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BIOSPHERE COMPATIBILITY: HUMAN, REGION, TECHNOLOGIES

The founders

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M. V. SHUBENKOV, M. YU. SHUBENKOVA

MODERN URBANIZATION: DEVELOPMENT PROSPECTS

Problem statement. *The new threats and challenges that society faces today determine the need to formulate new tasks related to the development of the living environment, and to form adequate responses to external and internal influences. Urban planning activity, accompanied by scientific research, planning and design of objects of the material and spatial environment, is designed to ensure the development of appropriate forms of organization of the anthropogenic environment. This makes it necessary to develop a fundamentally new methodology that corresponds to the time. The development of the desired methodology of urban planning is an urgent scientific task.*

Results. *The paper considers the new methodological foundations of an integrated approach to managing the processes of urbanization in order to transition to a balanced development of anthropogenic and natural territories.*

Conclusion. *The urbanization of territories, despite the environmental threats that accompany it, is a natural and irreversible process that historically accompanies and ensures the development of human civilization. It is necessary to develop a fundamentally new methodology of urban planning, aimed at the transition from sectoral planning of territory development to integrated biosphere-anthropogenic planning based on the principles of separate anthropogenic-natural zoning.*

Keywords: *territorial planning, urban planning methodology, ecological problems of cities and natural territories, biosphere urban planning.*

Yu. I. GOROKHOV

BIOSPHERE DEVELOPMENT OF TERRITORIES

The article discusses the development of the concept "Biosphere dome". The concept is viewed as part of the structure of the universe. It is based on the principles of spatial interaction, quantum mechanics and a binder from microcosm to macrocosm. The concept of "Biosphere Dome" implies, first of all, natural technologies and economics, as well as harmonious social relations. The tasks for the prevention of an ecological catastrophe are formulated. The concept includes protection from wind and water erosion, a thermos forest, a thermal accumulator pond, effective restoration of fertility, natural balance and a closed ecosystem, a unique microclimate. The principles of creating settlements of a new type are formulated - the settlements of the Family Homes, in which a collective of associates and like-minded people live in the reconstruction of Nature. An analysis of the Family Homes formed in the west of Ryazan is presented. The coincidence of their structure with the concepts proposed by the author is shown. The analysis of desert territories is presented and recommendations for their renovation are given. The analysis of the Stalin plan for the Transformation of nature and the practice of its implementation is given.

Keywords: *living planet, biosphere civilization, biosphere dome, family estates, biosphere planning, alternative and renewable energy sources.*

T.V. KARAKOVA, A.V. DANILOVA

VISUAL ECOLOGY IN THE CONTEXT OF THE FORMATION OF AUTHENTIC IMAGES OF THE URBAN ENVIRONMENT

The change of socio-economic paradigm of the state, the emergence of world architecture practice to new stylistic directions, the changing structure and functional orientation of the needs of mega-cities have brought to the fore the challenges of interdisciplinary rethinking of the design of the urban environment and its architectural features. The issues of the visual ecology of the urban environment have been broadened to include information on neuropsychophysiological processes of perception of the urban environment, synthesizing information on the compositional-spatial and plastic solution of architectural compositions. The authors update the role of artistic perforation in shaping the authenticity of architecture, considering synesthesia as a special feature of a person's systemic perception of the surrounding world.

Keywords: neuropsychophysiological processes, perception of urban environment, architecture, artistic perforation, composition, attractiveness

