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# BIOSPHERE COMPATIBILITY: HUMAN, REGION, TECHNOLOGIES

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I.Y. GLINYANOVA, V.T. FOMICHEV

**HIDDEN SOURCES OF NATURAL CONTAMINATION  
OF ATMOSPHERIC AIR WITH FINE DUST AS A PROBLEM  
OF ENVIRONMENTAL SAFETY IN POPULAR ITEMS:  
THE METHODOLOGICAL ASPECT**

*Fine dust is one of the main activators of the trigger in the destruction of the human body, the development of numerous diseases. In this regard, the issue of identifying the true sources of environmental pollution in settlements to improve the environmental safety of the population living there becomes an urgent issue. It is worth noting that the problems of pollution of settlements with fine dust are not always associated with the anthropogenic load of industrial enterprises, vehicles, but can also be caused by other sources of environmental pollution, including natural character. In many regions of the Russian Federation, there are certain problems in the state and level of public health, while sources of environmental pollution with fine dust remain not fully identified. There are, for example, regions in which there is a consistently high percentage of certain types of diseases compared to the national average, but no causes of these diseases have been found. The subject of this study is the analysis of the main sources of fine dust in the atmospheric air of settlements in different countries of the world based on a review of scientific studies carried out by scientists in Russia and abroad. The purpose of the work is to generalize sources of atmospheric air pollution of settlements and develop a methodological concept for identifying hidden natural sources of pollution. Research objectives: analysis of scientific research in Russia and abroad to identify the main sources of air pollution of settlements with fine dust; generalization of the main sources of the origin of dust particles in the atmospheric air of settlements; the construction of a methodological concept for identifying hidden natural sources of air pollution with fine dust in urban and rural settlements. Materials and methods: the research material is sources of fine dust in the atmospheric air of various settlements in the world; the study uses logical research methods: classification, generalization; analysis and synthesis; comparison and comparison; the method of logical interpretation and logical justification, etc. Results: summarized the main sources of the origin of fine dust in the atmospheric air of human settlements in the world; a methodological concept has been developed for the search for hidden natural sources of pollution of settlements with fine dust in the form of its eight fundamental, basic principles (phytodusting, biogeochemical, settlemental, historical, geological, medical-ecological, anthropogenic-natural, and comparative), etc. Conclusions: based on the developed basic of principles of a methodological concept, the author proposes to identify hidden sources of natural pollution with fine dust in settlements that are located us on the ancient platforms with the foundation of Precambrian age in order to improve the environmental safety of the population living there. The implementation of the basic principles of the methodological concept can be widely applied in various fields of human activity: ecology, environmental monitoring, environmental safety, construction, geotechnical and environmental surveys at the stage of pre-design work; geoecology, geology, etc.*

**Keywords:** environmental safety, fine dust; dust particles; fractional composition; natural sources of pollution; environmental engineering surveys; settlements; biogeochemistry.

E.S. TSHOVREBOV

## **SCIENTIFIC SUBSTANTIATION OF METHODS AND SYSTEM OF REQUIREMENTS OF MAINTENANCE OF ECOLOGICAL SAFETY IN BUILDING AND MUNICIPAL SERVICES**

*The analysis of existing scientifically methodological approaches to research of system of maintenance of ecological safety in building and municipal services is carried out. Scientifically proved methods of an establishment of criteria, levels, system requirements of ecological safety of settlements concerning negative influence of a waste of building and municipal services are offered. Necessity, the importance and an urgency of formation of ecologically safe organizational-technical system of complex use of secondary resources and its technological base - infrastructures in sphere of separate gathering, processing, recycling, neutralization of a firm municipal and building waste is shown.*

*Research objective is formation of conceptual approaches, methodical receptions of definition and a scientifically-practical substantiation of levels, indicators and system requirements of maintenance of ecological safety in a building and municipal complex.*

*As research problems serve: generalization of domestic and foreign researches in the field of the reference with a waste and secondary resources, maintenance of security of an environment and the person from negative influence of the economic activities forming dangerous anthropogenous objects - a firm municipal and building waste; revealing of factors of ecologically dangerous influence of a firm municipal and building waste on environment of settlements; system engineering of an estimation and the analysis of a condition of ecological safety of the city environment.*

*As object of research the organizational-administrative among themselves organizational-administrative, legal, technical and economic processes of the reference serve in the present work with a waste and secondary resources.*

*Conceptual approaches to creation of system of maintenance of ecological safety of settlements regarding influence of a waste of building and municipal services are offered. The generated quantitative both qualitative nature protection and resource indicators, levels of ecological safety have the big practical value for application in the various documentation at stages of investment process.*

**Keywords:** *ecological safety, preservation of the environment, production wastes and consumption, methods of scientific researches, natural resources, secondary resources, processing, recycling of a waste, savings of resources.*

