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Internationaler Kongress & Fachmesse

Environmental, Engineering and Legal Aspects for Sustainable Living

Programm Abstracts

euro-eco hannover2020

27 MAI 2020

INTERNATIONAL SYMPOSIUM

"ENVIRONMENTAL AND ENGINEERING ASPECTS FOR SUSTAINABLE LIVING"

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Europäische Akademie für Naturwissenschaften, e.V. Hannover
Europäische Wissenschaftliche Gesellschaft e.V Hannover

ISBN 978-3-00-032886-2

DOI: http://dx.doi.org/10.35630/978.3.00.032886.2

Publisher:
Europäische Wissenschaftliche Gesellschaft e.V. (EWG e.V.)
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http://dx.doi.org/10.35630/978/3.00.032886.2.1

ECOLOGICAL ASPECT OF URBAN DEVELOPMENT OF RAILWAY STATIONS IN THE STRUCTURE OF THE CITY

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The modern stage of the development of urban space is taking place in the context of an ecological paradigm. This requires addressing the environmental safety issues and the preservation of ecological balance based on the integrity of the landscape-ecological framework of territories. Rail transport is a significant technological factor influencing the environmental performance of the city. Its network not only connects cities with each other, but also occupies significant (7-9%) urban areas. These are mainly railway stations of various functional purposes. The goals of this article are to show the impact of their architectural-urban organization onto the ecological performance of the urban space and to identify perspective directions of future development.

The railways network and stations significantly changed the urban landscape during the first industrial revolution. In this period, many railway stations were located near rivers according to technological requirements. Engineering preparation of the territories for their construction included works on lowering the water level, embankment, topography levelling. Greened areas near railway stations were shrinking, giving way to cities roads, the station square, the station buildings, including coal depots, and the ferry depots. Examples are: Paris (France), Stuttgart, Berlin (Germany), Kyiv, Kharkov (Ukraine) and many others.

During the second industrial revolution, the railway network became the basis of the city's transport and communication framework (base). This has caused the planned location of the industry in the around of existing railway lines and building of new stations that serve manufacture. This process has continued the negative changes in the natural base of urban areas and environmental degradation.

Today, rail transport is considered to be the most environmentally friendly transportation, but railways and stations separate the city's space and destroy the city's landscape-ecological framework. To change this situation, effective architectural and urban transformation of the territories of these objects is necessary, especially in the central part of the city. Multi-functional railway station

complexes are formed on their base, covering an area of up to 40 ha or more. The high density of the built-up area and the intersection of a large number of communications of different types of transport make the environmental parameters of these areas worse.

The occurrence of new construction and transport technologies has opened up new opportunities for improving the environmental performance of urban areas in railway station zones. An analysis of the world's practical experience has revealed two main methods of the spatial and planning organization of railway stations, which provide successful solution of environmental problems.

First of all, this is the usage of underground space to accommodate the passenger platforms of the railway station. This allows reducing the building area of the railway complex, to increase of the planting of greenery area and to reduce the noise level. An example of such a solution is the reconstruction of the railway station in Studgard (Germany). The implementation of the project will make it possible to combine the urban areas previously separated by the railway station and improve the integrity of the natural landscape.

The reduction of the total area of the railway complex is also achieved by the creation of multi-layered structures using underground and aboveground space. An example is the project that is developed for Mr. San Francisco (USA). It provides for the improvement of the ecological characteristics of the city area by creating a green terrace above the passenger platforms of railway and bus transport during the reconstruction of the railway station. Such a solution is an ingenious symbol of the search for harmony between nature and technology.

It can be argued that the using of these techniques is a promising direction for the formation and reconstruction of railway stations in terms of improvement of the environmental performance not only of railway stations but of the whole city also.

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Nataliia Voiko

http://dx.doi.org/10.35630/978/3.00.032886.2.2

WORLD TRENDS IN LANDSCAPE PLANNING OF GREEN PEDESTRIAN NETWORKS

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The process associated with the growth of human mobility and the variety of motivations for its movement in a modern city leads to the inevitable functional transformation of the pedestrian streets in cities and changes the way of their use. There are specific problems of transforming urban walking routes and communications spaces in many cities of Ukraine, even small ones. On the contrary, in foreign practice, landscape organization and the creation city "greenways" (green paths) are widespread due to the important spatial and recreational meaning.

The "green" pedestrian network (GPN) is a multifunctional component of the modern architectural environment and urban greening system. It is a locally defined linear open green space along green natural eco-corridors, water-green city systems, pedestrian streets, parks, embankments, linear landscape systems (rivers, slopes, etc.), historical trade routes and railways. It performs the function for pedestrian, bicycle, tourist, biological and at the same time for ecological corridors and combines parks, nature reserves, cultural sites or historical places with the city's districts. The main users of green corridors are cyclists, pedestrians, runners, people with disabilities in wheelchairs.

