

*Paulina Tobiasz-Lis**, *Marcin Wójcik***

DEMOGRAPHIC AND FUNCTIONAL POTENTIAL OF THE NOVOSIBIRSK URBAN REGION IN RUSSIAN FEDERATION A CASE STUDY OF TRANSFORMATIONS USING THE DIRECTIONAL PROFILE METHOD

Summary. The research presented in this article focuses on the urban region of Novosibirsk, which is one of the most industrialized part of Siberia and the Asian part of Russian Federation. To show relationships between the city as the core of the region and its peripheral area a case study analysing territorial units within the southern settlement belt along the Novosibirsk–Cherepanovo regional railway line over a distance of approx. 100 km. This belt was chosen because of the continuity of the settlement and due to the presence of different functional types of edge towns. The adopted system, from the core to the area of weakening direct links to Novosibirsk, helped to define the directional profile of the urban region as relating to the demographic and economic characteristics.

The research was based on two methods of determining the functions of cities in the national settlement system: a research programme concerning the genesis of functional development and a research programme of specialised functions, the purpose of which is to determine the economic base (exogenous functions) of territorial units. The presented results have shown general tendencies in the transformations of the Novosibirsk urban region's spatial structure, both in long-term perspective (the generic view of function development) and under contemporary circumstances related to the economic transformation of Russia.

Keywords: industrialized urban region, population change, economic base, functional structure.

1. INTRODUCTION

Each region is a territorial social system which, due to various external and internal factors, changes over time in economic, social and spatial terms (Chojnicki 1988). In addition to the demographic, social and economic aspects, these transformations are also spatial. From the standpoint of economic geography, changes in the spatial structure of respective settlement systems are important. These structures are most often identified and interpreted in the context of various imbalances in spatial planning, which refers primarily to the assessment of changes in the functional and material (morphological) areas.

This paper focuses primarily on functional and spatial transformations. The adoption of functional methodology entails certain consequences in the research procedure,

* University of Lodz, Faculty of Geography, Department of Regional and Human Geography.

** University of Lodz, Faculty of Geography, Department of Regional and Human Geography.

i.e. it requires the study of the settlement as a whole (settlement subsystem), as well as a notional apparatus developed for the research of urban functions.

The study focuses on the urban region of Novosibirsk, as a settlement subsystem, in which strict (direct) relationships between the city as the core of the region and its peripheral area (area of influence of the core) can be seen. The formation of an urban region is an effect of functional specialisation (specialised areas) on a regional scale (Korcelli 1981; Rykiel 2002). The concept of “urban region” (“functional region”) refers to the observation of the daily movements of the population, with the relationships within the regional public transport system.

Functional and demographic analyses in this paper concern the whole core of the urban region, i.e. the city of Novosibirsk and its direct vicinity (Novosibirskiy District)¹. In the peripheral area of the urban region a case study was conducted (fig. 1). The case study analyses territorial (administrative) units forming the southern settlement belt along the Novosibirsk–Cherepanovo railway (the terminal station of regional railway) over the distance of approx. 100 km. This belt was chosen not only because of the continuity of the settlement, but also due to the presence of different functional types of edge towns, from Berdsk, tightly connected to the core, through Iskitim, intensely industrialised during the Soviet era to Cherepanovo – a peripheral local centre. The adopted system, from the core to the area of weakening direct links to Novosibirsk, helped to define the directional profile of the urban region as relating to the studies characteristics (demographic and economic).

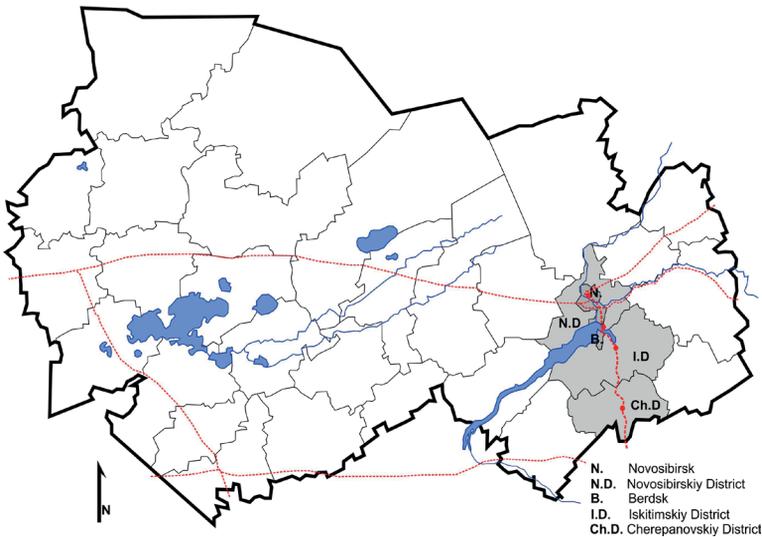


Figure 1. Territorial units selected for the study against the administrative division of Novosibirskiy Region into districts

Source: own study.

Research methodology refers to the functional concept that has been developed in economic geography since the 1940s (Dziewoński 1971; Jerczyński 1973; Suliborski 2010). In this case, we focused on two methods of determining the roles (functions) of cities in the national settlement system, namely

– **a research programme concerning the origin of functional development**, which focuses on the evolution of the functional development of cities (urban regions), viewed as a historical process. Research in this area relies on a specific “reading” of the history of the city, in which certain stages can be distinguished in relation to functional factors, the processes of functional transformations and their effects in the form of respective functions (functional structure) and the institutions responsible for their existence,

– **a research programme of specialised functions**, the purpose of which is to determine the economic base (exogenous functions) of territorial units. The economic base is the sector of activity in a given city, which is responsible for the creation of relationships with its surrounding, and thus the formation of the settlement system of the country (Suliborski 2001, 2010).

2. THE GENESIS OF THE DEVELOPMENT OF FUNCTIONS IN NOVOSIBIRSK URBAN REGION

The development of each city is closely associated with the fulfilment of specific dominant functions, whose type and transformation dynamics form its social and spatial specificity (Jewtuchowicz, Suliborski 2009). Functions are the main attributes of a city, and any changes to them are a result of a variety of causal factors, defined by A. Suliborski (2010) as functional factors. The identification and dynamic analysis of the functional factors and designates of certain functions in the form of institutions appointed to perform certain activities, forms of land use planning, social behaviours, allows the identification of functions present in a city at a given time, as well as the formulation of generalisations concerning functional processes and phases that the city went through during its history.

In this section we present the model of transformations in functions and the functional structure of Novosibirsk, which consists of functional factors and related processes, as well as functional phases with specific dominant functions (Figure 5). Since the concept of function relates directly to the forms of land development and use, the analysis also takes into account morphological problems, paying attention to the most characteristic forms in different phases of functional development of the city.

¹ The Novosibirsk urban (functional) region includes the south-eastern part of the administrative region.

