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## Contents

УДК 004.056.2

K. K. KOLIN

# TECHNOSPHERE OF THE XXI CENTURY AND HUMANITARIAN ASPECTS OF ENGINEERING EDUCATION

*The analysis of the main trends in the transformation of the technosphere of modern civilization, which manifest themselves in the XXI century as a result of the rapid development of the scientific and technological revolution and man-made human activity. It is shown that these trends pose a global threat to the further development of civilization. If these trends persist in the future, humanity may perish as a result of the destruction of vital ecosystems of the planet and the global ecological crisis, which is rapidly growing. It is expected that it will reach its apogee in the middle of the XXI century. The transformation of the information sphere entails deep destructive changes in the social, psychological and intellectual qualities of the individual. And it is also a new threat to global security. The article shows the negative impact on people of modern high rates of transformation of the technosphere. It causes them to feel fear of the future, which is approaching too quickly. The forecast of the dynamics of the main components of the technosphere for the period up to 2050 is presented. It is shown that the most rapid and radical changes occur in the information sphere of society. A new habitat forms a new person, changes his psychological, social and physiological properties and qualities. If this process continues to be carried out uncontrollably, then in the second half of the XXI century, humanity may become like a global anthill. People's lives in it will be strictly regulated, and their own intelligence will be lost. The article raises the problem of moral responsibility of engineers for the humanitarian consequences of their professional activities. To solve it, it is necessary to increase the level of modern humanitarian knowledge among representatives of the engineering corps of Russia.*

***Keywords:*** *demographic dynamics, information security, intellectual security, urbanization, environmental crisis, transformation of the technosphere, information society, humanitarian engineering knowledge*

***DOI:*** *10.21869/2311-1518-2023-41-1-3-15*

УДК 711.4

N. V. BAKAEVA, P. A. SIMAKOVA

# MODEL OF SPATIAL ORGANIZATION OF TOURISM CLUSTERS IN SMALL HISTORIC CITIES OF RUSSIA

***Relevance.*** *Small historical towns in Russia are currently facing many problems. At the same time, they play a special role in the socio-economic and spatial development of their regions and the country as a whole. A huge number of small towns have significant, often hidden reserves for their successful development through the improvement of the tourism industry. The cluster model of tourism organization is very effective due to the cooperation of various enterprises and elements of urban infrastructure and as a result of creating a high-quality tourism product and increasing the competitiveness of small towns.*

*A promising territory for creating a tourism cluster (TC) is the city of Torzhok, Tver region, Russia. Torzhok is located in relative proximity to big cities and is a monument of Russian urban art. This fact indicates the real possibility of the city to become an attractive object of cultural tourism.*

*In urban planning, the greatest interest in the organization of tourism clusters is their spatial organization and elemental composition. To date, none of the developed TC models reflects the characteristics of the spatial organization of TC elements on the territory of small historic towns. It is necessary to develop a model that would eliminate this drawback.*

***The purpose and objectives.*** *Development of a model of spatial organization of tourism clusters in small towns of Russia, which will take into account the needs and preferences of potential tourists, pedestrian and transport accessibility of cluster elements.*

*To achieve this purpose, the following objectives were solved:*

*– to analyze domestic and foreign experience in studying the structural and elemental composition of tourism clusters. Identify the main elements of the TC.*

*– to conduct a sociological study in order to determine the tourist demand of travelers to small towns in Russia*

*– to develop a model of the spatial organization of a tourism cluster.*

***Methodology.*** *When studying the theoretical foundations of the formation of tourism clusters, scientific articles and abstracts of dissertations were considered. The subject of the study was the structure and elemental composition of the TC. As part of the study, a sociological survey was conducted among potential tourists traveling to small historical towns of Russia to determine the necessary set of TC elements and their pedestrian accessibility.*

***Results.*** *The article considers the issue of spatial organization of tourism clusters on the territory of small historic towns of Russia and their elemental composition. The developed models of the spatial organization of the tourism cluster are presented, taking into*

*account the needs and preferences of potential tourists, namely the necessary set of elements of the tourism cluster and their pedestrian accessibility. The models were built on the basis of the results of a sociological study conducted by the author of this article.*