For a long period of time green routes as a part of a green pedestrian network remain an important factor for cultural, economic and political development in European cities. Some facets of this problem are investigated in the works of Ukrainian and international architectural and urban planning theory and practice. In particular, M.V. Lazareva, A.N. Nikulin, I.M. Georgitsa, N.N. Gear, V.A. Shemyakina and L.V. Gasenko devoted their works to the addressing the general problems of the architectural and planning organization of a pedestrian communication networks in cities.

The most noticeable changes in the green walking routes organization have been observed since the 1950s and relate to the gradual approximation of the pedestrian networks with the landscaping and a combination of both with tracks for non-motorized individual transport. The first green routes appeared as a response to the needs of society in conditions of an industrial and a technological

revolution. The time when a production method significantly changed the urban and rural landscapes due to the exploitation of natural resources and the intensive urbanization of the urban landscape, which led to environmental degradation.

Further development of green routes dates back to 1960-1985. During this period, greenways that were formed from the city system of open spaces that connect urban and rural spaces with park areas, turned into the urban green corridors.

After 1985, the large-scale development of the green pedestrian network began. During this period, green pedestrian networks focused on the aesthetic and recreational needs of urban residents, complement greenways for non-motorized vehicles and alternative corridors were created to protect the urban environment from the effects of transport.

Today it is impossible to imagine the high living standards of modern cities without urban green pedestrian paths that create a combination of a quality living conditions for the population. A “green” pedestrian network, “green” spaces and “green” ways are becoming an integral part of a modern city. The landscape-planning organization of green pedestrian networks requires changes in an urban development paradigm. It means a change in a way of thinking of architects responsible for the development and implementation of city programs. The results of the landscape-planning organization of green pedestrian networks should comply with the environmental standards of world urban planning as well as the expectations and needs of urban residents ensuring the preservation of an environment and improving a public health.

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http://dx.doi.org/10.35630/978/3.00.032886.2.3

APPLICATION OF THE «REVITAL» TECHNOLOGY OF WASTE WATER CONDITIONING FOR THE ALL-YEAR INTRA-SOIL IRRIGATION OF MISCANTHUS, GRAINED ON LOW-CARBON SOILS, WITH PRODUCTION OF BIO SUBSTRATE FOR RESTORATION OF SOIL FERTILITY AND INDUSTRIAL RAW MATERIALS

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The innovative technology "ReVital", developed at the Ukr R&D Center "Potential-4" for conditioning urban and industrial wastewater, uses low-energy equipment, resource-saving processes, and eliminates the negative impact on the environment.

The ReVital technology allows conditioning water for reuse with a composition and properties that comply with the standards applicable to water used for irrigation, equipment cooling, transportation, preparation of reagents, equipment washing, etc.

In wastewater conditioning processes using the ReVital technology, the minimum amount of carbon dioxide (greenhouse) gas, a metabolic product of aerobic microorganisms generated in buildings during aerobic biological wastewater treatment, enters the atmosphere, since the ReVital technology uses facultative microorganisms that use bound oxygen and physicochemical processes to destroy organic compounds, bacteria and viruses with the removal of reaction products as sludge.

The final stage of wastewater conditioning is the restoration of their biological integrity on a synergistic bioplate - an engineering structure with microorganisms immobilized on an inert substrate and an intra-soil irrigation system for moisture-loving perennial plants, in particular reed, miscanthus, etc.

The root system of plants removes ions of salts and organic impurities from water, and their green mass absorbs carbon dioxide and produces oxygen during photosynthesis.

The use of a bioplate is promising for the restoration of the ecological and sanitary state of small rivers, most of which within concrete settlements flow

in concrete trays, and the arrangement of wall vertical bioplates in them allows intensifying the natural processes of self-purification of polluted surface waters and restoring them as the habitat of aquatic organisms.

Sewage sludge, green mass of plants undergoes anaerobic degradation to produce biosubstrate to restore soil fertility, and also, as raw materials in industry, as biomass at bio TPPs, production of bio concrete, bioplastics, cellulose, etc.

It is promising to obtain from the biomass of miscanthus a chemical-thermomechanical mass (CTMM) - a high-yield fibrous semi-finished product (HYFSP).

The mass yield from Miscanthus is about 85-92%.

CTMM is used as a fibrous semi-finished product in the composition of a wide range of paper and cardboard products and serves as a partial or complete replacement of cellulose in these types of products while maintaining their high quality indicators.

Due to the lower cost compared to wood pulp, the use of miscanthus pulp has global prospects in the paper and cardboard industry.

