streamlining of terminology about metropolisation, studying its role in the economic space organizing at the global, national and regional levels, conceptual approaches to spatial analysis of metropolis processes in the region organizing for the development of effective mechanisms to realize the potential of competitiveness of metropolis habitats within the public policy of regional development.

Purpose of the article is to generalize conceptual approaches to spatial analysis of metropolis processes in the region; integral evaluation of cities metropolis functions in terms of organizational, managerial, economic, innovative and creative, representative and tourist, cultural, scientific and educational, transport and logistics and socio-demographic component; centro-spatial analysis of peripheral interactions in the region.

Results. In the context of finding mechanisms to modernize the national economy on the basis of its territorial organization potential, it is important to have spatial and functional snapshot of studying metropolisation processes in areas associated with the concentration of economic, cultural and informational potential of society's development in major cities and areas of impact, implementation of their socially important functions in the global and macro-regional levels. From the vector and the level of development of the main metropolitan cities, the complexity and diversity of their functionality (status), depends development of adjoining territory, intensity of production and retransmission of administrative and technological innovation, achievement of higher samples of material and spiritual culture, regions entry to the global socio-economic space.

Research of metropolisation processes is realized through spatial analysis as a scientific field that is formed by a combination of theory and methodology of regional economics, economic geography and spatial economy based at territorial paradigm; as methodology for studying of economic systems from the position of justification of the spatial distribution of transformation and, in particular, optimization the location of production and population, inter-regional economic relations.

Geographical slice of metropolisation is explained by its deployment in a certain range (regions), regardless of the particular geographic situation (quantitative and qualitative parameters of the territory, specialities of the urban frame and positioning of the major centers, etc.), the degree and nature of the inclusion of the territory, especially of its centers (potential and actual metropolis), in cross-border cooperation, in territorial socio-economic systems of higher taxonomic ranks. Economic dimension of metropolisation containing in itself interaction of not so much on the «horizontal» (territorial relations between localized socio-economic phenomena), but on the «vertical» (spatial dimension of economic, social and political relations) [1]. The basis of metropolisation are such integration processes of territorial organization of society as placement processes (concentration, sintering, diffusion, etc.), territorial specialization and integration. These processes develop under the influence of globalization, regionalization and territorial and social inequality, which leads to the formation and activation of the largest centers of social space of special functions of public importance in global and macro-regional levels.

Metropolisation considered as the process of increasing the concentration of social, cultural, economic (financial) capital and information, modern forms of economic activity, innovation and creative and managerial capacity in some major cities, that have convenient «nodal» position, which is defined as neighborhood relations and evolved system of communication [2, p. 5]. The result of metropolisation is metropolis and the result of the metropolis – metropolis space. Moreover the city, claiming the status of «metropolis» should not only be a powerful pole of

diversified economic activity, power, wealth and consumption, accumulation and redistribution (management) financial, commercial, human and information flows, organize and control its metropolis space, but also positioned as a competitive economically; have current structure of the economy, focusing on innovation, services, high-tech industrial complex, infrastructure, stratified space; observed high with integration into modern communication and network investment and innovative absorption.

Spatial analysis of metropolization process should be carried out with the use of evaluation methods of statics, dynamics and prognosis of their spatial and spatio-temporal models, in particular [4; 3, p. 66]:

- method of comprehensive evaluation of area of objective assessment elements of the natural, social, economic origin, of its filling; set of interrelated components of natural and social character creates the structure of space and is projected on the territory of a certain organization – territorial (spatial); territory of the region is considered in terms of spatial and positional orderliness principle (under anisotropic space);
- method of indistinct sets – the method of «fuzzy» classification, in which each indicator is characterized by different degrees of belonging to all classes; used to model the processes of interaction;
- method of neural networks to classify multi-dimensional phenomenon in low and distorted information; allows to select and simulate different situations during their existence, evaluate and predict the development;
- catastrophe theory – one of the main methods for studying the qualitative leaps – allows to assess the possibility of emergence, development and disappearance of spatial structures and their elements;
- spatial autocorrelation – method that allows to estimate the spatial differentiation of structures; used for regionalization and zoning of the territory;
- fractal analysis – a method of describing and modeling of processes and phenomena that give rise to structures that have common characteristics and represent similar patterns in different spatial and temporal scales;
- method of «chi-square» – method that allows to estimate the probability of manifestation of events in different parts of the geographical area;
- system-structural method under spatial analysis allows to allocate separate elements of objects with systemic properties and the connections (in this approach are no dynamic characteristics as attributes of object);
- dynamic method is used for evidence-based forecasting and development strategies.