***Conclusion.*** *The proposed models of the spatial organization of the tourism cluster will allow the most rational arrangement of tourist infrastructure facilities, which will create comfortable conditions for tourists and, as a result, a high level of tourist services. The model can be used by local authorities when developing planning solutions for tourism clusters in small historic town of Russia.*

***Keywords:*** *urban planning, urban planning activity, spatial organization, small historic towns, tourism cluster, tourism, structural and elemental composition, sociological study, tourist demand, Torzhok*

***DOI:*** *10.21869/2311-1518-2023-41-1-16-28*

УДК 719

P. YU. VOVZHENYAK

# PRESERVATION OF THE HISTORICAL PART OF THE CITY OF BELGOROD AS A CULTURAL AND HISTORICAL HERITAGE OF THE REGION

*One of the main priorities of urban development programs of our time is the preservation and regeneration of cultural heritage. The process of preserving historical territories in the city center is an effective solution to strategic urban development tasks that can affect neighboring territories. Most of the territories of the Belgorod OCN are now located in the central part of the city and occupy a significant part of its territory. In the future of development, it is possible to create open-air museums with the creation of new public spaces. The analysis of the means of application and world experience of the modern process of museification of the historical part of the city is carried out. The main qualities that historical buildings should have in modern use in order to achieve a high level of comfort are determined. The existing system of the historical center of the city of Belgorod and its elements in the form of historical and architectural monuments is analyzed. An urban planning analysis of the location of the last Belgorod fortress in the historical center of the city was carried out. The factors that influence the definition of the subject area of projects for the transformation of historical territories are identified: external (social, environmental, urban planning, security and rehabilitation) and internal (economic, planning, constructive, aesthetic). The concept of the conservation project proposal should be based on a comprehensive museification of historical and cultural heritage objects located within the boundaries of the territory of the historical center of the city.*

***Keywords:*** *an object of cultural heritage, historical buildings, urban planning, Belgorod, a place of interest*

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УДК 711.4

Y. G. STRASHNOVA

# SOCIAL FACILITIES: RETROSPECTIVE ANALYSIS AND DIRECTIONS OF URBAN DEVELOPMENT

*The purpose of the study is to determine the importance of social infrastructure for a modern city and to identify ways of its urban development (on the example of the city of Moscow). We used statistical data (from official municipal and regional sources), the results of a systemic, typological, functional-structural analysis, and a sociological survey of the population. An assessment of the current challenges of the development of society, an analysis of scientific research in the field of economics, education, and culture allowed the author to determine the importance of social infrastructure for a modern city as a tool for transforming the urban environment, improving the quality of human capital, and strengthening the economic basis of the city. The author proposes a periodization of the development of the social infrastructure of Moscow from the moment of the formation of the USSR in 1922 to the present with the identification of basic political and economic tasks that determined the role and directions of development of the sphere of cultural and community services. In the conditions of the existing structural deformations of the system of cultural and community services for the population, the lack of territorial resources in the areas of existing development, ways to improve the social infrastructure are proposed, including planning optimization of the territory, clarification of the typology and structure of public centers, development of a model of the functional and spatial organization of the service system, methods of intensifying the use of the territory , taking into account the sociological factor, monitoring the level of urban development of social infrastructure. The scientific novelty of this study is the study of the socio-economic basis of the SI problems in various periods of the development of the city of Moscow, the identification of unique modern sociological, planning conditions for its functioning, the development of a system of scientific and methodological approaches to its improvement.*

***Keywords**: social facilities, quality of human capital, retrospective analysis of social facilities's development, city center system*

***DOI:** 10.21869/2311-1518-2023-41-1-41-52*

УДК 728.52

A. E. BALAKINA, S. S. FEDOROVA

# FEATURES OF THE FORMATION OF THE ARCHITECTURE OF TOURIST OBJECTS IN THE AZOV RESORT AND RECREATIONAL ZONE OF THE KRASNODAR TERRITORY

