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BIOSPHERE COMPATIBILITY: HUMAN, REGION, TECHNOLOGIES

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E.V. KHOLODOVA

LANDSCAPE, COMPOSITION AND GARDEN AND PARK DEVELOPMENT IN THE COMPLEX MANOR BUILDING OF THE SETTLEMENT INDUSTRIAL DESERT OF THE KURSK REGION SECOND HALF OF THE XVIII - XIX CENTURIES

The research is based on little-known factual material: a comprehensive analysis of documentary and printed sources of central and regional archives, museums and libraries; family domestic and foreign archives; a full-scale survey of the surviving fragments of the Korennaya Pustyn settlement. The scientific novelty of the research is associated with the author's expeditions and the survey of the development complex of the village of Korennaya Pustyn (monastery, fair, village) (measurements, photographs, nature sketches), themes.

An important result of the study is the disclosure of the phenomenon of suburban estate construction of the Kursk province as a dacha settlement as part of the monastery and fair complex of the village of Korennaya Pustyn in the 2nd half of the 18th - 1st half of the 19th centuries. arrangement of a unique settlement.

The study was carried out at the expense of the State Program of the Russian Federation "Development of Science and Technology" within the framework of the Plan of Basic Scientific Research of the Ministry of Construction of Russia and the RAASN.

Keywords: *dachas, estates, monastery, fair, architecture, gardens, landscape*

E.V. SYSOEVA, M. O. GELMANOVA

ANALYSIS AND EVALUATION OF THE DUST POLLUTION OF THE TERRITORY OF MOSCOW WITH FINE PARTICLES OF PM_{2.5} USING A THREE-DIMENSIONAL NUMERICAL MODEL

At present, the problem of air pollution with solid particles suspended in the air is becoming significant in the territory of large megacities, which indicates the need to develop special measures to ensure the environmental safety of the urban environment, related to ensuring the standard level of concentrations of fine particles. The ability of dust particles of the PM_{2.5} fraction to absorb highly toxic organic compounds, and, penetrating into the upper respiratory tract and alveoli of the lungs, to release these compounds into the human body makes them secondary damaging factors that increase the negative impact of the urban environment on the human body. Due to the fact that particulate pollutants PM_{2.5} are more toxic and pose a greater danger to human health in comparison with PM₁₀, only PM_{2.5} are considered in this study. In this paper, using the example of a residential microdistrict in the southern administrative district of Moscow, the regularities of the distribution of fine dust particles in urban buildings are investigated using numerical modeling in the ENVI-met program. The results of the calculation carried out in this study demonstrated that the width of a roadway and, consequently, the number of vehicles passing it per hour plays a primary role in the formation of fine dust in the studied area. Dust pollution remains highly concentrated along the roads. The greatest negative impact of fine dust falls on residential buildings located along highways. In future studies, it is planned to assess how various options for integrated landscaping of the study area (including greening the roofs of buildings along areas with a high content of fine particles) can reduce the concentration of PM_{2.5}, this will allow us to formulate recommendations for rational and effective landscaping of urban areas.

Keywords: *air pollution, vehicle emissions, fine dust PM_{2.5}, CFD modeling, ENVI-met, urban landscaping, green roofs, environmental safety of the air environment*

M.V. USTINOV, I.V. SAVOSIN, M.M. USTINOV, S.M. USTINOV

DETERMINATION OF POTENTIAL BOUNDARIES OF WATER BODIES DIFFERENT PROBABILITIES IN THE TERRITORY BRYANSK REGION

The issues of flooding of territories are considered. The main cause of floods is called climate change, due to which precipitation becomes more abundant. In Russia, 40-70 major floods occur annually. About 500 thousand square kilometers, about 300 cities, tens of thousands of settlements, more than 7 million hectares of farmland are subject to these disasters. 4 districts of the city of Bryansk, up to 709 residential buildings may be flooded. The purpose of the research is to create potential boundaries of water bodies corresponding to the achievement of the water level, which is statistically possible 1 time in 100 years, 1 time in 20 years, 1 time in 10 years, 1 time in 5 years and 1 time in 2 years on the territory of the Bryansk region. Tasks: obtaining and processing data from a digital terrain model and data from hydrological observations at hydro posts; determining the contours of water bodies during low water levels; calculating potential boundaries of water bodies of various probabilities; verifying the results of calculations based on remote sensing data. Initial data: daily data from hydro posts; cartographic materials; digital relief model; remote sensing data. The studies provide for the phased execution of works: preparation of initial data; performing calculations related to the water level on the arrays of hydrological data; processing of the data of hydraulic posts. Several digital terrain models are used at the calculation stages. CMM processing is carried out in a single cycle, adapting processing algorithms to the type of underlying surface to ensure the possibility of calculations both in the territories of settlements and in inter-settlement territories along watercourses. To determine the flood zones, a geomorphological flood index is constructed. The best recognition of flood zones is provided for a geomorphological index having the form $\ln(hr/H)$. The geomorphological index is binarized by the multiclass classification procedure provided for by the purpose of research, by recognition with training. The final result of recognition is the potential boundaries of water bodies of various probabilities of flooding.

