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FUNCTIONAL AND TERRITORIAL STRUCTURE OF ECONOMIC AGGLOMERATION IN TRANSITION ECONOMIES: THE CASE OF THE CITY OF KIEV

ABSTRACT. The substance and theoretical fundamentals of development of economic agglomerations are considered. The general laws, principles and methodology of sustainable development of economic agglomerations in a transition economy are investigated. The territorial structure of the Kiev economic agglomeration and the ways to provide its sustainable development are analyzed.

KEY WORDS: economic agglomeration, Kiev (Kyiv) agglomeration, urban structural analysis, territorial organization, transition economy.

INTRODUCTION

The Eastern European countries, so-called transition economies, are now undergoing painful transformation of their functional structure and development of market economy. In many cases, their spatial evolution and economic growth depend on the level of development of urban territorial structures such as large cities and agglomerations. These produce more than 40–50% of a country's GNP and contain more than 60% of the total population (except Moldova). The rational territorial organization and sustainable development of agglomerations are now urgent for the countries of Eastern Europe. Nevertheless, most of them have irrational branch and territorial structure as a legacy of the Soviet regime. They encounter problems in settlement and transport networks, suffer from environmental pollution and depletion of resources as well as from predominance of heavy industries and a low level of development of the social sphere.

Ukraine has faced similar problems with development of large cities and agglomerations. Large agglomerations are developed without any scientifically justified spatial concept, which worsens their economic parameters and human living conditions. To solve the problems mentioned above and to create the necessary prerequisites for social and economic growth, Ukrainian geographers have proposed the concept of economic agglomeration, which includes not only the urban settlement system, but also the complex of various human activities that also agglomerate with each other in a limited urban area. The investigation of the substance and general principles of economic agglomeration as well as of the methodology of their rational territorial organization would assist in stabilizing the national economy of Ukraine and in giving potential for further growth.

THEORETICAL FUNDAMENTALS

Nowadays, agglomerations appear to be the key form of territorial organization of human activities in transition economies. Indeed, they are not only the forms of human settlement. The majority of labour forces, enterprises and services are concentrated in relatively small parts of urbanized territory having definite benefits of their location. Most of the advanced, progressive and internationally-oriented branches of economy are developing in agglomerations more intensely. Therefore, this form of territorial organization in a transition economy gains a lot of social and economic advantages of location and development of various kinds of human activities in a highly communicative and comprehensively integrated environment.

According to the afore-mentioned assertions, the agglomeration is a complex form of territorial unit that includes not only the urban settlement system, but also industrial enterprises and social institutions. So, the previous viewpoints on agglomerations seem to be imperfect. Most of the features of this territorial formation are described by the term ‘economic agglomeration’, proposed by S. Ischuk and A. Gladkey (Ischuk and Gladkey, 2005). Economic agglomeration, in contrast to ‘urban agglomeration’ or ‘industrial agglomeration’, includes all components of an economic complex and infrastructure with labour forces and land/natural resources. The concept of economic agglomeration is based on the theory of economic region well-known in regional studies and economic geography (Kuciński, 2004: 76; Domański, 2005; Korenik, 1999; Węławowicz, 2003; Gorzelak, Smętkowski, 2005; Czornik, 2004).

The economic agglomeration is known to be a compact functional and territorial, technological and economic as well as social integration of enterprises and institutions for various kinds of human activities based on a concentrated urban settlement system, intensive communication and a number of relations

(industrial, social, ecological and administrative). The economic agglomeration is characterized by integrated interdependent development and produces an additional socio-economic effect.

So, economic agglomerations integrate various industrial and agricultural enterprises, social institutions (general communal services, trade, cultural, educational, scientific, recreational and tourist spheres) as well as the infrastructure based on a united system of settlement, transportation and communication. An economic agglomeration includes the territory with a maximum concentration of the afore-mentioned relations, developed around a large city or cities.

It is known that development of economic agglomerations in a transition economy is based mainly on the functioning of an industrial complex in large cities and their satellite towns. They are characterized by common use of the territory, natural resources, industrial infrastructure and scientific basis as well as by close relations of industrial cooperation and combination. The key branches of industry gain a lot of additional advantages in economic agglomeration due to concentration and specialization processes. The auxiliary and attendant industrial branches, which are related to the main production cycle, are also developing fast. Their integration, interrelation, innovative character and modularity are rising rapidly. Moreover, the development of the social sphere, especially in the non-profit sector, is hampered due to historical factors, economic reasons and lack of administrative resources. So, most agglomerations in Eastern Europe face economic and social problems described in the introduction. Their sustainable development should be based on the concept of 'economic agglomeration' that includes all components of human activities in a highly urbanized territory.

