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USE OF GIS IN URBAN TERRITORY DEVELOPMENT RESEARCH

The paper investigates socio-geographic approach forming of spatial data bases which can be used for regulation of urban territory transformation processes. The authors have displayed the system of factors that determine current spatial transformations in Zaporizhia-city and their impact on function changes on urban areas. The structure of GIS was created as a data base with the aim to display spatial transformations of urban area. The abilities of GIS were identified in the contest of Zaporizhia-city urban territory development management.

Key words: *GIS data base, spatial transformations, urban territory, urban territory development management, social infrastructure, instrument, forecast.*

Анатолій Мельничук, Марія Растворова. ВИКОРИСТАННЯ ГІС У РОЗВИТКУ МІСЬКОЇ ТЕРИТОРІЇ. *Представлено суспільно-географічний підхід до формування просторових баз, які можуть бути застосованими для регулювання процесів трансформації міських територій. Відображено систему чинників, які визначають сучасні просторові трансформації у місті Запоріжжі та їх вплив на зміну функції ділянок міської території. Розроблено структуру ГІС у вигляді бази даних для відображення просторових трансформацій міської території. Визначені можливості застосування ГІС в контексті управління розвитком території міста Запоріжжя.*

Ключові слова: *база даних ГІС, просторові трансформації, міська території, управління розвитком міської території, соціальна інфраструктура, інструмент, прогноз.*

Анатолий Мельничук, Мария Растворова. ИСПОЛЬЗОВАНИЕ ГИС В РАЗВИТИИ ГОРОДСКОЙ ТЕРРИТОРИИ. *Представлен общественно-географический подход к формированию пространственных баз, которые могут быть применены для регулирования процессов трансформации городских территорий. Отображена система факторов, определяющих современные пространственные трансформации в городе Запорожье и их влияние на изменение функций участков городской территории. Разработана структура ГИС в виде базы данных для отображения пространственных трансформаций городской территории. Определены возможности применения ГИС в контексте управления развитием территории города Запорожье.*

Introduction. Problem setting. Present-day stage of global community development can be characterized by such processes and tendencies as: 1) Globalization; 2) Urbanization; 3) Modernization of technologies, willing to dominating of service sector on industrial sector of economics; 4) technogenic safety of manufacturing importance growth; 5) humanization of society, aim to satisfy the needs of each person, including cultural exigencies.

Since the beginning of economic system transformation from command-and-control planning to market-based adjustment these tendencies determine also development directions of post-Soviet industrial cities. The change of external conditions and principles of urban development in XXI century generates a need for adaptation, which leads to urban space transformations on physical and mental levels.

This problematic is especially crucial for the cities whose qualitative development was stipulated by high-capacity industrial complex creating. Social infrastructure of such cities was formed basing on needs and material sources of industrial complex to satisfy everyday needs and cultural wants of employees and their families.

The most spread way of adaption to new conditions became charges minimization by the number of employees and limiting the financing of social infrastructure facilities that before were on total or most balance of the enterprise. After period of adaptation, some enterprises managed to reach good level of profitability, but during the years of stagnation and in the contest of global tendencies, the transformations of urban space have taken place.

Urban space transformations evidence about both degradation and development of this urban territory. Urban space transformations can be expressed in very different ways as change of functional zoning, location of objects, forcing/weakening of linkages, perception of place or object role by residents.

Basing on foresaid we can claim that the overarching goal of the specialists who deal with strategic planning and tactic questions of urban territory development is revelation and forecasting of urban space transformation, understanding of their reasons, appraisement of positive and negative effects and in case of necessity correcting of urban space transformation processes.