Functional history of Novosibirsk is discussed by distinguishing four processes that form the functional structure of the city and six stages that generalise the character and behaviour of the most important functions. A characteristic feature of this case is that functional changes mostly depend on external factors, which usually result in strong dynamism of functional processes. The history of Novosibirsk shows how the sequence of decisions taken by the central government have led to the creation of the strongest urban region of the Asian part of Russia within the Siberian taiga.

The first stage is associated with the colonisation of Siberia by the Russians, which took place in the seventeenth and eighteenth centuries. Back then, the area now occupied by Novosibirsk was a series of settlements with agricultural, craft and trade functions. At the end of the nineteenth century, Tsar Alexander III issued a decision to route the main line of the Trans-Siberian railway through the area (Ob station). Owing to the extremely favourable geographical location at the intersection of important routes, the Trans-Siberian railway line (linking Siberia and the European part of Russia) and near the navigable river Ob connecting the north and south of Siberia, Novonikolayevsk (later Novosibirsk – a settlement on the right bank of the river), was quickly developing and received municipal rights in 1903. The railway bridge over the river Ob marked the main compositional axis of the city – Novonikolayevskiy Prospect (Krasnyi Prospect today), along which the marketplace and development plots were plotted (Nevzgodin 2005) (Figure 2). The Trans-Siberian Railway which required continuous expansion was a very important factor in the development of industry in the city. Agricultural machinery and food processing plants were created.

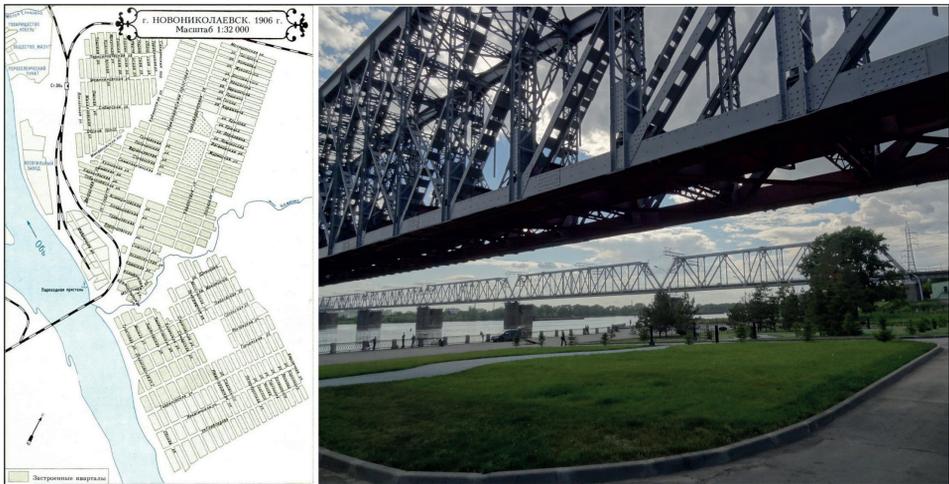


Figure 2. The spatial structure of Novosibirsk in 1906 and the railway bridge on the river Ob.
In the foreground a span of the bridge from 1893

Source: own study based on <http://nsk.novosibdom.ru/>.

After a period of political and economic instability caused by revolutions and civil war in Russia in 1917–1920, a phase of dynamic development of the city followed, which was associated with the New Economic Policy by V. Lenin and the rule of J. Stalin. There were investments in railway infrastructure (new connections between the city and the south of the country, as well as the Kuznetsk Basin) and the industry, including the construction of a new port. At the same time, public buildings were created and the construction of the first tram line in the city started. Rapid population growth necessitated massive investments in housing. Authorities invested in education. The city expanded in the style of slowly emerging socialist realism. Broad tracts and spacious squares meant as meeting places for the inhabitants dominated. Newly constructed buildings used numerous decorative elements such as attics, colonnades, pilasters, high ground floors, which gave them monumental character (Nevzgodin 2005). During this period, along with the expansion of regional railway connections, town rights were given to rural settlements around Novosibirsk such as: Cherepanovo (1925), Berdsk (1929), Iskitim (1938), with dominant industrial functions (extraction of raw rock, mineral industry, construction, food industry), forming the seeds of industrialized urban region.

The second stage of the dynamic development of Novosibirsk under the centrally planned (communist) economy covered the years 1941–1945, when over 300 industrial plants from the western part of the USSR were evacuated to the city. Production profile changed from light to heavy industry (mainly armaments). Most of the plants operating during the war were temporary, often housed in public buildings such, as schools or churches. The dynamic development of industrial functions took place at the expense of recession in other municipal functions – especially residential, cultural and educational.

After World War II, during the Cold War and the arms race, the plans of the central authorities of the USSR assumed further development of Novosibirsk as a major heavy industry and process engineering centre (Seth 2007). To this end, modernisation of existing plants and the construction of new ones started, with both mostly associated with defence industry. The city became an important centre for the machinery, electronics, chemical industries, as well as metallurgy and mining. The accumulation of large industrial plants required the creation of scientific and research base. In addition to the Siberian Branch of the Academy of Sciences of the USSR, several specialised higher education institutions were created. In 1957, the Council of Ministers of the USSR approved plans to establish the Akademgorodok research centre, which consisted of more than 40 research institutes, State University, as well as housing facilities for researchers and students and a rich social infrastructure. This led to a rapid development of scientific, housing and educational functions of the city, while significantly expanding its spatial range southwards (Nevzgodin 2005) (Figure 3). The same year, a new Tolmachevo airport was opened, which further strengthened

the strategic (in terms of communication) location of the city. The 1960s and 70s saw intensive development of residential areas based on the prefabrication technology, as well as the technical and social infrastructure of Novosibirsk and other cities in its agglomeration. Parks, greeneries and recreational areas were created. Works on a subway system were also started. The 1980s were characterised by economic slowdown and the end of large investments.

Political and economic transformations of the 1990s caused by the dissolution of the USSR and the transition to the market economy led to the closure of numerous plants and factories, as well as to the previously unknown level of unemployment. Currently, Novosibirsk is rebuilding its former importance. The city is the administrative centre of the Novosibirsk Region and the Siberian Federal District. In addition to powerful industrial plants, the city has a rapidly growing service sector providing primarily services for manufacturers and businesses, as well as commerce. The process of adapting functional structure of the city to the new political and economic conditions can also be seen in the microscale, in the Akademgorodok scientific and research centre, which is expanding due to the inflow of foreign capital and new investments associated with the high-tech industry. In 2006, at the initiative of the Siberian Branch of the Russian Academy of Sciences, as well as the authorities of the city and the region, a technological park was created to support innovative enterprises.