Economic agglomerations determine the location of the main part of productive forces in transition economies. Their development has a key impact on the national economic complex, settlement system and population growth as well as on the scientific, cultural and intellectual potential. Therefore, investigation of a rational territorial organization and sustainable development of economic agglomerations is becoming more urgent.

METHODOLOGY OF RESEARCH

Various methods and methodological approaches are developed for investigation of economic agglomerations. The development of economic agglomerations in transition economies is based on objective laws and principles (Domański, 2005: 26; Deelstra, 1998; Geenhuizen and Nijkamp; Pistun, 1989; Pistun et al., 1989; Sluka, 1994). The common methods are the systematic approach, structural analysis and synthesis, socio-geographical modeling, statistical method, generalization, etc. Most of them can be used in our investigation.

The method of territorial zoning can be used to analyze all the components of agglomeration development. This method consists in the delimitation of specific belts and zones in the agglomeration territory with a different functional structure and communication intensity. Each zone (belt or sector) of the agglomeration concentrates specific industries and human activities (Ischuk and Gladkey, 2005). Such zones have been delimited by different indices of urban concentration, industrial, social and infrastructural development, distribution of transport and communication systems and take into consideration administrative and territorial division of the territory. This method of territorial zoning and the afore-mentioned theoretical fundamentals permit to explore the territorial structure of the Kiev Economic Agglomeration and to distinguish general problems and trends of its development in Ukraine.

Table 1 presents the comparison of structural zones of the Kiev to structural zones of selected world agglomerations. Kiev agglomeration areas have been calculated using gravimetric method Every next zone in the table include all previous ones.

Table 1. Structural zones of selected world agglomerations

STRUCTURAL ZONES	KIEV	MOSCOW	LONDON	TOKYO	NEW YORK
Historical urban nucleus	Historical central hub: (Starokievskiy, Podilskiy districts (29.98 km^2 , $151.6 \text{ thous. people}$)	Center inside of Sadovoye circle highway (18.7 km^2 , $0.2 \text{ million people}$)	City, Westminster, West-End (26 km^2 , $0.2 \text{ million people}$)	Chiyoda, Chuo, Minato regions around the Imperial Palace (42 km^2 , $0.3 \text{ million people}$)	Southern part of Manhattan island (25 km^2 , $0.5 \text{ million people}$)
Central zone	Central zone inside of circle railways (175.55 km^2 , $986.8 \text{ thous. people}$)	Central zone inside of circle railways (80 km^2 , $1.9 \text{ million people}$)	London county (The City and 12 districts of inner cycle (311 km^2 , $2.5 \text{ million people}$)	City districts Chiyoda, Chuo, Minato, Shibuya, Sinjuku, Bunkyo, Taito (97 km^2 , $1.25 \text{ million people}$)	New York county and Manhattan island (57 km^2 , $1.4 \text{ million people}$)
The city in origin borders	Kiev inside peripheral belt and half-circle motorway (421.08 km^2 , $2,586.6 \text{ thous. people}$)	Moscow inside circle motorable highway ($1,060 \text{ km}^2$, $8.6 \text{ million people}$)	„Large London” City, 12 inner and 20 outer districts ($1,580 \text{ km}^2$, $6.7 \text{ million people}$)	Large Tokyo – 23 districts (621 km^2 , 8 million people)	New York City (Manhattan, Bronx, Queens, Brooklyn, Richmond) (781 km^2 , $7.1 \text{ million people}$)