This area of use of Miscanthus has a great environmental advantage, as it helps to reduce deforestation.

The use of ReVital technology for conditioning wastewater from pulp and paper mills and growing in synergistic bioplates with an intra-soil miscanthus irrigation system makes it possible to comprehensively solve the problem of protecting water resources from pollution and depletion, to use low-fertile lands, increasing their fertility with biosubstrate obtained from sewage sludge and biomass of miscanthus leaves, with the receipt of raw materials for the production of pulp.

Nataliya Koval

http://dx.doi.org/10.35630/978/3.00.032886.2.4

IMPACT OF PETROLEUM PRODUCTS ON AGRICULTURAL SOILS WITH DIFFERENT HUMUS CONTENTS UNDER EXPERIMENTAL CONDITIONS

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From a hygienic point of view, agricultural soils are most vulnerable to oil contamination, which has a toxic impact on soil biota, slowing down processes of soil regeneration. The content of humus in the soil determines the capacity of its absorption, plays an important role in the formation of its structure and determines the physical properties and fertility. The ability of soil purification is characterized by enzymatic activity of its microflora, in particular, such an enzyme as dehydrogenase. The effect of hydrocarbon loading on soils of two types of agricultural purpose was investigated experimentally to substantiate the safe normative content of petroleum products (PP).

Laboratory studies were performed on model soil media that reproduced one of the main types of soil: soil No. 1 (serosa) - 20 g / kg soil, soil No. 2 (gray forest) - 50 g / kg soil. In the laboratory, studies were conducted on the effects of two most common light-PP fractions: gasoline and diesel, on soil dehydrogenase activity of soil microflora, which were introduced in quantities of 1.0 g / kg, 5.0 g / kg, 10.0 g / kg. and 20.0 g / kg of sample. The introduction of a gasoline fraction of PP at a concentration of 1.0 g / kg in soil No. 1 showed a stimulating effect on the enzymatic activity of the microflora throughout the experiment (21 days). The concentration of the gasoline fraction of PP 20.0 g / kg in the soil showed a sharp inhibitory effect on the indicator of dehydrogenase activity as compared to lower concentrations of the pollutant and relative to the control. The results of the study on the 21st day of the experiment revealed a sharp inhibition of the enzymatic activity of soil microflora No. 1 under the influence of the gasoline fraction PP in comparison with the control: 1.92-2.29 times (at a concentration of 1.0 and 5.0 g / kg), 4.86 times (at a concentration of 10.0 g / kg), 5.3 times (at a concentration of 20.0 g / kg).

Diesel fraction of light petroleum products when added to soil No. 1, regardless of the concentration for the 10th day of the experiment had a stimulating effect on the indicator of dehydrogenase activity, which was higher than the control

value of 1.57-1.86 times. The dynamics of dehydrogenase activity at the end of the study (21 days) remained virtually unchanged compared to the 10 days of the experiment, but lower by 1.71-2.09 times relative to control. According to the results of the study of dehydrogenase activity at loading with gasoline fraction of soil No. 2 with humus content of 50.0 g / kg, a slight stimulating effect of hydrocarbons on soil microflora was revealed at concentrations of NP 1.0-5.0 g / kg relative to control values for 10 and 21 days experiment, respectively: 1.11-1.22 times 10 days and 1.43-17.1 times 21 days.

Despite the higher content of humus in soil No. 2, the enzymatic activity of soil microflora remained almost at the level of control values throughout the study period and practically did not depend on PP concentrations (gasoline fraction). Therefore, the higher content of humus provides greater resistance to microflora to the toxic effects of the gasoline fraction of PPs, which is manifested in the indicator of dehydrogenase activity.

The PP load (gasoline and diesel fractions) at a concentration of 1.0 g / kg showed positive dynamics throughout the experiment, regardless of soil type and type of PP. Experimental studies have shown that the gasoline fraction of petroleum products has a more inhibitory effect on the dehydrogenase activity of soil microflora compared to the diesel fraction, which is clearly observed on soil No. 1 with less humus content (20.0 g / kg).

Low concentrations of petroleum products, in particular the diesel fraction, with a lower humus content in the soil medium, have a stimulating effect on soil dehydrogenase activity, especially in the later phases of the experiment. Therefore, for agricultural soils by the indicator of the dehydrogenase activity, which was studied in the experiment, a normative indicator of PP content (gasoline and diesel fraction) at the level of 1.0 g / kg of soil is proposed.

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http://dx.doi.org/10.35630/978/3.00.032886.2.5

PUBLIC SPACES AND THEIR IMPACT ON PUBLIC HEALTH

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One of the most pressing problems today is the quality development of the urban environment and the health of its inhabitants. Since the end of the XVIII century as a result of the industrialization of society, there has been a great leap of urbanization, which led to a rapid increase in the size and number of urban settlements. With each year humanity have been more and more distancing from nature and entrapped within historically mixed stone aggregation.