Spatial analysis should include evaluation of quality properties of metropolization environment that are implemented outside the metropolitan area due to inherent functions as an integral result of the system functioning, expressing its socio-spatial role – organizational, managerial, creative, informational, spiritual, cultural and communication [5, p. 83]. In particular, you should keep in mind that metropolis features of modern large city are generated by stock of enterprises of multinational companies; transnational financial and credit institutions; convenient transport links to national and international level; agencies and institutions of higher level services (accommodation, catering and leisure); institutions of higher education (universities), research institutes and technology centers; large and renowned cultural institutions (museums, theaters, orchestras), cultural events of national and international level; specific «spirit of place», «place of beauty», due to the nature of space [6, p. 129-131]. This functions of metropolis cities are those that have supra-regional character and implemented with the participation of institutions of the highest hierarchical level and their implementation causes synergistic effects of qualitative transformations in space.

By the scientific staff of the Sector of Spatial Development of the State Institution «Institute of Regional Research named after M. I. Dolishnyi of the NAS of Ukraine» metropolis functions of Ukrainian cities are systematized and evaluated based on the integrated indices of development in terms of organizational

and managerial, economic, innovative and creative, a representative and touristic and cultural, scientific, educational, transport and logistics and socio-demographic component (Figure).

To calculate the integral indices of metropolis functions of regional centers, a system of performance indicators for each of the functions (arox. 90) was argued, which then were standardized, relative to benchmark value, and synthesized in integral performance.

The analysis has shown that by a majority of functions Lviv city confirms its status as a regional metropolis that has higher, than other cities in the Western region, metropolis potential. The evidence of given conclusion and results by each integrated development indicator are as follows:

- coordination and management of set of social activity types, concentration and accumulation of international capital, localization of leading institutions at the national (regional) and international levels, broadcast of managerial decisions through diplomatic and administrative offices of a higher level (because the level of organizational and managerial functions of Lviv {integral index – 0,920} are three times higher, compared to other regional centers of the Western region of Ukraine {from 0,263 to 0,470});

- concentration of headquarters of economically powerful corporations and companies, financial institutions and banks, insurance companies, stock exchanges, service organizations in providing sophisticated services determined by the best conditions for placement these objects for networking and degree of development of metropolis economic space (the level of development economic function Lviv {0,829} more than two times higher, than other cities {from 0,326 to 0,444});

- generation of technological and social innovations and their spatial distribution on the basis of advanced technical and technological, scientific research, education and skill building; involvement in inter-regional research and education network (as by potential implementation of metropolis innovation and creative functions of the leader of Lviv {0,790} as the main center of diffusion and communication in the production of social innovation and scientific and technological experience and persecutor – Ivano-Frankivsk {0,663}, the value of the integral indicator of scientific and educational functions of Lviv {0,930} is significantly higher, than other cities in the region {from 0,094 to 0,356});
- the cultural center of supra-regional level, i.e., Lviv has a higher cultural and artistic potential and significant sacral and historical role in the formation and development at the national and international levels (development of cultural metropolis function {0,930} are three times higher, than other regional centers of the Western region {from 0,281 to 0,4});
- formation of a specific image of the city, metropolis, production and broadcast in a metropolis space of information flows to exchange market information, establish effective business contacts and cooperation in the future (benchmark samples of social experience) due to the higher concentration of sources of information-producers – the functioning of major advertising agencies, consulting, accounting and analytical companies, exhibitions, regular points of socially important meetings and national and international level (development of tourism and a representative and functions of Lviv {0,842} is significantly higher, than other cities {from 0,087 to 0,366});