The city as agglomeration nucleus with inner suburban belt	Kiev with forest belt (827 km^2 , 2,631.9 thous. people)	Moscow with forest-protection belt ($2,600 \text{ km}^2$, 9.9 million people)	„Large London with the first inner metropolitan area ($5,400 \text{ km}^2$, 9.8 million people)	Large Tokyo (prefecture of Tokyo) – 23 districts and islands. ($2,187 \text{ km}^2$, 11.8 million people)	<i>New York metropolitan urbanization area – (7,272 km^2, 15.6 million people)</i>
City agglomeration	Kiev with suburban zone (12.3 thous. km^2 , 3,331.9 thous. people).	Moscow with suburban zone ($13,400 \text{ km}^2$, 12.7 million people).	London metropolitan area ($11,400 \text{ km}^2$, 12.1 million people)	Tokyo-Yokohama metropolitan area ($13,584 \text{ km}^2$, 32.7 million people).	<i>New York agglomeration statistical consolidated area (14,400 km^2, 16.6 million people)</i>
Metropolitan area	Kiev and Metropolitan oblast. (28.9 thous. km^2 , 4,512.3 thous. people)	Moscow and metropolitan oblast ($47,000 \text{ km}^2$, 15.4 million people)	Southeastern UK ($27,400 \text{ km}^2$, 16.8 million people)	Metropolitan region 8 prefectures- ($36,914 \text{ km}^2$, 40.5 million people)	New York Regional Planning Association territory ($33,254 \text{ km}^2$, 19.2 million people)

Source: elaboration by authors.

TERRITORIAL STRUCTURE OF THE KIEV ECONOMIC AGGLOMERATION

According to the earlier investigations carried out by Ischuk and Gladkey from the Taras Shevchenko National University of Kiev, the Kiev Economic Agglomeration has a completely developed belt-sector structure (Ischuk and Gladkey, 2005). There are 7 functional belts with unique specialization and territorial location (Table 2). Each belt includes different human activities and has specific problems of regional development. There are 5 belts located in the city of Kiev and only 2 are located in the peripheral zone. Indeed, the capital of Ukraine has developed as a highly urbanized and concentrated area. Kiev has a high level of development of communications and profound integration of various human activities. Therefore, Kiev has got a more complicated territorial structure than its suburbs.

Besides belts, Kiev Agglomeration has some functional sectors. There are 5 sectors in the city of Kiev and 7 in its suburbs (Fig. 1). City sectors have developed due to the internal differentiation of Kiev. Their borders correspond to economically-planned areas of the capital of Ukraine. Peripheral sectors

are based on 7 radial transport lines converging from different directions to Kiev. Below, we will consider the territorial structure of the Kiev Economic Agglomeration by dividing it into separate components.

Table 2. Functional zoning of Kiev Economic Agglomeration

FUNCTIONAL BELTS OF KIEV ECONOMIC AGGLOMERATION	MAIN FUNCTIONS AND HUMAN ACTIVITIES
1) Historical core of Kiev: – 29.98 km ² – 136,800 inh.	Political and administrative; management; diplomatic; historical and architectural; religious and spiritual; educational; cultural; art; business; commercial; scientific-innovative functions; machine-building, instrument-making and light industries, tourism.
2) Central belt of Kiev, bordered by historical buildings and the Dnieper river bank: – 40.48 km ² – 260,650 inh.	Educational; commercial; cultural; recreational; planning-and-design and research-and-production functions; precision engineering; machine-building and instrument-making industries; machine-tool construction; electrical engineering; radio electronics; light and food industries
3) Middle belt of the city, bordered by circular railway: – 105.09 km ² – 767,400 inh.	Settlement; scientific-innovative functions; river shipbuilding; machine-building, precision instrument-making, computer-making, food and flavoring industries; sphere of everyday and regular services; specialized secondary and higher education.
4) Peripheral belt of the city, bordered by newly-erected building blocks: – 245.53 km ² – 1,453,650 inh.	Settlement; heat and power supply; chemical and pharmaceutical, machine-building and repair industries; light and food, timber, paper, furniture and rubber industries; industry of synthetic fabric; natural-recreation functions; scientific and technical, innovative and educational functions; sphere of everyday, regular and episodic services.
5) Forest park belt with settlement/industrial areas – 405.91 km ² – 18,300 inh.	Recreational, medical and sanitary functions; specialized medical and sports functions; tourism; environmental protection
6) The first agglomerated belt which includes neighboring suburban towns: Vyshgorod, Brovary, Boryspil, Ukrainka, Obukhiv, Trypillya, Vasylkiv, Boyarka, Vyshneve, Irpin and others: – 2,354 km ² – 788,200 inh.	Settlement; power supply; powder metallurgy; machine-building, instrument-making, chemical and petrochemical industries; production of building materials; glass, porcelain and faience industries; timber, wood, pulp and paper industries; municipal services for the capital; high-intensity agriculture and food industry; hothouse market-gardening; greenhousing; scientific, specialized educational (secondary and higher), recreational and transport functions
7) The second agglomerated belt that includes distant suburb towns and their regions: Ivankiv, Baryshivka, Fastiv, Makariv, Borodyanka and others. – 10,986 km ² – 280,400 inh.	Middle-intensity suburban agriculture; light and food industries; production of building materials; timber, wood, pulp and paper industries; machine-building and instrument-making industries.