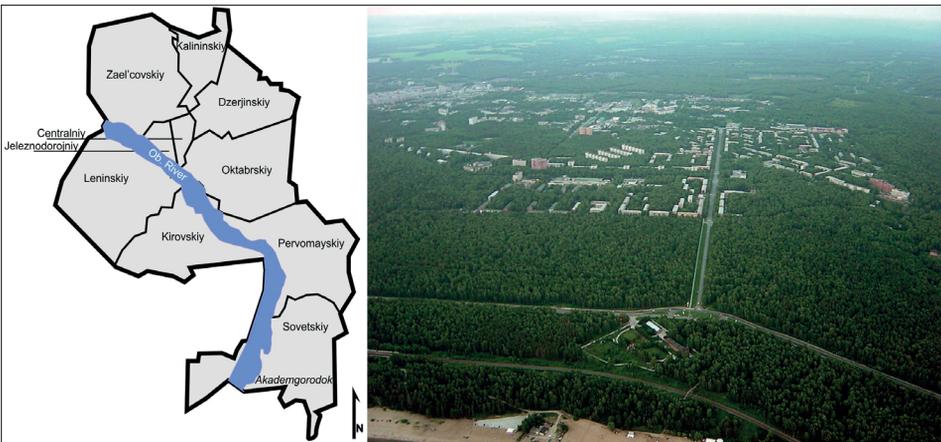


Figure 3. Akademgorodok scientific centre on the background of the administrative division of Novosibirsk City

Source: own study based on wikimedia commons.

Transformations of the functional structure of Novosibirsk in new political and economic conditions after 1991 were directly reflected in the spatial structure of the whole urban region. When subjected to the laws of the market,

space transforms in both quantitative and qualitative terms. New forms of development emerged such as shopping centres, banks, office buildings, mainly related to the influx of foreign capital, often contrasting with the existing 19th- and 20th-century buildings in city centres. There is also a concurrent development of housing areas, which reflects both new regulations in the free property market and the growing demand for higher-standard housing, as well as the need to isolate from the surrounding. As a result, housing estates built in the 1970s from prefabricated concrete that served as a symbol of the policy of egalitarianism undergo gradual decapitalisation, while new, fenced-off housing estates are created in the suburbs (Figure 4). New forms of buildings in the urban areas of Novosibirsk contribute to the increase in their mosaic nature, closing the gap between them and western European cities in terms of appearance and function.

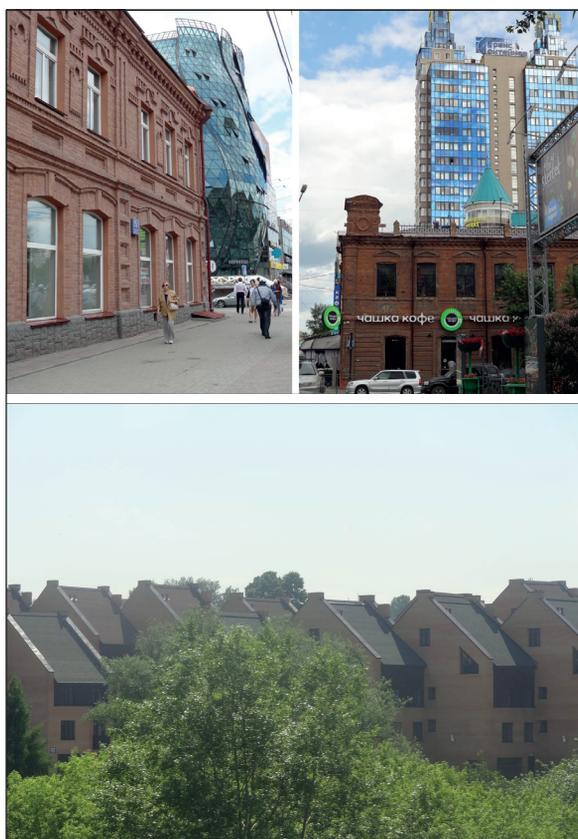


Figure 4. Contrasts and new forms in the landscape of Novosibirsk

Source: own study.

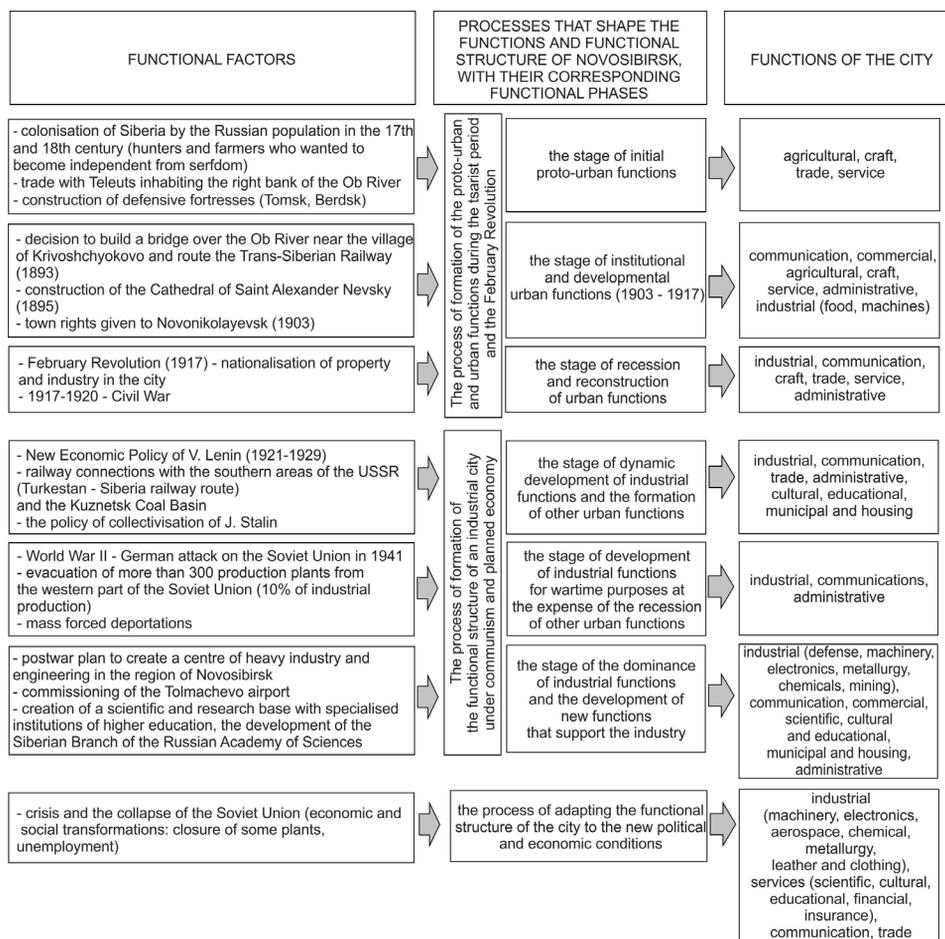


Figure 5. The model of transformation processes in the functions of the functional structure of Novosibirsk

Source: own study.