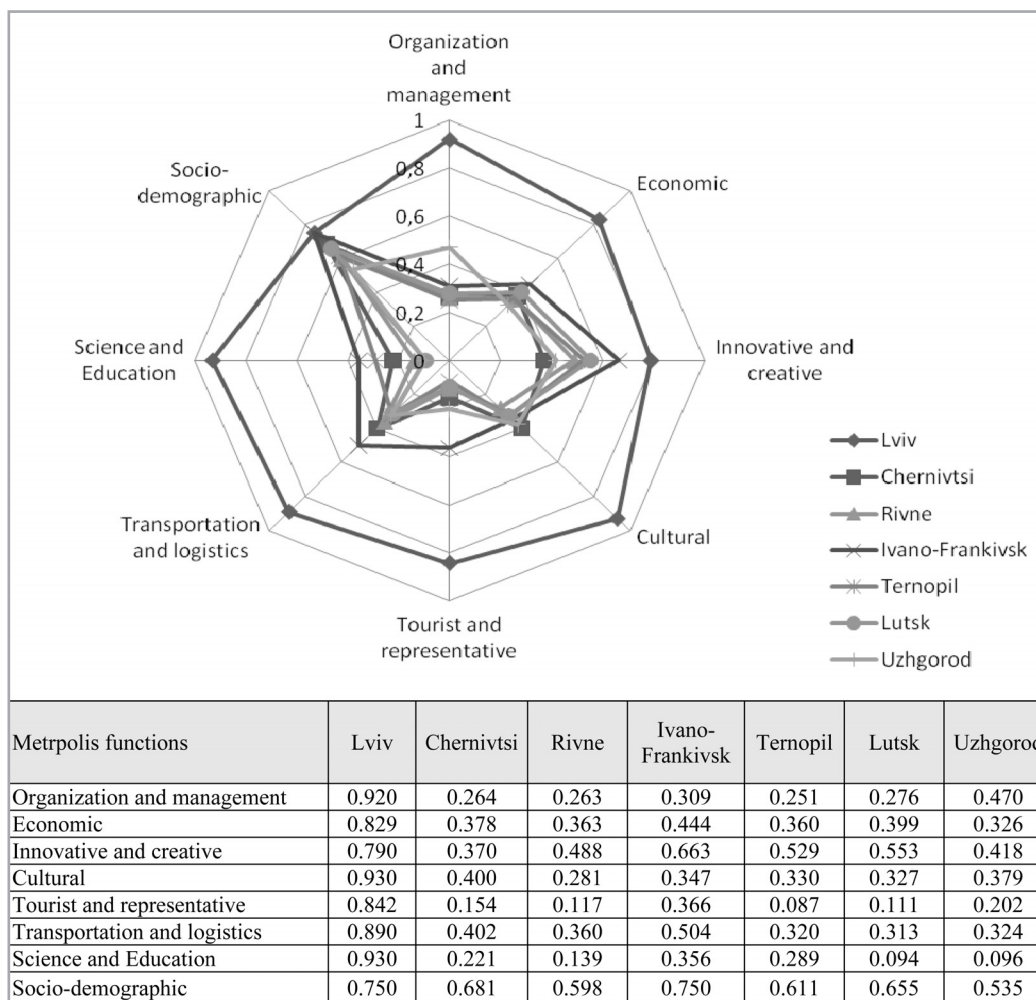


Figure: Integrated development indices of metropolis functions of regional centers of Western Region in 2013

Source: Author calculations

- support of transport and logistics connections over long distances and location of airports macro-regional and global significance (implemented through the port facilities, international airports, highways also transport corridors of international importance, large railway stations, inter-regional customs logistic terminals) and the development of infrastructure of leading forms of communication (the integral index of transport and logistics functions of Lviv {0,890} is more than two times higher, than in other cities {from 0,313 to 0,504}).

Socio-demographic bridge of cities is characterized primarily by the concentration of human capital (human resources capital, labor), which centers around the places of work and is the main user of social services for metropolization (urban) environment through higher compared to other settlements, quality of life, greater access to the labor market, health and social services, better living conditions. Lviv is not too ahead of the corresponding index to other regional centers of the Western region, which in most cases it catching up on the level and quality of social services, due to high competition in regional labor markets, real estate, health and other social services.

The intensification and concentration of socio-economic relations, the number and quality of «consumption» of urban space in areas metropolization is (resource, aesthetic, creative, innovative, recreational and other opportunities) in line with the post-industrial spatial transformation, importance and diffusion of managerial decisions, functional range (scale) of their impact serve as criteria that determine the presence (absence) of certain spatial functions of metropolis of social organization.

Given the fact that any area is heterogeneous regarding of influence transmission of generated by metropolis center (effects of «positive metropolization distribution»), the depth of their penetration by the territory will be different, which is manifested in the structural changes in the socio-economic region. Reaching effect of metropolization spread in spatial terms, i.e., the surrounding area and remote territories that depend largely on the absorption capacity of their economies to accept technological, managerial and social innovations, appropriate conditions and resources development, transport and communication corridors and networks, intellectual capital [7, p. 49].

Therefore, the research of center-periphery cooperation, based on qualitative assessment of Lviv region's socio-economic development dependence from its towns and villages proximity to the center of business activity – Lviv, has been worked out, in order to determine spatial zones with different intensity of main core influence (as generator of pulses and effects of «metropolization positive spread»). Selection of ranges of central, peripheral and half peripheral types, i.e. social and economic gaps was provided.

The analysis for 2008-2013 indicates the existence of a close inverse relationship between distance from the city and the socio-economic development of the areas that are in close proximity to the core (50 km), indicating a positive impact of location near Lviv, i.e. implementation of its metropolis functions. In particular, the correlation coefficients between indicators of distance to the city and the weights of the total area in the sense of employed workers ranged from -0.85 to -0.89; retail turnover of enterprises – from -0.81 to -0.84; freight of road transport – from -0.71 to -0.83; Engel coefficient weighted indicators of investment in fixed assets – from -0.57 to -0.89; investments into housing construction – from -0.83 to -0.92; net migration – from -0.62 to -0.88; the commissioning of housing – from -0.70 to -0.89.