The processes of urbanization have completely eliminated the opportunity to enjoy the environment. As a result, people get a homogeneous and aggressive environment, which, being unnatural, not only does not bring aesthetic pleasure, but also causes a significant number of social problems (V.A. Filin). Among the problems of human ecology, an extremely important aspect is the interaction with the visual environment, which is the key to the psycho-emotional health of the population. Thus, the development of urban lifestyles leads to the creation of new structural elements that will contribute to improving the quality of urban habitat and public health. Among them there are public spaces, as the main points of human concentration, performing a lot of functions. Public spaces are universal public areas which have various sizes, locations and destinations that involve the presence of people and their realizing their needs.

Analyzing investigations concerning public spaces, we can recall the concept of Jan Gayle "Cities for People" and identify the following main factors: a) quality of visual perception of the environment; b) ergonomics of the environment; c) psychological comfort and harmony of the environment (Y. Gayle).

An important aspect of a "successful place" is its authenticity. Exploring the issue of urban renewal to a higher level, N.V. Bauer in his dissertation "The Culture of Forming a Sustainable Urban Environment by Landscape Design Methods" states the importance of creating the so-called "place spirit". The formation of the urban environment integrity is impossible without the unity of material, ecological, aesthetic, ethical and spiritual systems (N.V. Bauer). The harmonious combination of the historical and contemporary context of the city -

as an indicator of the quality development of the urban environment, guarantees its recognition and uniqueness. The cultural potential of each city, and especially the historical one, is a basic tenet of settling and creating public spaces in the urban environment. A great number of experts in various fields of science have long come to the conclusion that the basis of the well-being or the disadvantage of a particular city is its individual cultural potential (V.A. Glazichev).

Taking into consideration all factors, we can state the necessity of creating public spaces in the historical city centers which are the starting point of any settlement. At present, the methodology for regulating and organizing public spaces within historical sites and habitats is imperfect. Preserving the historical component and ensuring the quality of further city development is the key to creating a healthy environment, which has a positive impact on the overall social development. That is why, as one of the options for solving the problem of healthy city population, we have identified the need to develop a number of methods of public spaces landscape organization within the historical city environment. Such methods will cause a positive effect the psycho-emotional state of the population:

- improving the quality of the visual urban environment;
- preserving and utilizing the cultural city potential;
- increasing tourist demand, which will positively affect the economic state of the country;
- preserving the authenticity of the place, creating a “place spirit “;
- creating an aesthetically, ethically, economically and socially “successful place”.

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Viktoriia Gryshyna

http://dx.doi.org/10.35630/978/3.00.032886.2.6

KHARKIV URBAN GREENING SYSTEM: CURRENT STATE AND CHALLENGES

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Addressing issues of normalizing the ecological status of the urban environment directly depends on the state of urban greening. This particularly true in the largest cities, where against the background of intensive urbanization there is an increase in the number and density of population, invasion of free natural territories, and separated natural landscapes lose the ability to self-regulation and development. Kharkiv city is one of the most prominent examples of large-scale embodiment of the theory of a modernist city. Since the 1930s, the main provisions of the Athenian Charter (1933) were implemented in the master plans for its development with a clear territorial differentiation of urban functions and the separation of recreational areas. Relying on the ideas of the Howard's Garden city, the green recreational spaces of cities were singled out as an integrated system and an individual object of urban planning in the Soviet architectural theory. The urban green spaces system (UGSS) has been designed on the principle of uniformity and accessibility of the green spaces location and their connection with suburban natural landscapes. In Kharkiv, the process of the UGSS formation was studied and its main stages were determined: 1 - the emergence of public gardening in the city center, the organization of suburban forest parks (mid-17th century – early-20th century); 2 - the UGSS planning in the Soviet period (1936-1983); 3 - stagnation (1983-2000). At the end of the second period, by expanding the area of green spaces in the city, the optimal and efficient UGSS was formed, combining a system of green spots with three green wedges and urban forests (with a total area of 7.9 thousand hectares, including public spaces of 1,460 hectares, with the population of Kharkiv for that period amounting 1.46 million inhabitants).

A detailed analysis of the current state of 130 green spaces in Kharkiv was conducted in accordance with the following groups of indicators: morphological and dimensional; recreational (suitability for recreation); environmental (state and ability to autoregulation). The types of Kharkiv green spaces were selected regarding their environmental needs: I – natural landscapes, capable to autoregulation (31%); II – degraded natural and artificial landscapes (52%); III - natural and

artificial landscapes which lost the ability to autoregulation (17%). Mapping of the types enabled to identify natural and ecological framework of the city. An analysis of the current state of the UGSS of Kharkiv revealed decrease in public green spaces by 38%; reduction of area, degradation and significant separation of the wedges' territories, breaking ties with the natural environment, invasion of park areas with residential and public buildings.