3. CHANGES IN DEMOGRAPHIC POTENTIAL

According to the statistical records of the Russian Federation, there were 2 709 461 people living in Novosibirsk Region in 2012, representing 1.9% of the population of the whole country. More than half of the population of the region (1 498 921 people) lived in its capital – Novosibirsk, which is the third largest city in Russia and the most distant “city of one million people” from

Moscow. Changes in the population in individual urban centres of the region should be associated with the above-mentioned political decisions taken in various historical periods. Their course was not natural – both the number of people and their distribution were controlled by the state authorities as a consequence of the policy of systematic development of Siberia and the Far East. In public awareness, these areas were associated with an opportunity of development, a change in current living conditions and hope, but also the fear of the unknown. After a period of dynamic repopulation during the Soviet era, the economic transitions after the collapse of the Soviet Union led to the depopulation processes of the entire region (Wites 2007). In the case of the Novosibirsk Region, located in the south-eastern part of the Asian part of Russia with relatively favourable environmental conditions and a high degree of industrialization and urbanisation, negative trends of depopulation at the beginning of the period of economic transition in the Russian Federation have been steadily improving over the last few years (Figure 6). Below we present the analysis of long-term population changes in individual locations of the Novosibirsk Region and their relationships with the transformations of their functional structure described above.

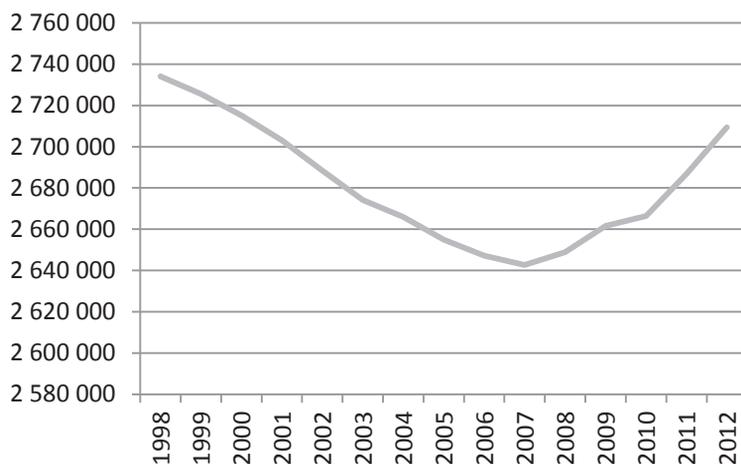


Figure 6. Changes in the population of the Novosibirsk Region

Source: own study based on CEIC.

In the case of all of these centres, we can see agricultural colonisation before 1917, with an increase caused by the Trans-Siberian railway route (Maryński 1995 from: Wites 2007). This investment resulted in the Novonikolaevsk (later Novosibirsk) taking a central position in the emerging urban region. In subsequent decades of Soviet Russia the population of Novosibirsk

increased almost tenfold, from about 70,000 inhabitants in 1917 to 640,000 in 1950, as a result of forced migrations, mostly during the totalitarian rule of J. Stalin. The growing population had an influence on the urbanisation coefficient of the whole Novosibirsk Region, which increased from 15% in 1926 to 41% in 1939. The period of Novosibirsk's development as a heavy industry centre supported by a strong and specialised scientific and research base between 1951 and 1991 resulted in an even more dynamic population growth. At the time of the dissolution of the USSR, in 1991, the population of Novosibirsk was 1 435 000. After a short period of a demographic crisis in the whole Russian Federation in the 1990s, the negative tendencies improved and the population of the centre of the Novosibirsk region has been slowly but steadily increasing over the last few years. It is worth noting that during the real decline in the population of the city in 1991–1998, which was still slight (4.4%) in comparison with other locations in Siberia and the Far East, net migration was positive, but did not compensate the natural loss of population. Therefore, reversing the depopulation of Novosibirsk and the entire urban region was much faster than in other places in Siberia and the Far East, as it only required changes to the natural movement of the population, which was helped by the age structure of the incoming population. In recent years, apart from a slight positive population growth rate (1‰ in 2011 and 2012), Novosibirsk saw high positive net migration.

The population of Berdsk, which is growing in the direct vicinity of Novosibirsk, is characterised by a steady growth, whose dynamics clearly corresponds to the events that determined its economic and spatial development. The largest population growth occurred after the relocation of the city, which took place in 1953–1958 as the effect of the construction of hydroelectric power station and an artificial lake on the river Ob. After moving Berdsk about 8 km from its original location, new industrial plants were created (the value of production doubled), residential-living areas expanded and the city was completely electrified. All investments led to significant improvements in the living conditions of the population, resulting in both positive natural population growth and net migration. Both Berdsk and the Novosibirsk Municipal District, which includes the areas surrounding Novosibirsk and some of its suburbs serving as a base for the centre of the region delimited in 1939, have seen positive natural growth and net migration in recent years.

Population changes in areas outside of the core of the urban region of Novosibirsk, mostly connected to agricultural economy and industrial production based on natural resources (mining), were different. High population growth rate recorded in Soviet times, caused by the policy of forced collectivisation and industrialisation, as well as mass deportations under the Gulag system (4-SIBLag in Isktim Municipal District), slowed down significantly. Over the last decade,

the Iskitim and Cherepanovo Municipal Districts have experienced a steady loss of population, mostly due to a negative net migration (Figure 7).

Taking into account the interrelations between various components of the real population growth (natural and migration) in the last years (2009–2011), we can conclude that the analysed cities in the Novosibirsk urban region can be classified in three categories:

- both components are positive (Novosibirsk, Novosibirsk Municipal District, Berdsk),
- one component is positive, the other negative (Cherepanovo – positive growth, negative migration),
- both components are negative (Iskitim).

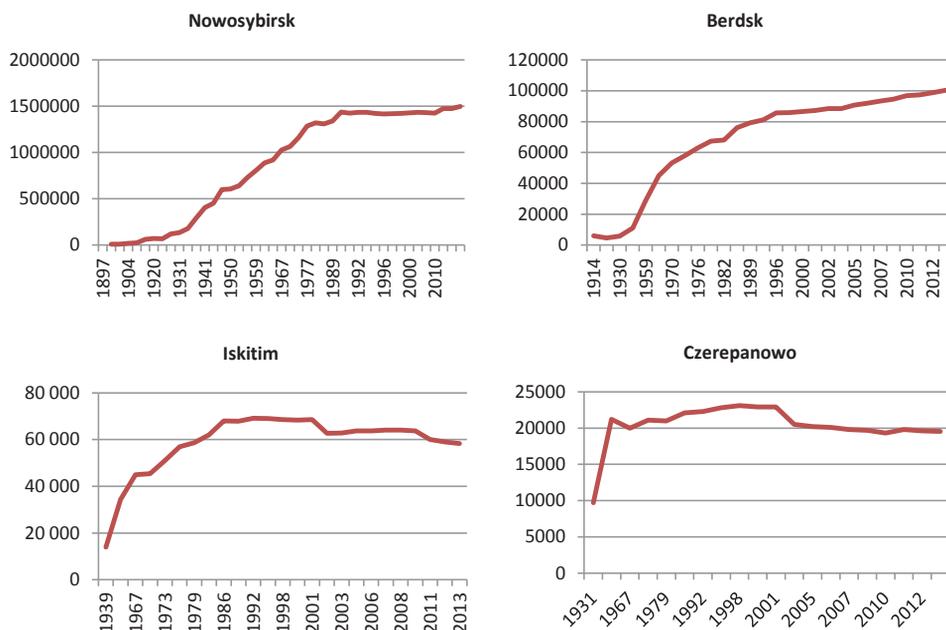


Figure 7. Changes in the population of selected cities of Novosibirsk urban region

Source: own study based on <http://www.gks.ru>.