N.P. UMNIAKOVA, V. S. SMIRNOV

CLIMATE CHANGE AND POLLUTANTS IN THE ATMOSPHERE

Climate change on Earth has been happening all the time. 8 thousand years ago, in the Holocene epoch, there were periods when the temperature on Earth was higher and lower than the modern one: the climatic optimum of the Atlantic period of the Holocene with temperatures 2-3°C higher than the modern one, periods of wave-like climate change during the Subboreal period with a tendency to cooling and drying of the climate with temperatures 20C lower than modern, and the subatlantic period with a tendency to increase the temperature of the Earth. A serious wave of climate warming began in the second half of the 19th century and continues to this day. At the same time, there was a trend towards an increase in the amount of greenhouse gases in the atmosphere, and at present the largest volume of greenhouse gas emissions falls on China (27.8%) and the United States (15.2%). Russia emits about 4.6% of the total, with about half of greenhouse gas emissions being recycled by green spaces and forests in the Russian Federation. Despite this, the temperature of the surface layer of the atmosphere in the territory of the Russian Federation continues to rise. The article analyzes changes in climatic parameters: temperature in different regions, slightly increasing precipitation and snow depth in winter, a decrease in the duration of its occurrence, as well as an increase in seasonally thawed soils and an increase in the depth of permafrost thawing. n these conditions, NIISF RAASN together with GGO named after A.I. Voeikov performed work on revising Code of rules SP 131.13330 "Construction climatology", which is necessary for the adaptation of the construction industry to the ongoing climatic changes

Keywords: temperature change, climate warming, atmospheric pollution, greenhouse gases, temperature anomaly

S.V. ANDREYUK, M.A. TARATENKOVA

MODELING OF WATER PREPARATION PROCESSES FOR TECHNICAL AND DRINKING WATER SUPPLY

The study of the mechanisms of complex processes and the properties of multicomponent systems, as well as their optimization in modern mathematical theory, make it possible to simulate the processes of water treatment based on influencing and determining factors. By planning a multifactorial experiment, the choice of the number of experiments and the conditions for their conduct is carried out, which are necessary to solve the problem with the required accuracy. The analysis of publications and achievements on the research topic is carried out. The article contains the conditions for choosing a methodology for planning a multifactorial experiment on the example of discoloration of surface waters by coagulation with preliminary ozonation and ion-exchange treatment of groundwater from nitrates. Based on the results of a three-factor experiment, second-order regression equations were obtained, which are experimental-statistical models of water preparation processes for technical and drinking water supply. The results of modeling indicators of surface water quality using the method of statistical processing of long-term observation data are presented.

Keywords: water treatment, modeling, multifactorial experiment, bleaching, removal of nitrates, coagulation, ion exchange.

P. O. YEGORYEV

ECOLOGICAL AND GREEN CONSTRUCTION AS AN INTEGRAL PART OF CHANGING TECHNOLOGICAL PATTERNS

A large number of different types of challenges that characterize our time require analysis and assessment of the causes of the latter, the search and understanding of ways to overcome these challenges, requires the formation of the correct vector of development in the field of professional activity, in particular, the development of engineering systems in construction. This paper presents the results of research on the sources and causes of the crisis we are currently observing, shows the relationship between the processes of changing the technological structure with changes in some basic engineering technologies in construction, shows the possibility of radically improving the efficiency of construction using already developed new technologies, shows the possibility of starting the practical formation of the core of a new technological structure, it is already possible to put into practice the construction of new facilities with fundamentally different operational characteristics.

Keywords: modern challenges, technological structure, stages of development of the structure, biosphere compatibility, innovative technologies, cardinal increase in efficiency, reduction of resource intensity, ecological and green construction

D.P. ZULETA

CULTURAL CHANGE, DEVELOPMENT AND ENVIRONMENTAL SUSTAINABILITY IN ECUADOR

In our time, as for many centuries, human life is an integral part of nature. The world that surrounded our forefathers was filled with a certain meaning. It is important for a modern child to learn to realize that nature is the source of all life on earth, to find ways of harmonious interaction with nature. Over the past decades, the ecological state of the environment has deteriorated significantly, the zone of human economic activity has expanded, and the habitat of the animal and plant world has decreased. Environmental problems, having reached a planetary scale, form a new social reality. Their solution depends primarily on the level of ecological culture of the population. Ecological knowledge, skills, and beliefs are especially necessary today for the education of a new value attitude to nature, the development of a person's worldview consciousness. However, ecological culture can only be a part of the overall culture. The higher the level of cultural development, the higher the development of technology. And, as shown in this article, the higher the development of technology, the higher the damage to the environment. Paradoxically, the protection of the environment is also possible only with a high cultural development of society. The article deals with specific environmental problems of Ecuador, such as deforestation, problems related to mining, industrial activities, irrational use of natural resources by the population, agricultural technologies, etc. The ways of solving the problem related to the mobilization of civil society, for which it is necessary to increase the cultural development, including of aboriginal tribes, are outlined.