Thus, the process of the UGSS degradation, the inability to meet the requirements of sustainable urban development and autoregulation of natural landscapes is shown. Nevertheless, within the limits of the Ukrainian town-planning norms (<100 people per hectare) all the population demand for recreation is fully provided. Another issue identified in the UGSS is the unsatisfactory state of green spaces, which is determined by the age of the vegetation and diseases of domesticated plants due to climate change.

In order to reconstruct the UGSS of Kharkiv, the following is proposed: to develop methods and measures for the sustainable development of natural ecological framework in the city; to stop hard zoning of urban areas and developing the recreational functions outside the green spaces; to establish new green areas due to redeveloping industrial enterprises and the greening of "third-order landscapes" (P. Bouchain and G. Clement); to re-create the connections between existing green areas within the city and with external natural landscapes using green corridors; conservation and reconstructing the existing green spaces of the city; to landscape public spaces; to change the quality of the living environment; to create natural gardens of the new wave including local plants.

The strategy of the reverse expansion of nature into urban areas, including the need to change the quality of the urban tissue and the spread of natural territories outside the UGSS is determined as the main one. The means of reverse expansion are vertical gardening and greening the roofs of houses, constructing of nature-integrated architecture, forming the green pedestrian infrastructure and green streets, construction of eco-quarters, etc. The reconstruction of residential areas rebuilt in 1960-1980s into eco-quarters has been determined as the most effective method of reverse expansion in Kharkiv.

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http://dx.doi.org/10.35630/978/3.00.032886.2.7

ON THE PECULARITIES OF DESIGNING AGRORECRETIONAL ECOLOGICAL SETTLEMENTS BY MEANS OF EFFECTIVENESS CRITERION

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It is becoming evident today that the growth of settlements, increasing the share of urban population, as well as the emergence of more complex networks and systems of cities leads to the expansion of urban areas and their qualitative changes. In contrast, there is a tendency to create agro-recreational and recreational entities of different types. This, in turn, both improves the economic situation of the settlement itself, and provides the opportunity for a full rest of the local residents and visitors. However, in most cases, the process of formation of agro-recreational entities is not sufficiently provided with the necessary methodological recommendations and town-planning standards.

As a result of our research, an algorithm for designing agro-recreational eco-settlements (as a new type of settlements) has been formed, which allows quickly and fairly accurately to solve city planning problems, taking into account both social, economic and environmental aspects.

The algorithm consists of two main stages:

- assessment of ecological integrity of a agro-recreational eco-settlement landscape by means of the landscape ecological integrity index, and accordingly, determining the area of focus of settlement greening;
- solving the problems of agro-recreational eco-settlements formation by means of efficiency criterion.

The criterion of ecological integrity is considered as limitation of the task of agro-recreational eco-settlement formation. That is, the maximum integrity of the landscape should be ensured for the settlement architectural and urban planning. In the presence of water resources, agro-recreational eco-settlement can develop both along the coastline and up to the coastline with the formation of beach areas. If the area is provided with forest resources not far from the settlement, the settlement development should take place towards the forest with the possible formation of a sylvan park.

The next stage is the formation of possible solutions for the system (agro-recreational eco-settlement), their assessment and ranking based on the communication criterion. The decision on the choice of a place of recreational entity/ agricultural enterprise of agro-recreational eco-settlements is made on the basis of proportionality of two factors: - recreational / agrarian attractiveness and transport distance of the recreational object from the settlement. Thus, demand for recreation / agrarian enterprises decreases with increasing costs for transport services, and in the presence of poor transport infrastructure the concentration of summer residents/ agricultural workers in the areas closest to settlement increases. With high availability of recreational / agricultural resources, the problem can be solved through the selection and subsequent development of the territory as the settlement system evolves and taking into account the growing needs of the population. In cases of severe shortage of recreational / agrarian resources, a set of measures is needed to increase the recreational / agricultural potential or maximize the attraction of resources of adjacent territories (calculations using the ecological integrity index).

Then, on the basis of the obtained results, the procedure of functional and planning structure formation of agro-recreational eco-settlement takes place.

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http://dx.doi.org/10.35630/978/3.00.032886.2.8

THE LEVEL OF HOUSING COMFORT AS A FACTOR IN ENSURING SUSTAINABILITY OF URBAN DEVELOPMENT

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'Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable. 11.1. By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums' is one of the 17 basic goals of transformation of our world, which are defined by 'The 2030 Agenda for Sustainable Development'. It aims to reach the proper level of living conditions comfort.