Keywords: flooding, water level, cartographic materials, digital model, contours, boundaries, hydropost.

A.V. GORODKOV, V.A. ROMASYUKOV

TO MONITORING AND EVALUATION OF ACOUSTIC PARAMETERS OF THE TRUNK TERRITORIES OF THE LARGEST MEGOPOLIS (On the example of the South-Eastern JSC of Moscow)

The state of the environment of the mainline zones of the largest industrial and residential area of Moscow, which is part of the South-Eastern Administrative District, which are most vulnerable to a number of environmental factors, including the acoustic effects of road traffic, has been investigated. The relevance of the study of the state of air pollution in these territories is due to the proximity of the red lines of residential buildings, the presence of pedestrian and public spaces, public service institutions, in which the standard level for the factor of air pollution must be ensured. The paper analyzes the impact of traffic flows, provides an assessment of traffic intensity. For the instrumental assessment, a steady-state aeration regime was selected with the direction of wind flows towards the points of analysis. The relationship between the concentration of air pollution and the parameter of the intensity of traffic flows has been revealed. On the example of ten main arteries that form the main transport frame of the SE AO of Moscow, it has been established that the traffic intensity during peak traffic periods is over 5500 vehicles / hour. In accordance with the requirements of GOST 23337-78, the calculation of the equivalent noise levels formed at the control points of measurements was carried out. A noise map has been built, reflecting the updated state of the acoustic regime of the studied areas. Recommendations are given for the normalization of the acoustic regime of territories by means of protective landscaping of highway sections and pedestrian zones.

Keywords: atmospheric air, concentration of harmful substances, vehicles, carbon dioxide, nitrogen dioxide, lead, maximum permissible concentration.

E.A. URETSKY, E.S. GOGINA, A.P. DARMANYAN, V.V. MOROZ

IMPROVEMENT OF TECHNOLOGICAL EQUIPMENT FOR INDUSTRIAL PROCESSES OF WASTE WATER PURIFICATION BY THE REAGENT METHOD

The results of the experimental study of the flow structure in devices with anchor stirrers with various methods of supplying and withdrawing liquid flows both at a laboratory plant with a capacity of 25 liters and at standard devices of the Brest Electromechanical Plant (BEMZ) enterprise with a volume of 2.0 m³ are presented; 2.5 m³; 5.0 m³ and 6.3 m³. It was shown that the best model for describing the structure of flows in the studied apparatuses is the single-circuit circulation model. Based on the studies conducted, the patent-protected design of the zoned chemical reactor was developed, which was introduced into the process of treating the waste water of the BEMZ plant. This made it possible to carry out several technological processes in one volume (neutralization of wastewater containing hexavalent chromium, paint-containing contaminants, complex compounds of heavy metals) with the subsequent neutralization of all types of waste water. All this led to a decrease in metal and energy consumption of reactor equipment by 3-4 times. To intensify the process of mixing reagents with waste water at the entrance to the zoned chemical reactor, patent-protected small-sized vortex mixers were installed, which provided a preliminary segregation of chemical reagents and treated waste water by at least 95%. As a result of this combination of successive flow mixing steps in vortex mixers and in a zoned chemical reactor over a wide range of effluent and chemical flow rates, the structure of flows in the apparatus began to correspond to the model of ideal mixing. As a result of the intensification of the movement process, the sensitive elements of the automatic control system in the stagnant and bypass zones of the chemical reactor were excluded, which ensured a reduction in the consumption of reagents for neutralizing waste water at the BEMZ by at least half. The use of the proposed design (zoned chemical reactor in combination with vortex static mixers at the inlet) allows you to minimize the number of technological equipment (mixers, reactors, flocculation chambers) by combining their functions in one volume without reducing efficiency and productivity and at least four reduce metal and energy consumption, as well as reduce the need for production areas for its placement.

Keywords. pH, chemical reactor, flow structure, mechanical stirrers, static mixer, substance conversion, chemicals.