Source: elaboration by authors.

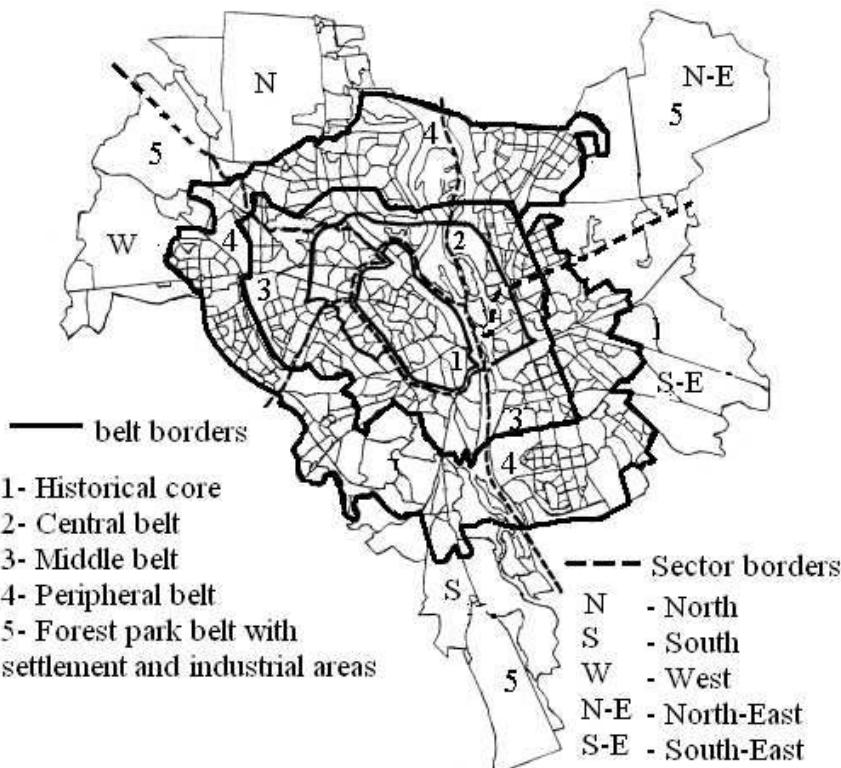


Fig. 1. Territorial structure of the city of Kiev

Source: elaboration by authors.

The historical core of Kiev occupies 3.6% of the total city area and includes 5.2% of the total population. This territory has a high level of development of domestic and international political, administrative, public management and diplomatic functions. The Supreme Council (Rada) of Ukraine, Government, Presidential Administration and representative offices of international organizations, embassies and consulates are located here. The historical core fulfills various religious, cultural, educational, scientific, tourist, public and business functions. A lot of historic places and architectural monuments from the 11th to the 20th century are located here. Some of them are under the protection of UNESCO (Kiev-Pechersk Monastery ‘Lavra’, St. Sophia’s Cathedral).

Furthermore, the historical core carries out industrial functions such as machine-building and light industry. Residential areas have also developed in it.

The functions of public management including all national, regional, municipal and local authorities are concentrated here in excess. Among scientific

institutions, there are plenty of humanitarian academic institutes, design centers, information and archival centers as well.

Nowadays, the Kiev center has a highly developed network of elite mercantile businesses which is displacing the everyday and regular services. The historical core is overcrowded with transport and traffic jams arise everyday. The historical core continues to fulfill its industrial, transport and research-and-production functions being non-specific for them. The representational and metropolitan functions are still insignificant here. Moreover, some local authorities and institutes of secondary education should be removed from the city center and moved to other parts of the city.

The central belt of Kiev (*includes 4.9% of the total area and 9.8% of the total population*) contains those institutions of science, education, trade, tourism and culture which were displaced from the historical core. A lot of specialized academies, technical universities and high schools are located here. Research institutes, design offices, construction and technical institutes are also situated here.