Today, 883 million people live in slums. Most of them live in East and Southeast Asia. But even in Kyiv in XXI century there are 566.7 thousand people (more than 19 % of population) who have housing that does not meet the normatively defined level of comfort.

According to the General Department of Statistics data, as of 2018, in Kyiv, there are 63.5 million square meters of the total area of residential buildings (including individual estate), which is 1 081.7 thousand apartments. At the same time, among the total number of apartments, 1.9 % (20 539 apartments) are not provided with cold water supply and 3.3 % (35 691 apartments) – with hot water supply. The amount of 4.3 % of apartments (46 513 units) do not have sewerage and 3.9 % of the total number of apartments (42 185 units) are not provided with heating.

However, even the housing, which is equipped with all kinds of facilities, often does not meet the proper level of living comfort for a variety of criteria. First of all, this is so-called 'outdated housing stock'. According to the current legislation the outdated housing stock is the stock, that, 'in technical condition, does not meet the regulatory requirements for safe and comfortable living'. In Kyiv, the volume of the outdated housing stock is 20 % - 12.3 million square meters. The entire mentioned stock can be divided into four types, namely:

1) historical buildings – constructed before 1920. This type includes both particularly valuable buildings that are registered in the Register of Cultural Heritage Sites, and so-called 'background' buildings, which are not directly

protected, but contribute to the creation of an urban environment that corresponds to a certain historical period. The volume of this kind of stock is 2.58 million square meters;

2) barrack type buildings – the least valuable 2-, 3-storey buildings of the construction period after the Second World War that were built as a temporary housing. The volume of the stock is 0.28 million square meters;

3) 'stalinka' type buildings ('ordinary' and 'nomenklatura'-intended') – buildings of the 30s and 50s of the 20th century with quite comfortable layout. The volume of the stock is about 0.73 million square meters;

4) 'khrushchevka' type buildings (5-storey panel and brick buildings, 9-storey panel buildings). These buildings refer to the first period of mass industrial housing construction (the 50-60s of the 20th century). The volume of the stock is 8.73 million square meters.

The technical condition of buildings assigned to the outdated stock is extremely unsatisfactory, physical deterioration of constructive elements comes up to the emergency level (deterioration of 60 %); sanitary and hygienic characteristics of inner residential and non-residential premises do not meet the regulatory requirements for safe living and pose a threat to the health of residents.

Another criterion that significantly affects the level of comfort of living is housing sufficiency. That is, the number of square meters of the apartment's area per 1inhabitant.

According to researchers, the housing provision level in Ukraine is three times lower than what UN standards require. One Ukrainian accounts for 23.8 square meters of housing; the average housing supply in Kyiv is 21.8 square meters per person. At the same time, in Europe, these figures are almost twice as high.

Conclusion. Housing conditions developed in Ukraine and, in particular, in Kyiv require immediate improvement, first of all, this applies to the so-called outdated housing stock. Low housing sufficiency, a threatening technical condition, harmful sanitary and hygienic conditions, the negative impact of the environmental comfort level on the psycho-emotional state of residents - all this requires an immediate solution. A possible way to resolve this issue can only be a complex reconstruction of the territories of outdated housing stock, which is about 20% of the total. The choosing of a possible reconstruction method should depend on the type of outdated housing stock: from complete demolition followed by new construction in the freed territories (the barrack type stock and part of the panel houses of the first period of mass industrial housing construction) till complete conservation with restoration (for cultural heritage objects).

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http://dx.doi.org/10.35630/978/3.00.032886.2.9

WASTE PRODUCTS OF HEAT POWER INDUSTRY AS A POWERFUL FACTOR AFFECTING PUBLIC HEALTH AND LIVING CONDITIONS OF POPULATION

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Waste of heat power industry ranks first in terms of volume in all industrialized countries. For disposal of waste generated by these sectors, the largest areas are allocated, where wastes are placed outdoors, and operating parameters of these facilities, namely high potential of dust generation, cause a negative impact on the living conditions of people in the settlements nearest to the waste ponds and become a powerful source of pollution of environment with hazardous substances.