Analysis of previous studies. Methods. The necessary instrument in urban space transformations analyses is scientific approach using. Among the methods of urban space transformations study the most spread are: 1) method of observation; 2) comparison method; 3) statistical analysis; 4) method of expert assessment; 5) socio-geographical method; 6) historical-geographical study basing on determination of historical-geographical cross-sections. The last ones methods (socio-geographical method and study of historical-geographical cross-sections) deserve special attention. Socio-geographical method is widely used in up-to-date geographical studies and has become one of the leading methods of collecting primary data, which is difficult to show in quantitative terms. Nowadays socio-geographical method is often used as an alternative method on collecting of official statistic data because of its higher veracity. High effectiveness of socio-geographical method using is proved by many scholars. [3, 5-8].

One of the main stages of study of spatial transformations of urban territory development is determination of the historical-geographical cross-sections. [9] Distinguishing of historical-geographical cross-sections implies an indication of chronological periods, during

each of which the following was true: society was at a certain stage of perception of the geographical environment and was characterized by a certain level of development of the territory, the degree of natural resources involvement into economic processes, the level of development of productive forces, the means of production, economic specialization. [4]

Goal and tasks of the study. The aim of this paper is to propose the structure of GIS data base that can be used as an instrument for analyses and forecasting of spatial transformations of urban territory on the example of Shevchenkivskiy district of Zaporizhia-city. To achieve the goal of the research such tasks were set:

- Basing on current methodical and methodological developments of GIS technologies and theoretical background of urban studies to show the opportunities of GIS implementation into the process of urban territory development management;
- to find the most proxy indicators which describe the peculiarities of spatial transformations of urban territory in Zaporizhia-city (on the example of Shevchenkivskiy district);
- to form the structure of GIS data base "Territory functions transformation of Shevchenkivskiy district during industrial period of Zaporizhia-city development".

Summary of the main results of the study. In spite the benefits of each above-mentioned methods the use of either one of called methods or their combinations will not be effective enough. The coherent understanding of the situation on the current period and of its dynamics on previous stages can be got only by GIS-technologies use by creating of GIS database with general criteria and indexes for most representative historical-geographical cross-sections. Analyses of singular and serial visualization of collected data will give the opportunity to get information about all the aspects of urban territory transformations (essence, location, time, meaning, dynamics, etc.).

Choise of object. Zaporizhia is one of the cities that got an impulse to development in the result Stalin's industrialization in 1920-1940s. During the next two decades huge industrial complex was formed. In the result the population has grown from 55 700 people in 1927 to 300 000 people in 1940, communal infrastructure (plumbing, drain), social infrastructure (33 schools, 21 children garden, 9 hospitals and policlinics), and transport infrastructure (75 km. of tram lines) were created during quite short period of time. [11] After the war (1941-1945) Zaporizhia was rebuilt and the city saved its industrial specialization. The collapse of Command and Administration System was a huge stress for such cities because their urban development was closely connected with industrial growth. Nowadays the understanding of industrial development role in new intensive way can become the solving of the problem of urban development in market conditions.

GIS data base creating and use is an important instrument of urban territory development management, which can be used in case of complex urban territory development of Shevchenkivskiy district of Zaporizhia-city.

Shevchenkivskiy district of Zaporozhia, formed in 1962, covers an area of 98 km^2, its population is 154 697 pers. (01.06.2012). We consider that Shevchenkivskiy district is the most representative object of GIS database creating because its social infrastructure and main objects was formed under the protectorship of district forming enterprises (State Company "MiGremont", CE SIC "Iskra", State Company "International airport «Zaporizhia»", JSCo "Zaporizhian Abrasive Integrated Plant", refinery, meat-processing plant, Company "Ice Zaporizhia", bread-baking complex №3) and city forming enterprise "Motor Sich" in Soviet period. [12]

Structure of GIS database. GIS database "Territory functions transformation of Shevchenkivskiy district during industrial period of Zaporizhia-city development" will include such main blocks, criteria and indexes (look Table 1).

Main criteria will be shown for key historical-geographical cross-sections – 1990, 1995, 2000, 2005, 2010 years and the forecast for 2015 and 2015 will be proposed.