The industrial sector is represented by the precision engineering, shipbuilding and instrument-making industries as well as light and food industries. The east side of this belt has recreational functions based on resources of the Dnieper river. Only a few separated areas in the central belt contain historical monuments and public places. A lot of outdated industries, ramshackle housing and uncovered roads can be found throughout this area. The central belt of Kiev requires complex reconstruction and development of representative, internationally-oriented functions in the territory of ex-industrial zones. Currently, the problem of irrational transport development and communications between the Dnieper banks has become urgent.

The middle belt of Kiev (*includes 12.7% of the total area and 29.1% of the total population*) has a highly developed industrial sector, especially machine-building, transport-building, precision instrument-making, computer-making, machine-tool, electrical engineering industries as well as radio electronics, light and food industries. There are several research institutes and also institutions of secondary and specialized education.

The main function of this belt is settlement. About 30% of the total population is living here. Therefore, most territorial resources in this belt are residential areas. The main problems of this belt are insufficient municipal improvements, low quality of general communal services, environmental pollution and traffic congestion.

The peripheral belt of Kiev (*includes 29.68% of the total area and 55.12% of the total population*) is the most populated area in the capital. More than a half of Kiev citizens are living here. The dominant functions are settlement, general communal services and education.

There are a few industrial plants in this belt. They are located in several industrial centers specializing in heat and power supply, machine-building and general engineering, chemical and pharmaceutical industries, production of commodities and consumer goods. Some scientific research institutes are located near the industrial zones and form metropolitan technopolis. The functions of public services, medical care and general communal services are highly developed in the peripheral belt. Nevertheless, most of them are of a very poor quality and the number of services is small. Furthermore, the main problems of the peripheral belt are environmental pollution, transport congestion, overpopulation as well as insufficient municipal improvements.

The forest park belt with settlement-and-industrial areas (*includes 49.0% of the total area and 0.7% of the total population*) has a low level of economic development and population density. This belt keeps in reserve natural landscapes of the buffer environmental protection area and contains additional recreational, medical and sanitary facilities. The density of industrial development and population settlement is limited by sanitary standards.

Kiev has 5 sectors of its territorial structure developed in the urban territory. We will not consider each of them in detail, but will only indicate their specialization. The northern sector is specialized in settlement function and in machine building. The western sector is also developed as the settlement area and has a lot of educational institutions. The southern sector is predominantly industrial and scientific. This is the main area of the Kiev technopolis development. And two eastern sectors also concentrate most of the population and develop chemical, pharmaceutical, power supply and food/light industries.

The suburb zone of the Kiev economic agglomeration has 2 functional belts.

The first agglomerated belt (*includes 17.7% of the total agglomeration territory together with Kiev and 74.76% of the total suburb zone population*) has the most intense economic, labour, cultural and recreational relations with the metropolitan city. The main functions of this belt are decongesting the urban areas, supplying the agricultural and food industry products and developing the recreational green zones and parks. Many industrial enterprises of this belt (powder metallurgy, machine-building and instrument-making industries, power supply, chemical industry, production of building materials, glass, timber, wood, pulp and paper industries) have close relations with the metropolitan ones in the field of science, applied research, logistics, commercial functions, etc. There are international transport system, innovation and scientific-research organizations, educational and recreational centers in the first agglomerated belt. The latter is characterized by a high level of urbanization and a high population density.

So, the first agglomerated belt is somehow a sequential part of Kiev. It has intensive relations with the capital in a variety of ways. The first agglomerated

belt has a lot of problems. Most important of them are environmental pollution (especially near the thermoelectric power station), outdated equipment, development of unprofitable businesses, poor living conditions, lack of municipal improvements and a low level of general communal services. Insufficient development of the social sphere leads to the growth of so-called ‘pendulum migration’ (or migration of labour forces) from this agglomerated belt to Kiev. According to (Ischuk, 2005: 78) and (Pistun, 1989: 67), about 200,000 of the first belt inhabitants come to Kiev for work every working day.

