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Evolutionary Urbanistics of Kazakhstan of the 20th and 21st centuries: Cartographic and Network Modeling, Socio-Demographic Dynamics, and Ecological History

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Studies of a wide range of urban problems are carried out in the modern urbanistics, as multi-interdisciplinary scientific knowledge (Glazychev, 2011; Mikrourbanizm. . . , 2014 and et.). One of such topical issues is a comprehensive analysis of complex geopolitical, socio-economical, geoecologico-historical, demographic and migration processes of the evolution of a network of urban settlements. Meta-disciplinary studies on a combined field of urbanistics, evolutionistics, and ecology seem to us particularly important today. In this regard, we can talk of evolutionary urbanistics, which is important for both understanding the development of the urban landscape on a global scale, and forecasting, managing, ensuring the sustainable development of specific territories, urban systems, settlement networks and their separate elements. To this end, studies on the dynamics of urban systems and settlement networks in time and space gain particular importance, in which, in a certain sense, a paleogeographical problem can be formulated and solved: our studies show the effectiveness of a well-known approach, namely, drawing series of maps for certain time intervals. The consistent arrangement of the designed cartographic models along the time arrow leads to the formation of a common vision of the settlement system as a whole and its spatial-temporal transformations. A subsequent evolutionary analysis of such a model filmstrip makes it possible to reveal trends, stages, rhythms, key events both throughout the whole territory analyzed, and for regions and separate localities and urban systems. And only at the next stage of research, it becomes possible to hypothesize on the causality of the revealed evolutionary changes, conclusions of an ecological-historical and evolutionary-urbanistic nature, with subsequent forecasting and giving recommendations for sustainable development of the network, necessary for making sound management decisions in the process of managing these territories and cities. In the Saratov State Technical University named after Yuri Gagarin the team of the chair of geoecology and engineering geology, the laboratory of engineering geoecology, as well as the Network chair of Evolutionary Urban Studies, the UNESCO Chair on Global Problems and Emerging Social and Ethical Challenges for Large Cities and Their Population at the Faculty of Global Processes of the Lomonosov Moscow State University, together with the scientific and educational center for the non-linear dynamics of complex networks have been actively working on a wide range of urban problems over the past years: from analysis of dangerous geoprocesses in urbanized areas and the ecological history of settlements to aspects of global urbanistics and the urban landscape evolution (Sayamov and et., 2016). And highlighted is the project of the study of the evolution dynamics of settlement networks in Kazakhstan (Yashkov and et., 2017; Yashkov, Ivanov, Vinogradova, 2016). Of particular interest are, in our opinion, the Soviet and post-Soviet periods, since this time interval is characterized by: a) a particularly active dynamics of settlements – the high rates and scale of changes in the qualitative and quantitative parameters of the settlement network evolution; and b) a good manifestation of the changing signs of urban systems – the appearance, degradation and necrosis, the disappearance of separate settlements and elements of their networks. At the present stage of our research on the Kazakhstan settlement network, we have intermediate results and are at the beginning of evolutionary analysis to be fully implemented in the future. In this report we present summarized factual data. To date, a database has been made, cartographic models have been designed with the help of geoinformation technologies,

as well as mathematical models based on the theory of complex networks have been created, archival materials and oral history data have been collected and processed. Such a combination of techniques has enabled us to eventually obtain the most objective, in our opinion, patterns of the distribution of settlements during separate intervals of historical time. The “filmstrip” made from these “frames” shows the dynamics of settlements and can serve as a basis for further research. A series of thematic maps, presented in a special section, reflects the evolution of the Kazakhstan urban settlement network and covers the historical period from 1926 to 2009. Such a wide time range allows, in our opinion, approaching the understanding of the prerequisites for the serious transformation of the Kazakhstan urban settlement network at the turn of the 20th and 21st centuries. Besides, the study includes maps and historical photos of the Zhanatas town in few years, including 1994 and 2013, as one of the model polygons of our evolutionary-urbanistic studies to illustrate local changes in the "living"and "dead"urban infrastructure. Zhanatas is thus a very revealing urban system which has experienced the influence of a complex of external factors (political, economical, social, cultural, ecological, etc.) and internal factors (living comfort, medico-sanitary and epidemiological ones, etc.) of development. In a separate block about the “model” polygon (the Zhanatas town), special attention is paid to our study of the role of the 1990s numerous crisis phenomena in the evolution of towns and urban nature management, which influenced the living comfort in the urban environment.

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