Table 1

The structure of GIS database «Territory functions transformation of Shevchenkivskiy district during industrial period of Zaporizhia-city development»

Block	Indexes and creteria	Method of the research/source of information
I. Industrial territories development	- Location; - Industrial enterprise specialization (main production); - Overall production; - Staff (number of employees); - Average and maximum wage packet; - Objects of social infrastructure that is on the financial balance of the enterprise.	Official statistic data

Continuance of the table 1

II. Social infrastructure development	- Children's pre-school institutions: quantity, location, source of financing; - Health care providing institutions: quantity, location, source of financing; - Sport complexes and athletic fields: quantity, location, source of financing; - Institution for Culture and Leisure: quantity, location, source of financing; - Recreation areas: quantity, location, score of current condition, source of financing; - Religious institutions: quantity, location, confession, church union, source of financing.	Official statistic data
III. Ecological situation dynamics	- Emissions of harmful substances into the environment; - Area of land withdrawn from use due to its high level of contamination; - A score of residents of neighborhoods level of contamination caused by the location of a particular industrial plant.	- official statistic data; - socio-geographical method.
IV. Change of land use	- Functional accessory basic territorial units; - Preservation or change the destination of specific - objects.	- analyses of the general plan of town development; - comparison method; - historical-geographical cross-sections study; - socio-geographic method.
V. Preservation of key sites of the urban environment	- Architectural monuments: functional accessory, protection status; - Monuments: an event or a person devoted to, a year of establishing, the initiator and sponsor of the installation; - The names of the streets.	- comparison method; - historical-geographical cross-sections study; - socio-geographic method.

Conclusions. Creating and implementation of GIS data base "Territory functions transformation of Shevchenkivskiy district during industrial period of Zaporizhia-city development" will allow to obtain a complete picture of the progress and causes of spatial transformations of urban territory of Shevchenkivskiy district, identify the value of the enterprise as a factor of social development. Basing on obtained results an effective strategy of development for Shevchenko district territory, the city of Zaporozhia and industrial cities, formed during the Soviet period will be proposed. GIS database creation and use is an important tool in the process of urban territory development management, which can be practically used for optimization of urban space in the planning phase of the urban area.

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Summary

Anatoliy Melnichuk, Mariia Rastvorova. USE OF GIS IN URBAN TERRITORY DEVELOPMENT RESEARCH.

The goal of effective urban territory development management needs the involvement of different instruments for analyses and forecast of their functions changes. In the current terms of Ukrainian transition on European model of development the instruments that become extremely important are the tools which makes wider the opportunities of territorial community to determine the direction and the responsibility for the results of urban territory spatial transformations. The vision of structure and content of GIS data base for display of urban territory spatial transformations is formed on the example of Zaporizhia-city. The abilities of GIS in the contest of urban territory development management are determined. The planning of urban development mapped with GIS can become the basis of solving of the most difficult development tasks, called with the changes of territory functions and spatial transformations. Proposed GIS called "Territory functions transformation of Shevchenkivskiy district during industrial period of Zaporizhia-city development" is focused on ensure that decisions related to changes in the prevailing functions territory. Such decisions lies in the coordinates of the relationship of local government (self-government), business and local communities. Openness and completeness of GIS can be the basis of a civilized negotiation decision-making in these coordinates. Spatial transformations in the city of Zaporozhia related to overcoming the consequences of the transition from a command to a market-based system of economic relations, increasing the role of territorial communities in the management of the city. In Zaporozhia they are performed and inevitable in the near future due to hyperbolized industrial function of the city during the Soviet period of development. Social infrastructure of modern Zaporizhia-city does not meet the growing demand for quality and variety of services to its population and tasks redistribution of power from the center to the regions, declared in the proposed reforms in Ukraine.

Key words: GIS data base, spatial transformations, urban territory, urban territory development management, social infrastructure, instrument, forecast.