E. D. KHETSURIANI, T. E. KHETSURIANI, V. L. BONDARENKO, D. S. LARIN

## **EXPERIMENTAL TECHNOLOGIES FOR PROTECTION OF RIVER WATER INTAKES FROM SEDIMENT DEPOSITION**

*The article presents laboratory studies in which the main goal was to study the minimum retention of sediment at the water intake using a double bottom guide threshold. Studies of the operation of bottom guide thresholds were conducted by observing the nature of water movement. So, to identify the flow mode, bottom and surface floats and photography were used. Initially, the flow regime in the area of the bottom water intake head installation without guide thresholds was studied. Then the flow regime was studied at the same flow rates, depths, and average speeds, but after installing double bottom guide thresholds. Because of the conducted research, the position of double bottom thresholds was found, at which the best effect of deflection and removal of sediment from the area of the water intake head is obtained. When setting up experiments, methods of planning experiments were used. Based on the data obtained in laboratory studies, the proportion of bottom sediment deposited at the water intake was found. Factors under study: angle between the guide walls  $\varphi$ , average speed, depth. A plan was drawn up that allowed us to build a linear model of the first order and test the hypothesis about the linear nature of the influence of factors on the process under study. The plan of the experiment is presented in encoded form, the values of factors in non-encoded form, and the values of the studied parameter obtained as a result of the experiment. Studies have shown that the use of a double bottom guide threshold to protect water intake structures from bottom sediment can be considered effective.*

**Keyword:** *Water resources, bottom sediments, guiding thresholds, technologies, ecosystem, water flow regime, efficiency.*

A. M. BREKHUNTSOV, Y. V. PETROV, D. S. SOKOLOVSKAYA

## **ASSESSMENT OF DIRECTIONS CREATION OF A STATE INFORMATION SYSTEM IN SPHERE OF WASTE MANAGEMENT IN THE TYUMEN REGION**

*In recent years, one of the most pressing global problems becomes environmental pollution by household and industrial waste. At all levels of government in our country are carried out "garbage reform", regional programs in the field of waste management are developed and implemented. One of the main problems today is unauthorized landfills, because they represent a serious source of pollution hazardous substances for human health. Hence, the need for detection and monitoring of unauthorized landfills, this problem can be solved using remote sensing data.*

*For the current rate of development in all spheres of society, the use of remote monitoring is the most relevant solution. Efficiency and accuracy of information determines the tendency to expand the use of space monitoring to solve many applied problems, especially in state of the environment.*

*The list of places of waste accumulation for the Tyumen region, compiled by the Departments of Departments of Subsoil Use and Ecology of the Tyumen region and included in Attachment 3 to the Territorial Waste Management Scheme currently does not take into account all real unauthorized landfills and requires a new inventory. An inventory should be made of all waste disposal facilities, using satellite image decryption materials, data from the department itself, as well as data from interactive maps of public organizations, to fully reflect the real situation in the field of waste management in our region.*

*The purpose of our article was the analysis and synthesis of materials from various sources in order to identify problems in the field of waste management and formulate recommendations to executive authorities for their solution. Moreover, pay attention to the need to create a single registry on the current state of all waste disposal facilities and monitor the dynamics of landfills and their reclamation processes.*

**Keywords:** *Satellite images, remote sensing, waste disposal facilities, solid municipal waste, unauthorized dump, ecology, monitoring, liquidation and reclamation.*

P. V. SKRYABIN

## URBAN DEVELOPMENT AND ECOLOGICAL MODELS OF THE SOUTH SIBERIA

*In this publication, the author proceeds from a direct relationship between the quality of the urban environment and the preservation of the ecological balance of the developed territory. Following the idea of maximum conservation of non-renewable natural resources, a new direction in urban planning is proposed, focused not on socio-cultural needs (the socialist model), not on financial and economic development (the liberal model), but on preserving the natural and ecological potential of the territory. It is not difficult to calculate the natural and ecological potential of the territory using mathematical equations, after which a town-planning and ecological model of the planning organization of the territory of any scale is proposed. The territory of Southern Siberia, which has a unique natural landscape and territorial potential, was selected. The Northern site boundary is the axis of the TRANS-Siberian railway, from the West, from the South-West and the South territory limited by national borders with Kazakhstan, the Eastern border of the selected axis Kemerovo-Novokuznetsk. It is proposed to consider the selected territory on three large-scale levels. The first level is Federal (including several neighboring administrative entities: part of the Novosibirsk region, the Altai territory, the Altai Republic, and the Kemerovo region). The second level is regional (Gorny Altai). The third level is municipal (Chemalsky district). At each level, the ecological capacity is calculated, the ratio of disturbed and undisturbed natural territories by economic activity is revealed, and an ecological framework is proposed based on existing and planned specially protected natural territories (reserves, reserves, reserves). This allowed us to determine the direction of urban development of the territory, that is, the route of future transport links, the location of new settlement nodes (settlements, future farms and tourist complexes), which is the basis of the urban-ecological model.*