D.P. ZULETA, D.R. CALDERON

HUMANISTIC BALANCE OF THE BIOTECHNOSPHERE IN ECUADOR: CALCULATION METHOD

The article is devoted to the development of a methodology for calculating the humanitarian balance of the biotechnosphere on the example of cities in Ecuador. One of the key directions of solving the urban planning of a modern city is to create conditions for full human development and self-sufficient development of urban areas based on the paradigm of compatibility with the biosphere, leaving aside the antagonism between nature and human activity. We are talking not only about architecture and urban planning, but also about life activities in settlements, cities and megacities, i.e. about the functioning of the productive and governing spheres and about human development in all respects. The relevance of the planned research is dictated by the need to implement the paradigm of biosphere compatibility in order to form a safe and comfortable living environment, create new ecological, energy and resource - minimized technologies, structures and materials. The purpose of the article is to develop the principles and methods of quantitative assessment of the humanitarian balance of the biotechnosphere in the architectural and construction complex of cities and settlements.

Keywords: Ecuador, biotechnosphere balance, humanitarian factor

E.M. KOCHENKOVA, S.V. MAYOROV, S.B. SBORCHIKOV

SANITARY PROTECTION ZONES IN THE EXISTING DEVELOPMENT

Introduction. *The sanitary protection zone is a widespread, but still not clearly defined concept in the legislation. According to the RF Government Decree No. 222 the SPZ design project is required to justify the size of the sanitary protection zone of the object, and its border must be put on cadastral records for all industrial facilities. Accordingly, the SPZ design issue is relevant for all industrial facilities without exception. This work is based on the SPZ project data of a real enterprise for the production of car components from polyurethane foam in Kaluga.*

Materials and methods. *Justification of the SPZ size is carried out on the basis of the received cartographic and tabular materials. The calculation of the dispersion of harmful substances in the atmosphere, assessment of noise impact, impact on the landscape and assessment of the SPZ by a combination of factors are performed. The criterion for determining the SPZ size is not exceeding at its border hygienic standards, established for the atmospheric air of populated areas as 1 MPC.*

Results. *According to the factors of acoustic and chemical impact, it is proposed to establish the variable boundary of the SPZ from the boundary of the industrial site. Calculations for other types of negative impact are not carried out, their impact is assessed as insignificant. The integral size of the object SPZ is established on the basis of the calculations by a combination of factors. A program for instrumental control at the border of the design SPZ with the selected design control points is being compiled. If the fact of exceeding the MPC is revealed, additional measures are provided to achieve full compliance with the established standards.*

Conclusions. *The main unfavorable factors of the production activity impact on the environment and humans are emissions of pollutants into the atmosphere and sources of acoustic exposure. Currently, an urgent problem is the development and implementation of environmental standards for the quality of atmospheric air for its chemical properties. In certain situations it would be advisable and even necessary to additionally estimate the total value of pollutant emissions per year.*

Keywords: *sanitary protection zone, estimated sanitary protection zone, chemical pollution, anthropogenic impact, maximum permissible concentration, production zone.*

A.A. LAPIDUS, A.A. STEPANENKO

METHODOLOGY OF SELECTION AND EVALUATION OF TERRITORIES FOR BUILDING CONSTRUCTION

The article deals with the problem of developing an effective methodology for the selection of urban areas for the construction of multi-storey buildings and a comprehensive assessment of the organization of the construction of buildings in conditions of dense urban development. The lack of methods impedes the effective work of the construction industry both in the megalopolis and in the regions. Factors, technical complexity, and a host of other implementation challenges unique to high-rise building projects do increase their susceptibility to failure and failure. The purpose of this article is to study the factors affecting the assessment of the effectiveness of the organization of the construction of multi-storey buildings in conditions of dense urban development, the rejection of projects of multi-storey buildings. Research findings and derived empirical data can improve the success of high-rise building projects. Primary data were used for the study. A structured survey of experts from the National Register of Nostroy specialists in the field of construction was carried out. Materials and methods. Experts carried out an individual assessment of the proposed factors out of 10 groups of factors with the help of ranks in the course of which, the factors were arranged in descending order of the degree of their influence on the resulting sign or object of research. Data are analyzed using frequency distribution and percentage, point mean and factor analysis. Conclusions. The factors most significant for abandoning multi-storey projects are insufficient client funding, improper planning during the pre-construction stage, structural failure of a multi-storey building during construction, business bankruptcy of the contractor, inadequate planning of the construction project and refusal to attract qualified specialists with technical knowledge and experience. The factors assessed are grouped by human resource capacity, planning and design quality, contractor selection and variability, insecurity and variation, and force majeure and political risk. Further research may focus on specific strategies for reanimating abandoned high-rise buildings.