It is clear that the intensity of influence on the development of the city districts is quite varied, hence the medium and the most remote areas of core impact are with less force. Accordingly, decreasing of investment activity by foreign investors as the distance from the core falls. However, in the area of intensive influence of Lviv in terms of retail turnover were all administrative districts (correlation coefficients > 0.56), indicating that by convergent development in trade, and explains, in particular, the market infrastructure development (large wholesale markets, including agricultural production, storage, databases, etc.)

and higher purchasing power demand in the regional center. Instead, migration processes are characterized by high intensity only in metropolis area of 50 km.

Thus, the influence of metropolization center on social and economic development of the administrative districts of Lviv region has centrifugal-zonal character, because the intensity of this effect decreases with the growth of distance from the core of regional centers of regional metropolis. The level of socio-economic development of territories is a derivative, depending, on one hand, from the power of generated by the core of development pulses, on the other hand, from the available local economic potential and capacity to absorb influences of metropolization center and other regional centers of business activity concentration (i.e., Stryi, Drohobych and Krasnohrad cities). A gradual «filling» of socio-economic gaps, in our opinion, is possible if the increase in level of metropolization core and adjacent areas development, i.e. territorial spreading of generated by the metropolis positive social and economic effects.

When justifying balanced spatial development policy, should be taken into account the fact that, along with territorial spread generated by the the metropolis of positive socio-economic effects, also take place new functional filling processes of major regional metropolises, their spatial expansion and, therefore, a possible further deepening of regional socio-economic disparities. Metropolization causes anisotropy of space, increasing asymmetry of the formation and development of different spatial patterns and formations. That is why, the role of regional metropolises as «economic locomotive» of the national and regional economies is determined by the existence of effective redistributive mechanisms that allow extend the term in a positive economic impact on a substantial territory.

Conclusions. At the core of redistributive mechanisms and spatial development of the regions should be balance of interests between metropolises and peripheral areas development. From one hand, it is the problems of urban environment conflict solution (increased range of job seekers, increased inequities in access to resources, strain social services and infrastructure, environmental degradation, etc.) and, from the other hand, introduction of reasonable redistribution, organizational and economic mechanisms of peripheral areas potential activation. This can be partly achieved by providing planning schemes in developing areas, in order to form needed around-metropolitan industrial zones with the deployment of new enterprises and industrial parks, IT companies, technopolises and logistics centers and the provision of tax preferences and subsidized support to enterprises, business relocation from metropolization center to growth potential regions (medium and small cities, villages). Proposed approach will improve the environmental situation in the cities and promote employment in surrounding areas. In turn, freed-metropolitan urban areas should be used primarily for the construction of new facilities of the quaternary sector, business infrastructure and enterprises of V-VI technological structures (modes). As a result, elimination of asymmetry in socio-economic development between certain depressed and prosperous areas will be provided due to the formation of the polycentric spatial development model of the region, increasing the economic potential of metropolitan cities complexes, as well as smaller towns of the regions.

Realization of the polycentric spatial development model is possible under conditions of economic and social inter-regional and intra-regional integration. In particular, the economic part demands:

- 1) creation of infrastructure networks (transport, information, financial) between cities with high potential for economic growth and less developed (rural) areas and small towns giving the greater financial autonomy in order to increase business activity at different administrative and territorial formations, the possibility pendular labor migration, capacity of capitalization of remote settlements, etc;

- 2) implementing of inter-regional cooperation model based on the principles of cohesion and mutual reinforcement of equal

growth centers (such as towns Drohobych and Truskavets-Boryslav, Chervonohrad, Sokal) by adjustment of interregional cooperation relations, implementation of joint projects for inter-urban agglomerations (economic dipoles) with the introduction of mechanisms of depressed surrounding areas effects neutralization.

However, social integration is possible under conditions of introduction in all the regions the same standards of living conditions (health, education, water supply, environmental safety) to exclude mobility by unacceptable living conditions; ensuring equal access to public transport, telecommunications, administrative, financial and other services to create spatial cohesion.

Summarizing the above, should be noted that the prospects to increase capacity of major cities metropolization as centers of creative, innovative and competitive economic activities are related to the expansion of intra, inter-regional and international relations, activation of inter-municipal cooperation, spatial optimization of economic clusters, institutional frameworks to encourage endogenous development factors, ie the effective use of internal growth potential.

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Received 10.10.2014

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Стаття надійшла до редакції 10.10.2014

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