Keywords: Ecuador, ecology, cultural development, indigenous peoples, environmental problems.

O.E. SADKOVSKAYA

URBAN CONSTRUCTION ACTIVITIES PROMOTING THE HEALTH OF THE LOWER DON

The purpose of this study is to develop a list of necessary urban planning measures aimed at improving the Lower Don. In accordance with the goal, the following tasks have been set: to determine the problems of the territory under consideration; the project of organizing the model of landscape and urban planning; to propose urban planning measures to improve the health of the Lower Don.

The article discusses the problems of urban planning organization of the floodplain areas of the Lower Don from the confluence of the Manych River to the Azov Sea, from the boundaries of the Tuzlov River catchment area to the channel of the Azov Distribution Canal. Cartographic analysis of the considered territory was carried out on the basis of satellite images (Google map), and data of the cadastral map (<https://pkk.rosreestr.ru/>) and materials of the spatial planning (<https://fgistp.economy.gov.ru/>). Multiple planning irregularities and irrational decisions on the location of economic activities, which contribute to the degradation of the water body, have been identified. A model of the organization of the floodplain territories of the Lower Don is proposed, based on the functioning of the existing landscape, in which the surface runoff is planned to be considered as a resource for the development of the territory. For the purposes of this study, the study area is conditionally divided into 4 landscape zones: girder-channel, coastal, irrigated and nature-like. On the basis of the identified problems and types of landscape zones, planning models for the organization of floodplain areas of the Lower Don have been developed. A list of urban planning measures is proposed, which are aimed, on the one hand, at water conservation and protection of water resources, and, on the other hand, at increasing the indicators of the comfort of urban areas. The article was developed on the basis of Public independent institution of the Rostov region "Regional research and design institute of town planning", in the framework of the state assignment for the implementation of research work "Landscape and urban planning organization of floodplain areas of the Lower Don (from the Taganrog Bay of the Azov Sea to the Manych River)" in 2021.

Keywords: Lower Don, Rostov region, water-saving measures, landscape urbanism, eco-urbanism, ecological sustainability, floodplain territories, microclimate, ecosystems, planning models of landscape organization.

A.V. ABRAMOV, N.M. KOZLOVA, O.A. PCHELENOK, M.V. RODICHEVA

DEVELOPMENT OF METHODS FOR IMPROVING THE AIR QUALITY OF URBANIZED TERRITORIES

The low quality of atmospheric air in several territories of Central Russia is associated with the disaster at the Chernobyl nuclear power plant. As a result of weathering of the soil, there is an influx of dust containing Cs¹³⁷ radionuclides. The possibility of improving the quality of atmospheric air through the use of green spaces that impede weathering processes is noted. To assess the effectiveness of this measure, experimental studies of Cs¹³⁷ migration processes in the soil-plant system in the territories of the Bryansk region were carried out. The level of soil activity in these territories varies by more than ten times. With activity up to 3000 Bq / kg, bean plants accumulate less Cs¹³⁷ than rapeseed. The increase in bean biomass with increasing plant radioactivity is linear in both the year with drier and wetter weather. In a dry year, a sharp increase in biomass is observed with an increase in plant activity above 450 Bq / kg, which is associated with the moisture-loving nature of beans.

In a year with drier weather, a sharp increase in rape biomass is observed with an increase in plant activity in the range of 300 - 400 Bq / kg. On the contrary, in a year with wetter weather, the maximum biomass growth is observed at activity values of more than 850 Bq / kg, which is associated with the species characteristics of plants. A correlation was established between the biomass of plants and the concentration of dust in the air both in a year with drier and wetter weather, which indicates the possibility of improving the quality of the air through green spaces.

Key words: air quality, radionuclides, Cs¹³⁷ radioactivity, residential zone, dusty air pollution, soil-plant system.