Keywords: *factors, methodology, dense urban development.*

N.A. LITVINOVA, V.N. AZAROV

ON THE REGULARITIES OF THE VERTICAL DISTRIBUTION OF CONCENTRATIONS OF POLLUTANTS IN THE ATMOSPHERIC AIR FROM MOTOR VEHICLES OF RESIDENTIAL AREAS OF THE CITY TERRITORIES

The problem of vertical atmospheric air pollution of urban areas of residential areas associated with harmful emissions of motor vehicles is considered. A brief description of the studied objects is given. Concentrations of harmful substances such as carbon monoxide (II), phenol, formaldehyde, and aliphatic hydrocarbons (C1-C5) were experimentally determined at different heights and distances from the highway. The regularities of their distribution in the atmospheric air along the vertical of buildings of the urban environment are established. The points on the height of buildings that are most susceptible to vertical pollution, depending on the type of local development, have been identified. Based on long-term experimental studies, the degree of influence of atmospheric air on the quality and parameters of the air environment inside buildings (temperature, speed and humidity) has been established. The dependence of the vertical distribution of concentrations of gaseous pollutants on the height of buildings on vehicles for various types of local.

Keywords: atmospheric air, harmful substances, type of local development, concentration, carbon monoxide (II), aliphatic hydrocarbons, phenol, formaldehyde, motor transport.

G.V. LEVKINA, S.I. MARCHENKO, O.A. IVANCHENKOVA

JUSTIFICATION OF THE DESIGN OF BUFFER ZONE OF NATURE MONUMENTS OF REGIONAL SIGNIFICANCE, TAKING INTO ACCOUNT THE PRINCIPLES OF BIOSPHERIC COMPATIBILITY (ON THE EXAMPLE OF THE NATURE MONUMENT "FOREST RESERVE NAMED AFTER G.F.MOROZOV")

The article presents the results of research obtained in the course of a comprehensive environmental survey of the territory of a natural monument of regional significance. Taking into account the principles of the concept of biosphere compatibility, one of the important environmental factors of sustainable development is the unity of settlements and nature. The creation of specially protected natural areas of regional importance is part of the environmental policy of the constituent entity of the Russian Federation. However, this does not exclude the possibility of a negative impact of human economic activity on natural objects, therefore, it is necessary to provide an effective system for the protection of this territory and improve the quality of its condition. To date, there are no clear requirements of regulatory documents for the creation of buffer zones for specially protected natural areas of regional significance. Having studied the state of more than thirty natural monuments of regional significance in the Bryansk region, approaches to justifying the design of protected areas are considered, the main factors and threats of negative impact on them are noted, such as the potential danger of the impact of roads on forest ecosystems, a high recreational load. The limited use of territories adjacent to specially protected areas in world and domestic practice is considered an effective method of preserving natural components and complexes in a natural or little-modified state. A concrete example shows the practical implementation of the design of a buffer zone with an indication of the size and boundaries. It can be concluded that a comprehensive detailed survey of the territories of natural monuments of regional significance, supported by long-term observations of the state of the environment, will effectively identify in kind and justify the need to create protected areas of buffer zone, taking into account the principles of the concept of biosphere compatibility.

Keywords: specially protected natural area, buffer zone, recreational load, anthropogenic impact, forest ecosystems, settlements, ecological survey

L.A. ZVEREVA, E.A. MELNIKOVA

THE PRINCIPLE OF MODELLING EROSION PROCESSES IN URBANIZED AREAS

The main supplier of sediments entering water bodies in urban landscape conditions is surface water flows of watershed surfaces formed in residential areas.

The purpose of this work was to investigate the possibility of using a kinetic model to describe the process of water erosion in the catchment areas of the urban landscape. Surface water erosion was considered as a heterogeneous process involving simultaneously proceeding stages: destruction of soil-forming rocks, transfer of particles of destroyed rocks and soils into the sedimentation zone; formation of sedimentation. The article describes a process diagram reflecting the possible stages of the transition of the initial substance of the system - soil in its natural state - into soil washed away as a result of water erosion. Dependencies characterizing the erosion process are given.

Processing of experimental data according to the proposed method allows predicting the course of erosion processes. At the same time there is no need for long-term observations, taking into account a large number of parameters of the erosion process which are difficult to define. It is enough to measure the depth of erosion in the initial period of precipitation or snowmelt.

The application of the kinetic model was tested on the basis of experimental data. The observations were carried out on the territory with the soil cover disturbed due to the construction work in the flood-lands of the Desna River within the city of Bryansk where stream erosion developed.

The analysis and comparison of the calculation results with the experimental data obtained showed their good convergence which allowed us to conclude that the kinetic model can be used to describe and predict the process of water erosion in the catchment areas of watercourses in urbanized areas.

Keywords: *surface erosion, watershed surfaces, urbanized areas, kinetic model*