The second agglomerated belt (*includes 82.3% of the total agglomeration territory and 26.23% of the total suburb population*) is specialized in suburban agriculture, food, machine-building, chemical, timber, wood, pulp and paper industries. It plays an auxiliary and attendant role in the agglomeration’s economy. This belt is at a lower level of development than the rest of the agglomeration territory. Many industrial enterprises make no profit or are closed completely. This is a predominantly agricultural and depressed region. Most of progressive industrial enterprises and social institutions were moved to Kiev or to nearby suburbs. In this belt, the process of rapid depopulation, labour migration to the central core and a decrease of economic activities is taking place. Most of the northern territories of this belt suffer from radioactive pollution after the Chernobyl disaster. Inhabitants living in this belt have a very low income and many of them are unemployed. The territory of the second agglomerated belt needs structural economic and social changes.

There are 7 structural sectors in the suburban zone of Kiev agglomeration. The three northern sectors are specialized in chemical industry, powder metallurgy, timber industry and agriculture. They have environmental problems and suffer from radioactive contamination. The western and eastern sectors are predominantly agricultural. They also have food and light industries. The most developed are the southern and the south-western sectors. The first is specialized in power supply and drastically pollutes the environment; the second is a region of high-tech industry and know-how, instrument-making industry, precision engineering, aircraft building and electrical engineering. This is part of the Kiev technopolis.

After examination of the current situation of the Kiev agglomeration’s development we can consider and substantiate the main directions of optimization of its territorial organization and of its sustainable development.

THE WAYS OF OPTIMIZATION OF KIEV ECONOMIC AGGLOMERATION'S DEVELOPMENT

According to earlier investigations (Ischuk and Gladkey, 2005), we can summarize the main ways of optimization of Kiev economic agglomeration's development.

The historic core of Kiev needs to lower its industrial, settlement and transport functions. Main activities for this territory should be public management, international, representative, historical and cultural functions, tourism as well as the development of cultural-spiritual and public centers. **The central belt of Kiev city** should remain a territory of commercial and business activities, local authorities, academic science and education. **The middle belt of Kiev city** is a promising area of science-intensive technologies, applied science and metropolitan technopolis development. These functions can be maintained, first of all, in this belt via attracting foreign investments. **The peripheral belt of Kiev city** requires optimization of the settlement and transport system, decrease in environmental pollution, development of general communal services and social care. **The forest park belt** is suitable for the development of a recreation system, specialized sports centers and areas of nature conservation. All the aforementioned suggestions are included now in the program of 'Kiev-2020 socio-economic development'.

Now let us analyze the suburban zone of the Kiev agglomeration. **The Northern sector of the suburban zone** is a territory of natural and environmental protection (after the Chernobyl disaster) and of light and food industries development (in the first agglomerated belt). **The North-Western sector of the suburban zone** is maintained as a recreation area, region of growth of building materials production, machine-building and agricultural machine-building, timber and wood industries as well as additional educational functions. **The Western sector** requires development of an agricultural complex (livestock-breeding) and food industries based on the economy of private farmers. **The South-Western sector** is charged with scientific-innovative activities and modular industrial enterprises based on the Kiev technopolis. This function will be combined with the development of additional residential areas, rapid communication and educational systems. **The Southern sector** has a large potential for further development of natural protection regions and recreation areas. This sector needs application of environmentally appropriate technologies. **The Eastern sector** will remain specialized in agriculture (vegetable-growing, potatoes-growing, dairy farming, poultry keeping and fruit growing). In addition, light and food industries and machine-building will be developed in this sector. And the last **North-Eastern sector** will be specialized in powder metallurgy,

chemical and machine-building industries (which have close relations with Kiev enterprises) as well as the agricultural complex. Additional residential areas, educational and scientific institutions and recreational areas will be developed in the sector in the near future.

CONCLUSIONS

So, we have analyzed the territorial structure of the Kiev economic agglomeration and revealed specific problems of its sustainable development. These problems are the same as those in other metropolitan agglomerations of Eastern-European transition economies. Indeed, these countries encounter similar processes of privatization and commercial growth, development of postindustrial activities as well as optimization of the urban territorial structure based on a market economy (rather than on a command-administrative system). The government support of these processes is highly required for further European integration of these countries, for development of innovative and progressive human activities as well as for improving living conditions. The concept of economic agglomeration and its rational sustainable development is one of those scientific projects which could be used by the state authorities to provide the afore-mentioned measures for highly urbanized metropolitan areas. The results of the present investigations will help rationalize the territorial organization and provide better conditions for the sustainable development of the key regions of economic and social growth in transition economies.

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