Photo 1. New and old forms of housing blocks in the center of Novosibirsk



Photo 2. Degraded industrial areas in the center of Berdsk



Photo 3. Industrial landscape along the railway line Novosibirsk-Cherepanovo. Working settlement Linevo



Photo 4. Railway station Cherepanovo



Photo 5. Part of the metropolitan center of Novosibirsk



Photo 6. Residential areas in the peripheral settlement. Cherepanovo

4. ECONOMIC FUNCTIONS IN NOVOSIBIRSK URBAN REGION

4.1. Research methodology

One of the most commonly used measures of defining the role of specific cities and other settlements in the settlement system is the employment in relevant sectors of the economy. Excessive employment (above a certain average level) in specific sectors of the economy is equated with exogenous functions. Exogenous functions determine the relationships between settlement units (cities, urban agglomerations) and are therefore a factor organising the settlement system of the country (Suliborski 1983). The purpose of the identification of exogenous functions is to identify those economic and social activities that determine the importance (role), and thus the position (rank) of respective cities or regions in the social division of labour within the national settlement system.

Spatial and economic studies of complex settlement forms of current urban regions require the use of methods by which we can identify various processes of social change and determine the factors that shape their direction and pace. This part of the study focuses on the processes of economic change. Functional methods of studying the settlement system were adopted for this purpose. They are methodologically based on the concept of economic base. Functional studies in accordance with the assumptions of the economic base concept require the division of economic activities into two sectors: endogenous and exogenous. The size of the exogenous sector shows the strength of the ties between the settlement unit (territory) and other settlements. Endogenous sector caters for the needs of residents of these settlements.

The most important aim of the concept of the economic base is to identify the exogenous functions of settlement units, i.e. those activities (or a specific part of them) which are the basis for connections between the settlements and the outside world and can thus serve as the main elements in creating systems. In order to determine the exogenous functions, an indirect method of identification proposed by H. Hoyt, known as the residual method, is often used².

² The Hoyt coefficient is a modified version of the location coefficient. It has the following form:

$$Z_{nadiw} = Z_{iw} - (Z_w \times Z_{ik} / Z_k)$$

where:

Z_{nadiw} – excessive employment in sector i in area w ,

Z_{iw} – excessive employment in sector i in area w ,

Z_w – total employment in area w ,

Z_{ik} – employment in sector i in the country,

Z_k – total employment in the country.

4.2. The employment structure in the core of the Novosibirsk urban region

Studies of functions of the urban region according to the concept of economic base were conducted based on the statistical data showing employment in the basic sectors of national economy in 2012 for selected territorial units in the Novosibirsk urban region and the whole territory of Russia³.

First, we determined the share of the core of the Novosibirsk urban region in the employment in the main sectors of the economy in the overall employment in Russia (Table 1). According to the initial assumption, the core means Novosibirsk city and the surrounding Novosibirsk Municipal District. The surrounding area can be equated with the suburban zone of Novosibirsk, which is an area with the closest functional links with the region's capital.

Table 1

The share of employment of the core of the urban region in the total employment of the Russian Federation

Sector of the economy	Novosibirsk City and Novosibirsk Municipal District	The Russian Federation	Share (%) of Novosibirsk City and Novosibirsk Municipal District in the Russian Federation
1	2	3	4
A – agriculture, hunting and forestry	3441	6 428 000	0.05
B – fishing	79	142 000	0.06
C – mining and quarrying	338	1 068 000	0.03
D – manufacturing	76 599	10 230 000	0.75
E – electricity, gas and water supply	19 402	1 960 000	0.99
F – construction	14 508	5 581 000	0.26
G – wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	44 650	12 400 000	0.36

³ Source of data: www.gks.ru. The study focuses on the most recent available data (2012). Comparison of available data for the years 2010–2012 revealed no significant differences in the overall level and structure of employment nor, as a consequence of the adopted research procedures, in the exogenous employment structure. Identification of the economic base (exogenous functions) in selected areas is based on the 2012 data.

1	2	3	4
H – hotels and restaurants	3888	1 250 000	0.31
I – transport and communications	40 537	5 381 000	0.75
J – financial intermediation	18 909	1 215 000	1.56
K – real estate, renting and business activities	54 153	5 657 000	0.96
L – public administration and defence, compulsory social security	44 618	3 760 000	1.19
M – education	56 934	5 711 000	1.00
N – health and social work	49 662	4 597 000	1.08
O – other community, social and personal service activities	16 107	2 532 000	0.64
Total employment	443 825	67 912 000	0.65

Source: own study.

In 2012, the part with most investment, i.e. the core of the Novosibirsk urban region, employed approx. 444 thousand people. The share of the area surrounding Novosibirsk (Novosibirsk Municipal District) in the total employment of the core was only about 5% (with a population share of approx. 8%). Indirectly, this indicates the presence of other functions in the direct suburban area, whose identification requires a different type of information (residential, recreational, suburban farming areas, etc.). The share of employment of the core of the urban region in the total employment of the Russian Federation was 0.65%. Taking into account different economic sectors of the core of the urban region, we can see significant disproportions in that regard (Table 1, Figure 8). The core of the urban region plays a significant role in the case of sectors, whose share exceeds the overall share of this region in the national economy (over 0.65%). Preliminary assessment of the role of different sectors of the economy shows an important role played by Novosibirsk as a centre with important social functions, such as public administration and defense, compulsory social security, health and social work and education, as well as those that determined the city's path dependency in developing functional processes (city-forming functions), such as manufacturing, electricity, gas and water supply and transport. The contemporary role of Novosibirsk is mainly shaped by employment in financial intermediation (the highest share among all branches) and real estate, renting and business activities.