V.P. GUSEV, A.I. ANTONOV, V.I. LEDENEV, I.V. MATVEEVA

ASSESSMENT OF THE NOISE IMPACT OF AN EXPANDED THERMAL POWER PLANT ON RESIDENTIAL BUILDINGS

Expanded in capacity, CHPP-16 is one of the many industrial enterprises of the metropolis for the production of electric and thermal energy with a continuous cycle of operation and a large number of main and auxiliary equipment. It, on the one hand, provides the vital activity of the population, on the other, negatively affects it, emitting increased noise around the clock. The sound power of such thermal power plants is proportional to their energy capacity, which depends on the number of power units, peak boilers and combined-cycle gas plants (CCGTs) included in them. Noise protection of the territories adjacent to them (residential buildings), a very relevant and not simple scientific and technical task, related primarily to the assessment of their noise impact. The article discusses the results of such an assessment for CHPP-16 with CCGT. The assessment was performed using instrumental and computational methods. The full-scale acoustic survey made it possible to approximate the required noise reduction of the station's external sources in the near zones of residential development. A more complete understanding of the noise impact of the station on the environment is obtained on the basis of acoustic calculations that meet the requirements of the SNIIP "Noise Protection". At the same time, the depth of penetration of increased noise into the building and its required reduction at the border of the sanitary protection zone are determined.

Keywords: noise impact of CHPP on the environment, noise sources, methods of noise assessment in urban development.

V. I. RIMSHIN, E.S. KETSKO

COMPREHENSIVE TECHNICAL SURVEY OF TREATMENT FACILITIES FOR RECONSTRUCTION OF URBAN WATER SUPPLY SYSTEMS

Modern and corresponding to the entire necessary requirement water treatment facilities should be in every settlement. And the state of ecology in the surrounding area will depend on how well these systems perform the functions assigned to them. Untreated liquid waste can cause bad consequences, the death of flora and fauna, soil contamination, as well as people. Reconstruction, technical re-equipment, renewal of water treatment and water disposal facilities are an important and logically justified process for the development of improving the efficiency and safety of water purification technology for its subsequent consumption by the population. This is due to changes in the living conditions, with scientific and technological progress, with an increase in the norms and rules requirements for the efficiency, quality and safety of the purification and water treatment process, a decrease in energy consumption for the structure operation and the transition to alternative and safe energy sources. Water treatment and water disposal facilities reconstruction consists in full or partial changes of their structures, modernization and improvement of technological processes at water treatment facilities, replacement of outdated main and auxiliary equipment with modern ones. Reconstruction justification of water treatment and water disposal facilities is carried out due to a full comprehensive technical survey of structures, main and auxiliary engineering equipment, their performance, efficiency and safety. The comprehensive technical survey results make it possible to determine and select technically and economically viable solutions for the modernization and reconstruction of water treatment and wastewater disposal facilities. The paper presents the comprehensive technical survey results of a treatment facilities block in a water treatment plant, identified defects and damage affecting the structures bearing capacity, performed a design justification of the structures technical condition, proposed methods for eliminating the identified defects and damages within the planned reconstruction of water treatment facilities.

Keywords: *comprehensive technical survey, reconstruction, water supply and sewerage systems, sedimentation tanks.*

Yu. N. LAPIN

THE CONCEPT OF AN ECO-FRIENDLY MINI-DISTRICT IN THE "ISLAND" CITY

Currently, the search for new concepts in urban planning is becoming more and more urgent due to the need to simultaneously solve the problems of biosphere compatibility of cities and the improvement of the environment in them. In this regard, this paper develops and concretizes the concept of an island city with an inverse layout proposed by the author earlier. The island city consists of separate large urban areas separated by green multifunctional strips of continuous ecological framework. Currently, in the domestic practice of urban planning, urban areas are made up of so-called residential areas, which in turn consist of microdistricts. The paper proposes an alternative to residential areas and microdistricts in the form of ecological mini-districts with a pronounced inverse radial-ring zoning. The main idea of the planning structure of the mini-district is to transfer business and most of the service functions to a fairly densely built-up external zone and organize a fairly extensive public and recreational core within the mini-district. A transition buffer zone with intermediate characteristics is allocated between the inner and outer zones. The advantages of the mini-district will be a rich range of activities and leisure activities, a high degree of stylistic and aesthetic diversity of the living environment, as well as safety and environmental friendliness.

Keywords: *natural framework of the city, island effect, island city, urban environment, mini-district, micro-district, block, transport accessibility, green spaces, recreation, environmental sustainability.*