The subject of studies was the waste generated during burning of coal in the boilers — the ash and slag mixture and waste product — vanadium-containing sludge formed during combustion of the oil-gas mixture in boilers. The hazard degree of wastes was established on the basis of calculations of their hazard category in accordance with the regulatory documents by parameters of acute toxicity of substances and mixtures and their evaluation, taking into account adequate routes of exposure, primarily inhalation, according to European Parliament and Council Directives – European communities (75/442/EEC dated 15 July 1975, 2008/98/EC dated 19 November 2008 «On Waste», European Parliament and Council Directive 2006/12/EC dated 5 April 2006, Council Directive (91/689/EEC) dated 12 December 1991 «On Hazardous Waste», Council Directive No. 91/689 «On Hazardous Waste», Commission Decision (dated 3 May 2000) and Regulations (EC) No. 1272/2008 of the European Parliament and of the Council (dated 16 December 2008). Calculations of the ratio of the total concentration of all toxic components in the ash and slag mixture (ΣC_i) to a total value of assessment of acute toxicity of these substances (ΣATE_i) showed that the coefficient obtained: ($\Sigma[C_{mix}]/\Sigma ATE_{mix}$) = 9.540267/19.97184 = 0.4776859) allows to attribute the ash and slag mixture, based on the scale for defining the hazard category, to Category 2 (0.05<Category 2≤0.5) – Class II (highly hazardous) in case of exposure by inhalation - according to the Commission Decision (dated 3 May 2000) EC and EC Council Regulations (No. 1272/2008 dated 16 December 2008). The hazard

category of the ash and slag mixture in case of oral exposure is determined by the coefficient obtained: $(\Sigma[C_{mix}]/\Sigma ATE_{mix})=9.540267/0.01915041 = 498.17$, allows to characterize the ash and slag mixture as a waste product of Category 4, i.e. Class IV – «low-hazardous» in accordance to the evaluation of acute toxicity range (300<Category 4≤2000) for oral exposure – according to the Commission Decision (dated 3 May 2000) and EC Regulation No. 1272/2008 (dated 16 December 2008). The hazard degree of vanadium-containing sludge in case of oral exposure determined with the use of coefficient $(\Sigma[C_{mix}]/\Sigma ATE_{mix}) = 31.1985266/98.968924 = 0.315$, indicates that, in accordance with the hazard scale, the waste product – sludge from the waste pond — belongs to Category 2 (0.05<Category2≤0.5) in case of oral exposure - according to the Commission Decision (dated 3 May 2000) and EC Regulations No. 1272/2008 (dated 16 December 2008). The hazard degree of this waste product determined based on the evaluation of acute toxicity in case of oral exposure showed that the ratio is $\Sigma(C_{mix})/\Sigma(ATE_{mix}) = 31.1985266/0.35294152) = 88.395739$, that indicates that, in accordance with the scale of the hazard category range, the waste product— sludge — belongs to Category 3 (50<Category 3≤300), the corresponds to Class III (moderately hazardous) according to the Commission Decision (dated 3 May 2000) and Regulations (EC) No. 1272/2008 of the European Parliament and of the Council (dated 16 December 2008).

The results obtained indicate that the determination of the hazard degree of waste — establishing of the hazard class based on the provisions of the EU regulatory documents is legitimate in terms of taking into account all the toxicity characteristics of components of complex chemical mixtures that are the part of waste, and allow to evaluate waste following these documents by their hazard degree taking into account of priority routes of exposure, primarily oral and inhalation routes. Based on the results obtained, we also believe it necessary to note that when using the mentioned method for determination of the hazard class of industrial waste, conditions of handling this waste becomes the critical factor, thus, if dust generation is excluded at all the stages of accumulation, storage, transportation and disposal of waste and thus inhalation exposure is blocked, in many cases the hazard category of such waste will be significantly reduced.

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http://dx.doi.org/10.35630/978/3.00.032886.2.10

USE OF BIOSAN PRODUCT FOR INTENSIFICATION OF BIOLOGICAL WASTEWATER PROCESSING AT MEAT PROCESSING PLANTS

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The aim of our work was to study the effect of the biological product "BioSan" on the structure and functioning of activated sludge SBR-reactor during wastewater treatment of a meat processing plants. The local treatment facilities of the meat processing plant have been operating since 2014 as part of: the grease trap, averager, the filter, a pressure flotator with a preliminary input of a coagulant and flocculant, SBR-reactor, the biofilter loaded with a zeolite substrate and the contact reservoir for introducing polyhexamethylenehuinidine chloride solution. This purification scheme did not provide at the output the normative quality of return water in terms of organic pollution (COD, BOD_5) and ammonium nitrogen. One of the main reasons is the presence of the slaughterhouse at the meat processing plant. In this regard, dissolved difficultly oxidized compounds, and in particular, blood, which were not removed during physicochemical treatment, were present in the wastewater. So, transparent wastewater with intense pink color and the following hydrochemical characteristics was delivered to the SBR-reactor: COD reached 1500 mg dm^{-3}, BOD_5 was 480 mg dm^{-3}, and the concentration of saline ammonia nitrogen was 67 mg dm^{-3}. After biological purification, the COD was 120 mg dm^{-3}, BOD_5 – 40 mg dm^{-3}, the concentration of saline ammonia nitrogen – 32 mg dm^{-3}.To intensify the operation of treatment facilities, "BioSan" biological product was used, which included groups of eutrophic bacteria in the amount of about 10^{11} cells (Bacillus subtilis, Bacillus lichenformis, Lactobacillus acidophilus, Enterococcus faecium, Clostridium butyricum), as well as xylan (up to 700 units g^{-1}), cellulase (up to 40 units g^{-1}) and protease (up to 4 units g^{-1}) enzymes. The biological product was dosed into the averager in the form of 10% suspension at the rate of 0.2 l m^{-3} of wastewater. The use of the biological product began in 2019. As a result, already in the averager, the microorganisms of the biological product "BioSan" decomposed difficultly oxidized dissolved contaminants. After further physicochemical purification, the transparent wastewater with COD was 650 mg dm^{-3}, BOD_5 – 328 mg dm^{-3}, and the concentration of saline ammonia