We can clearly see functional dominants in the structure of employment determined by the number of employees in different sectors of economy. The main conclusion is the dominance of two large groups of employment. The first

one is related to the activities of the institutions connected with the functioning of the state, region and local structures of authority, as well as financial sectors from public finances that meet community needs. Activities in education, health and social welfare, public administration and defence, compulsory social security in 2012 accounted for approximately 34% of the total number of persons employed in the core of the urban region (444 thousand employees). Sectors that determined the development of Novosibirsk, i.e. industrial manufacturing (including energy production and supply and construction) accounted for approx. 25% of employees. We also have to include approx. 9% people working in transport and communications. Dynamic service functions of the transformation period accounted in 2012 for approx. 20% of employees, mainly in wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods, financial intermediation.

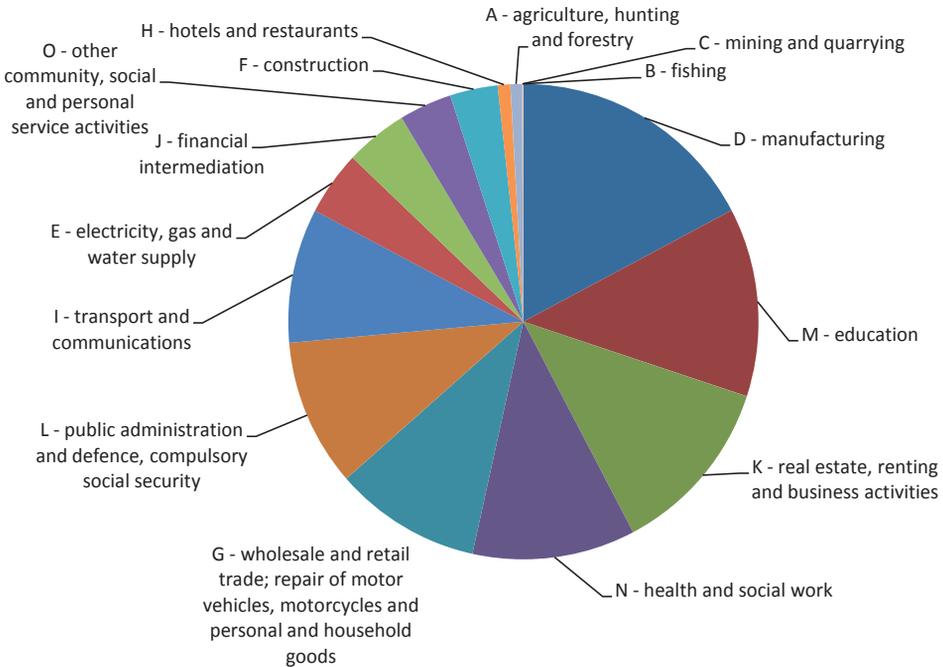


Figure 8. The employment structure in the core of the Novosibirsk urban region in 2012

Source: own study.

In summary, we can conclude that the economic structure of a large urban centre, the core of the region is three-fold in the case of Novosibirsk and includes almost equal sectors of industrial production (along with transport), public services and commercial services. Compared to methodologically

similar research conducted in the urban region of Łódź (Poland) significantly influenced by the socio-economic transformation, we should note that Novosibirsk did not experience a drastic decrease of employment in industry. Similarities can be observed in the significance of employment in public administration and, to a lesser extent, in other public services (Jewtuchowicz, Wójcik 2010).

4.3. The structure of employment in the peripheral area of the Novosibirsk urban region (the area along the Novosibirsk–Cherepanovo railway)

Given the data concerning employment in administrative units located along the Novosibirsk–Cherepanovo railway (i.e. Berdsk, Iskitim and Cherepanovo), we should primarily point out their small social and economic potential compared to the core of the urban region (Figure 9). In total, these three units employ around 51 thousand people (Berdsk City – about 15 thousand., Iskitim Municipal District and Iskitim City – about 26 thousand, Cherepanovo Municipal District – 9.8 thousand).

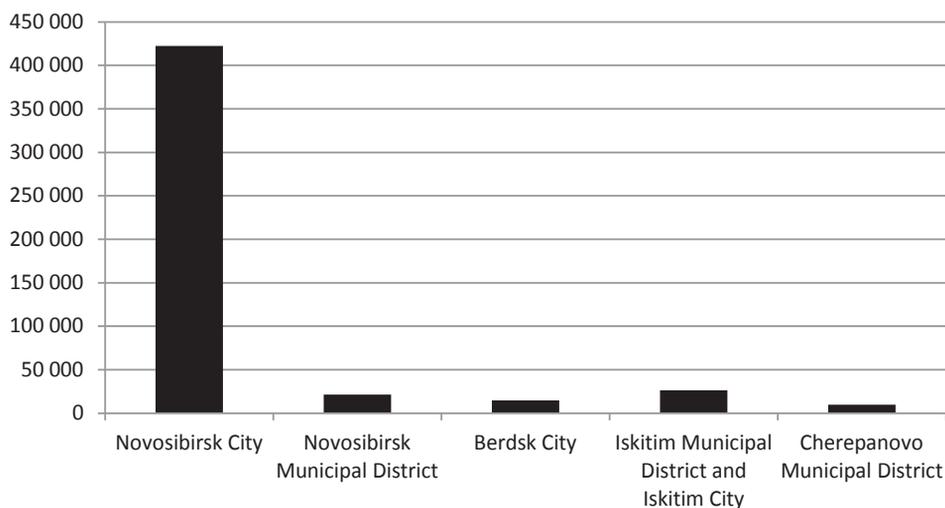


Figure 9. Employment in studied administrative units of the Novosibirsk urban region in 2012

Source: own study.

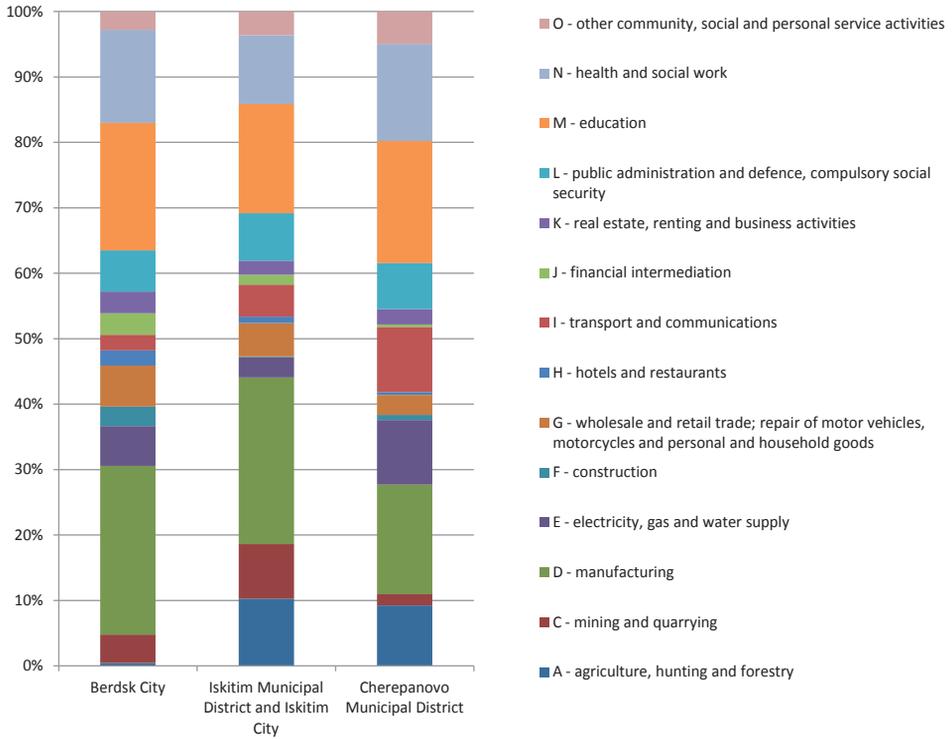


Figure 10. The employment structure in the peripheral areas of the Novosibirsk urban region in 2012

Source: own study.