*The affordable cost of recreation on the Azov coast, as well as the presence of the sea, combined with a favorable climate, make these territories attractive for Russian tourism. However, more than half (62%) of all accommodation facilities in the regions of the Azov region are individual accommodation facilities: small private guest houses, which provokes a number of problems. The state of the resort and tourism industry in the Azov resort and recreational zone is a very topical issue, but most studies present an assessment of the current state of the resort and tourism industry from the point of view of related sciences.*

*In this regard, the purpose of the study is to determine the features of the formation of the architecture of tourist facilities for this region, and its tasks can be determined: identifying the most developed and resort-oriented areas of the Azov region, studying iconic accommodation facilities in selected areas, systematizing the collected material, taking into account the main factors (natural and climatic, functional-planning, socio-economic) and their criteria (climate type, temperature, air humidity and terrain; typology of accommodation facilities, territory development system; capacity index of resort complexes, seasonality of work) that affect tourist attractiveness.*

*The practical significance of the study is related not only to identifying the strengths and weaknesses of the development of the resort in this region, but also to predicting the tourist attractiveness of the Sea of Azov regions. The analysis allows you to determine which of the existing accommodation facilities will be popular and attractive to tourists in the near future, and which of them require urgent modernization. The totality of the results obtained shows the presence of real opportunities for the sustainable development of the Azov region as a resort.*

***Keywords:** accommodation facilities, resort and tourist facilities, the Azov Sea region of the Krasnodar Territory, tourist complexes, assessment of the existing state*

***DOI:** 10.21869/2311-1518-2023-41-1-53-62*

УДК 72.036:502.6

O.V. VOLICHENKO

# ENVIRONMENTAL CONCEPT OF THE CHINESE ARCHITECT WANG SHU

*The eastern philosophical tradition in the professional mind of the architect is associated primarily with Japanese architecture - the theory of metabolism by Masato Otaka, Fumihiko Maki and the philosophy of symbiosis by Kisho Kurokawa. Today, Chinese architects - Ma Yansong, Zhu Pei, Li Xingang and others - are entering the arena of world architecture, bringing their own approach to the creation of a co-evolutionary space. The purpose of this study is to study the creative concept of the 2012 Pritzker Prize winner Chinese architect Wang Shu. Understanding Chinese traditional culture from the perspective of environmental conservation and respect for Nature, the place of design and the structures and materials used, becomes a hallmark of his work. Consideration of his philosophy and generalization of ecological design methods becomes the subject of this study. The interest in turning to this particular architect is due, first of all, to his attitude to the profession - in the rapidly changing technogenic world, Wang Shu refers to the values of the Craft, expressed in the ability of the master to «feel the thin»", material, design, combining modern (Construction methods) and traditional (traditional and recycled, previously used building materials). Design based on the harmonious unity of nature and architecture, combined with the active use of recycled materials that were previously destroyed at the construction site of buildings (ceramics, wood, stone and glass) - becomes the characteristic handwriting of the master.*

***Keywords:** ecological design methods, the concept of «place», secondary materials, Chinese architecture, eco-architecture*

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УДК 504.064.36

V. N. AZAROV, A. O. BURLACHENKO

# THE CONSTRUCTION PRODUCTION ORGANIZATION TAKING INTO ACCOUNT THE ECOLOGICAL SAFETY OF THE DECISIONS TAKEN

*The approaches applied until recently to the organization of construction production are based on the most effective management solution choice based on an assessment of its technical and economic efficiency. This does not take into account the degree of man-made impact on humans and the environment, as well as the effectiveness of this solution at all object's life cycle stages. This significantly reduces their effectiveness.*

*In the concept of BIM technologies, the life cycle of a construction object consists of several stages. To manage a construction object, it is necessary to develop mathematical models that allow making optimal decisions that are effective for all stages of the life cycle.*

*As an efficiency indicator in the selection of certain solutions, a criterion is proposed that allows taking into account both the given unit costs for the implementation of control solutions and the degree of technogenic impact from their implementation. In addition, the developed model makes it possible to determine the probability of finding an object at a particular stage of the life cycle (the occurrence of a particular position). The proposed system of information and mathematical support is based on a model of the construction object life cycle in the form of a transition graph. At the same time, this model allows you to accept as an object of management both a separate building (structure) and significant elements of an urban agglomeration (for example, a residential neighborhood, an industrial area). The life cycle decomposition into stages and states in which the construction object resides throughout its duration is substantiated. To determine the probability of an object staying at a particular stage (in a particular state) with a given resource, a transition matrix was compiled and mathematical dependencies were obtained.*