**Keywords:** urban planning, territorial planning, settlement, ecological balance, natural landscape, spatial grid.

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

## ABOUT THE INFLUENCE OF GARDENING ON THE MIGRATION OF HEAVY METALS IN THE SYSTEM "LITHOSPHERE - BIOSTROME - ATMOSPHERE" OF THE CITY ENVIRONMENT

*It was established that green spaces accelerate the processes of migration of pollutants, in particular, heavy metals in the system "lithosphere - biostrome - atmosphere". It was experimentally confirmed that in the cold season, toxicants are concentrated in the lower layers of the soil, practically not moving to the surface, as a result, their concentration in the air is low. A direct correlation was revealed between the intensive vegetation of plants and the concentration of heavy metals in the upper layers of the soil. An increase in the concentration of heavy metals in the air during the period of active vegetation of plants was confirmed by the example of the territory exposed to the active influence of railway transport and industrial enterprises.*

*A scheme of the process of transferring heavy metals in the system "lithosphere – biostrome – atmosphere" is proposed, a mathematical model of their balance is compiled, and dynamics of the flows of heavy metals are calculated. The heavy metal flux balance schemes were developed and built in the "lithosphere – biostrome – atmosphere" system, which allow one to evaluate the effect of green spaces on these processes. As a result of the analysis of the positive and negative zones of the flows, the fact that the green spaces accelerate the processes of interstructural movement of heavy metals in the lithosphere – biostrome – atmosphere system in the selected area is theoretically confirmed.*

**Keywords:** green spaces, air quality, urban environment, heavy metals, system "lithosphere - biostrome - atmosphere".

I.P. AVILOVA, M.O. KRUTILOVA

## **A COMPREHENSIVE ENVIRONMENTAL SAFETY-BASED ANALYSIS OF CARBON IMPACT IN CIVIL BUILDINGS**

*Construction market ecocodevelopment is an important multidisciplinary challenge from the standpoint of environmental protection. It implies a search for new ecooriented building solutions, which in turn will contribute to developing low-carbon construction, improving tools for quantitative assessment of environmental construction safety and instruments of the extended responsibility. Full-scale implementation of the concept of low-carbon development of the construction industry involves managing the environmental safety of buildings and structures in all of its life cycles. It should start with the stages that do not negatively affect the environment (pre-design and design), but allow to prevent negative consequences at the most energy-intensive stages (construction and operation). A comprehensive environmental safety-based analysis the author proposes makes it possible to optimize design, planning and technological solutions at the pre-design and design stages from a carbon minimization perspective.*

**Keywords:** low-carbon construction, environmental construction safety, green building, extended responsibility in construction.

V.S. FEDOSIHIN, O.M. SHENTSOVA

## **CONCEPT AND METHODOLOGY FOR SUSTAINABLE DEVELOPMENT EVALUATION CITIES AND CITIZEN ENTERPRISES: ECONOMY, ECOLOGY, SOCIOLOGY (on the example of Magnitogorsk and Magnitogorsk Iron and Steel Works)**

*This study examines the problem of sustainable urban development on the example of the industrial city of Magnitogorsk and the city-forming enterprise - Magnitogorsk Iron and Steel Works. Having studied and analyzed the available materials on the issue of sustainable development of an industrial city and city-forming enterprise, the study authors specified that the sustainable development of a city is a unity of three approaches and their principles: economic (the principle of preserving total capital by which urban income is obtained), environmental (dust and gas principles emissions into the atmosphere of general and from a ton of steel produced at the plant) and sociological (principles of interaction stability, stability and mutual control of life of people and social groups). They are not equivalent in value and represent a complex structure. Their degree of importance depends on the historical moment in time, for which a complex indicator is calculated. The authors proposed a methodology for assessing the level of economic, environmental and social activities of Magnitogorsk and Magnitogorsk Iron and Steel Works based on digital indicators for a calendar year and criteria in the form of points, which allows to identify their level within a calendar year, and to state the presence or absence of sustainable development of Magnitogorsk and Magnitogorsk metallurgical plant. This technique is advisory in nature. The authors note that it is necessary to continue scientific work on studying the path of the city of Magnitogorsk and the Magnitogorsk Iron and Steel Works to URG, improving its concept and principles included in economic, environmental and sociological components. For this, it is necessary to use the new principles of national goals and strategic objectives of the development of the Russian Federation for the period up to 2024, approved by Decree of the President of the Russian Federation of 05/07/2018 No. 204, with reference to the city and areas surrounding the city that are not yet known.*

**Keywords:** Magnitogorsk, Magnitogorsk iron and steel works, city development, metallurgical production, ecology, economics, sociological approach