The main difference compared to the employment structure in the core of the urban region presented above is the more important role of employment in production sectors, mainly processing and excavation. In this respect, public sectors (funded by the state), such as administration, defence, education and healthcare are also more significant. In view of the dominance of these two groups, employment in commercial services such as commerce, repairs, financial and business activities is less prominent (Figure 10).

5. ECONOMIC BASE OF THE NOVOSIBIRSK URBAN REGION

According to the main assumptions, the main element of research of the economic structure involves the determination of the economic base of Novosibirsk, as well as of selected administrative units (along the Novosibirsk–Cherepanovo railway). The economic base is identified with exogenous functions, namely those that serve as a base

for the communication with the surroundings, thus determining the size and character of integration between the city and the settlement system of the country.

The procedure of calculating the economic base allowed for determining the exogenous employment and, consequently, the openness of urban economy of Novosibirsk and other administrative units in question (Figure 11).

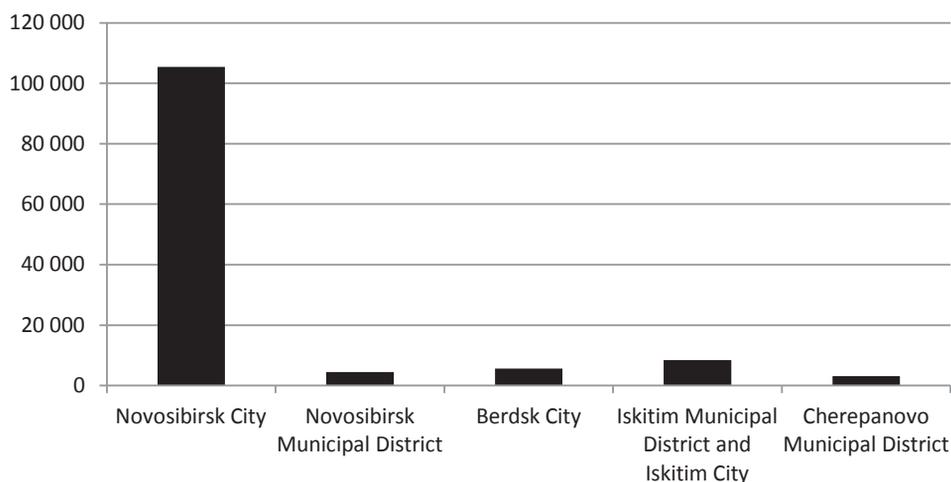


Figure 11. The size of the economic base in selected administrative units in 2012 in the Novosibirsk urban region

Source: own study.

The level of development of exogenous functions (economic base) of Novosibirsk was estimated at 105 thousand employees (approximately 110 thousand including close suburban zone). Compared to the capital of the region, other administrative units in the study (Berdsk City, Iskitim Municipal District and Iskitim City, Cherepanovo Municipal District) were not significant in this regard in 2012 (total of approx. 17 thousand employees), similarly to the analysis of employment structure.

Taking into account the share of exogenous employment (economic base) in the overall employment, the openness of the economy of a given territory can be assessed (Figure 12). It was noted that lower values of this coefficient are characteristic for the core of the urban region (Novosibirsk and its suburban area), i.e. approximately 25%. This is primarily due to the development of a huge endogenous sector that provides great concentration of population with basic and specialised commerce, transport, industry (e.g. food and textiles), energy production, educational and cultural services, as well as an increasingly important sector of professional services (banking, insurance, business services), that are especially important in shaping such centres.

Areas in the peripheral zone have higher economy openness indexes (approximately 30–35%). This is due primarily to the poor economic diversification of

economies with relatively small overall potential dominated by large workplaces, industrial workplaces or workplaces founded by the state (public administration, defence, compulsory education, health and social work). The share of commercial activities is relatively small. These areas are served by Novosibirsk and numerous specialised businesses concentrated there (very high spatial concentration).

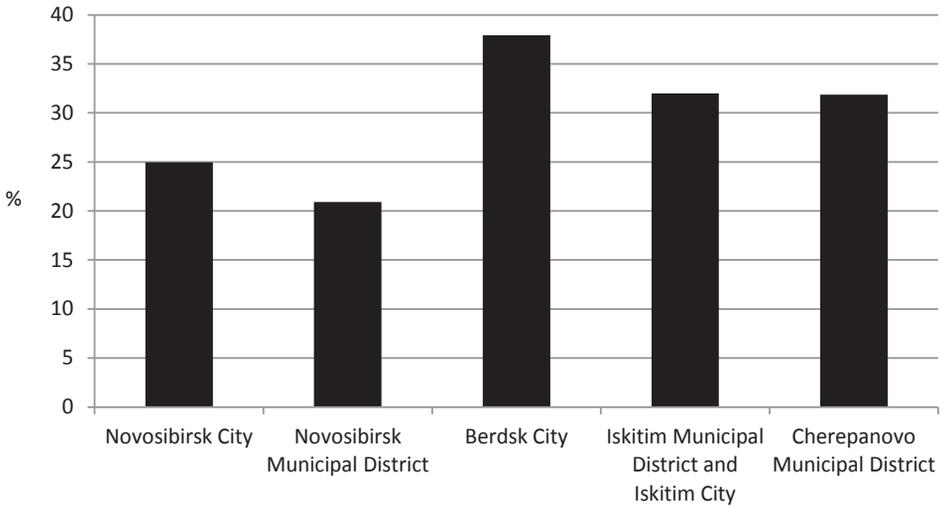


Figure 12. The level of openness of economies in selected administrative units in 2012 in the Novosibirsk urban region

Source: own study.

Considering the above, the results of measurements of economic bases of territorial units in relation to the functional structure (Figure 13) are interesting, as they are crucial for this part of the study.

The functional structure is most diverse (8 exogenous functions) in the core of the urban region (the city of Novosibirsk). The most important components of the economic base are the functions directly controlled by the state, i.e. public administration, compulsory (the most important function), education, health and social work. Together they form around 55% of the economic base of the city. When we include transport, also largely dependent on the state, in this group, this share grows to 60%.