*Thus, the information and mathematical support of the methodology for managing a construction object throughout the life cycle has been developed, taking into account the environmental safety of the decisions taken. The developed model makes it possible to achieve a significant reduction in the complexity of the search and increase the effectiveness of the optimal management solution.*

***Keywords:*** *BIM technologies, information management model, life cycle, construction process, ecological safety*

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УДК 504.03.711

S. V. KORNIENKO, E. A. DIKAREVA

# ANALYSIS OF THE URBAN HEAT ISLAND USING MICROCLIMATE SIMULATION FOR URBAN QUARTER

*This study demonstrates that the development of green infrastructure is an important task in the formation of urban planning strategies to reduce the effect of the urban heat island and improve the ecosystem of the city. Simulation is an effective method for studying the complex mechanisms of urban climate formation at the stage of urban planning. The purpose of this study is to assess the severity of the urban heat island in relation to the quarter, taking into account various scenarios of its landscaping, using modern simulation tools. Based on modeling in the ENVI-met software and computing complex of the thermal conditions of the quarter on the hottest days, its high thermal heterogeneity was established. The maximum temperature values are noted in roads and soils, the minimum – in green areas. The temperature conditions of the quarter changes over time. Exceeding the average temperature of the urban quarter territory over the average temperature in green areas means the possibility of forming an urban heat island. The calculation established that most of the quarter is located in the urban heat island zone. This is also confirmed by an increase in air temperature in an urbanized area. Recommendations are given to mitigate the urban heat island. Based on the results of the thermal simulation of the quarter, it was established that the most effective solution compared to the original model is an increase in the area of lawn grass and shrubs by 10%, an increase in the area of trees by 12% and a decrease in asphalt pavements of paths and sites by 5.7%. Such a solution maximizes the mitigation of the urban heat island and provides a high level of comfort for the urban environment. Further research will focus on the development of a multi-factor correlation-regression model to assess the mitigation effect of urban heat islands by means of improving green infrastructure.*

***Keywords****. Urban planning, urban heat island, remote sensing, ENVI-met, green infrastructure, urban quarter*

***DOI:*** *10.21869/2311-1518-2023-41-1-84- 95*

УДК 692.433

A. YU. LAPIN, E. V. SYSOEVA

# INVESTIGATION OF THE EFFECT OF THE INTRODUCTION OF «GREEN» ROOFS USING SIMULATION CALCULATIONS ON THE EXAMPLE OF THE CITY OF TULA

*Environmental issues in large, including industrial cities of Russia, are acute, since the execution of production processes and simultaneous control over the well-being of the environment is a complex multifactorial aspect that requires careful study and elaboration. In addition, there is a sharp shortage of public green spaces in many territories, which are regulated by legislation and are designed to increase the environmental comfort of citizens. In densely populated cities, the issue of providing residents with green spaces is accompanied by a lack of free space, «green roofs» are able to solve this problem without taking up additional space in the city, compactly placed on the roofs of existing buildings, while increasing the commercial attractiveness of objects and preserving the enclosing multilayer coating system.*

*The article considers a brief historical background of the development of the technology of «green» roofs in the world and in Russia, provides examples of modern buildings and structures actively using this technology, explains the general structure of the modern «green» roof in the context of the current regulatory documentation. The collection and analysis of data on the example of the Tula region concerning demographic, social and environmental indicators for correlation calculation was carried out. Graphs and polynomial trend lines of various environmental factors are constructed, determination coefficients and functions of trend lines are determined. A correlation matrix is compiled, conclusions are drawn about the possible improvement of the ecology of the urban architectural environment. A regression analysis was performed with statistical results entered into a tabular form. Based on the function obtained as a result of regression analysis, simulation modeling of the population was carried out, taking into account the increase in the area of green spaces of general use*

***Keywords:*** *«green» roofs, environment, ecological balance, urban environment*

***DOI:*** *10.21869/2311-1518-2023-41-1-96-110*