The formation of metropolitan functions is significantly influenced by two groups of economic activity related to professional and commercial services, i.e. real estate, renting, business activities and financial intermediation (25% of the economic base).

Functions that were of key importance for the formation of economic base of such centres in communist times are currently less influential in forming the settlement system of Russia. Manufacturing activity currently (2012) comprise approximately 15% of the economic base.

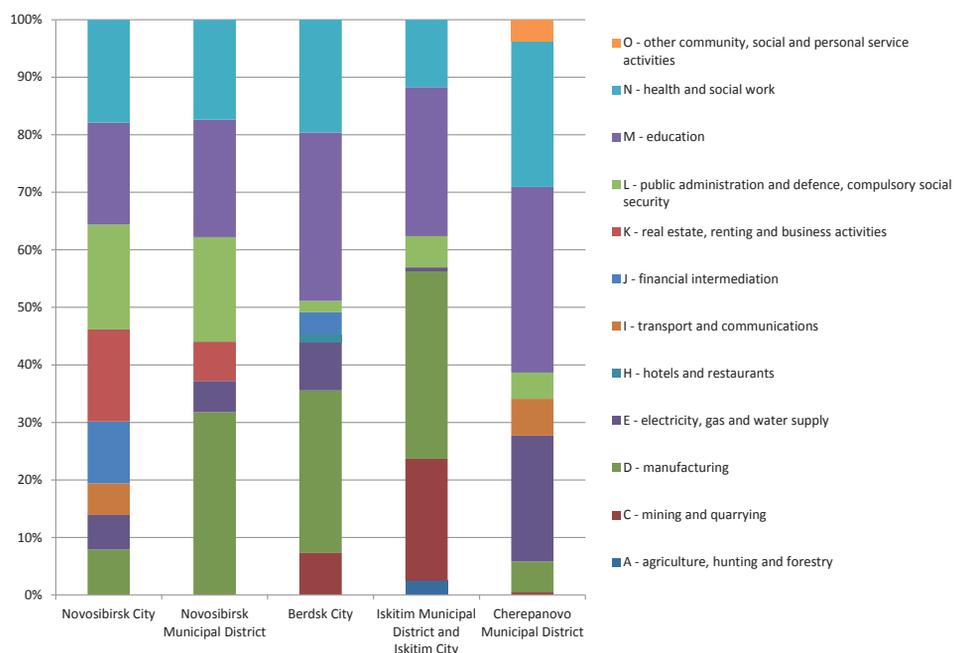


Figure 13. The size of the economic base of selected administrative units in 2012 in the Novosibirsk urban region

Source: own study.

The economic base of the outer zone of the urban region consists of a smaller number of functions (7). In Berdsk City, Iskitim Municipal District and Iskitim City we can see a balance between manufacturing sectors (approx. 40–50%) and communal services. In contrast to the core of the urban region, the economic base lacks commercial services (Iskitim) or they are marginalised (Berdsk).

On the other hand, the peripheries of the urban region (Cherepanovo), where the direct influence of the big city (Novosibirsk) is diminishing, the vast majority of the economic base consists of employment in state institutions, i.e. various types of schools, hospitals and healthcare institutions, offices and transport services. This economic base based on public service is complemented by the industry.

6. FINAL CONCLUSIONS

Research of the demographic and economic potential of the Novosibirsk urban region using directional profile method has systematically shown general tendencies in the transformations of its spatial structure, both in the long-term perspective

(the genetic view of function development) and in contemporary circumstances related to economic transformation of Russia.

The main conclusions of the analysis relate to the following processes of structures that shape the urban region of Novosibirsk:

1) the development of city-forming functions of Novosibirsk and the settlements connected to it (urban region) was the effect of political decisions, i.e. the construction of Trans-Siberian railway (Russian colonisation of Siberia and the Far East), as well as the location of industry within the zone not directly threatened by wartime activities (World War II), then the creation of other functions to support this industry, primarily scientific and higher education institutions,

2) Novosibirsk and the area in its direct vicinity became the biggest urban region in Siberia with strong industrial functions, high concentration of population and a well-developed sector of public services to serve the population (educational, scientific, healthcare, cultural and administrative functions),

3) the first period of the post-Soviet economic transition (the 1990s) caused a demographic crisis in Novosibirsk Region, although it was more noticeable in the core of the Novosibirsk urban region, mostly due to the recession in the processing industry. Because of economic crisis in the core of the urban region, the population was relatively stable in the peripheral zone (migration from peripheries to the industrialised centres of regions weakened),

4) in the first decade of the twenty-first century, Novosibirsk's economy experienced some growth and functional restructuring, especially related to the development of commercial and public services. This contributed to the influx of population from peripheral areas, especially in productive mobile age, which, in turn, resulted in the increase in natural population growth. As a result, there has been growth in population. At the same time, peripheral areas of the urban region experienced depopulation (mostly caused by migration), largely due to their less attractive job market,

5) the economic base in the Novosibirsk urban region has a very high concentration of exogenous functions in the core, which creates considerable spatial disproportions in socio-economic development caused by extensive development of most of the Novosibirsk Region. The structure of the settlement network was formed based on the locations of specialised centres, especially in industrial activities (territorial manufacturing complexes). Contemporary functional weakness of local centres (the lack of the original hierarchical system), especially in multi-functional development, along with recession or relative stabilisation of industrial functions, leads to increasing disproportions in regional scale, which can in turn result to a crisis in the economic base of smaller towns and settlements,

6) the current structure of the economic base of the Novosibirsk urban region is a result of functional reconstruction focused on the core (Novosibirsk city). This transformation is most characteristically evident in the decreasing significance of exogenous industrial functions (even though they are still relevant in the

employment structure) accompanied by the growing importance of metropolitan functions, i.e. specialised services and stabilisation of state's financial activities at a high level,

7) the high share of government functions in the economic base, especially in the core of the urban region, is an expression of the impact of centralised state management policy. One interesting feature is low importance of commerce in the employment structure and the lack thereof in the structure of the economic base, which may be the effect of commercial activity outside of the official circulation,

8) the identified structure of the economic base is not very favourable for the development of balanced urban functions and may be susceptible to various external influences in the future. The economic base of the Novosibirsk urban region depends, to a large extent, on the condition of the state budget, as a considerable portion of exogenous activities (forming the settlement system) is financed by the authorities (hierarchical dependence). A large share of industrial functions, including mining, in the structure of employment and economic base (especially in the peripheries of the region) of towns and settlements can cause adverse trends in the development in the case of larger crises, especially in the raw material market (decline in raw material prices). Given that the income from the sale of raw materials (especially energy-related) is one of the major incomes in the state budget, this can have a negative impact on public spending and on social functions.

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