nitrogen was 34 mg dm^{-3} entered the SBR-reactor. Further biological treatment of return water reduced COD was 80 mg dm^{-3}, BOD_5 – 15 mg dm^{-3}, concentration of saline ammonium nitrogen – 2 mg dm^{-3}.

Microbiological monitoring was carried out quarterly during 2017-2019. We studied the species composition, concentration and sedimentation rate of activated sludge, the physiological state of organisms, sludge index. Live samples of activated sludge were not preserved upon delivery; inspection was performed under the Axio Imager A1 (Zeiss) microscope on the day of sampling. Prior to introducing the biological product into the averager in the SBR-reactor as a result of microscopy of live samples of activated sludge, organisms in the unsatisfactory physiological state, which developed in the absence of both phases of the nitrification process, were most often encountered. Activated sludge often had a low sedimentation rate, its concentration by volume was average 95% vol., and on dry matter – average 6.5 g dm^{-3}, the sludge index – average 180. The above described characterized activated sludge as swelling. Most often, organisms such as amoeba and colorless protozoa were recorded in it (for example, Amoeba, Paramaecium,Flagellatae, Coipoda, Bodo, Vorticella). After the systematic introduction of a biological product, the situation in terms of qualitative and quantitative estimates of activated sludge has changed. So, the status of the physiological state of activated sludge organisms has changed, due to the development of organisms characteristic of both nitrification phases. These include some types of amoeba, colorless protozoa, ciliates and rotifers (for example, Acrella, Centropyxic, Carhesium, Epistylis, Anisonema, Aspidisca, Epistylis, Cathypna, Resticula, Monommata, Nematodes). Active sludge had a high and medium sedimentation rate, its concentration by volume was average 25% vol., and on dry matter – average 4 g dm^{-3}, sludge index – average 43. Thus, the studies have confirmed the effectiveness of the use of the biological product "BioSan" in the treatment of wastewater from meat processing enterprises, as well as wastewater from other enterprises containing difficultly oxidized organic compounds and high concentrations of ammonium salts.

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http://dx.doi.org/10.35630/978/3.00.032886.2.11

THE POSSIBILITY OF APPLYING SULPHUR RECOVERED FROM WASTE OIL IN THE PRODUCTION OF RUBBER

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In the process of cleaning crude oil from hydrogen sulfide produced many elemental sulfur, which is in Tengiz a result of processing of sour oil and gas, indicating the content of hydrogen sulfide. Many elemental sulfur consumes the rubber industry for the vulcanization of rubbers. Sulfur vulcanizing agents included in the group, ensures the vulcanization, i.e., the transformation of plastic and viscoelastic rubber compounds in highly elastic rubber due to the formation of a uniform spatial with the sulfur atoms linking the individual chemical bonds of the macromolecules rubber.

Constantly increasing demands on the quality of tires cause the necessity of creation of effective components of rubber compounds. Particular attention is paid to development of curing agents. Previously, we have carried out work on the application of purified sulphur in the Tengizbrekina and tread rubber compounds that have shown promise for the future. However, the manufacture of frame rubber compounds using purified Tengiz sulfur is not justified, because rubber was hard. In this work, we have conducted research and presented the results of experiments on the possibility of application of polymeric sulfur, obtained from purified Tengizsulfur.

Polymeric sulfur reduces the amount of sulfur in the formulation of rubber compounds without reducing the curing rate, which leads, consequently, to improve the quality of rubber. The use of polymeric sulfur can also adjust the elastic properties of the resulting rubbers. Polymeric sulfur was introduced on a laboratory mill at the end of mixing, in a second stage, in order to prevent premature vulcanization. In the process of cleaning crude oil from hydrogen sulfide produced many elemental sulfur, which is in Tengiz a result of processing of sour oil and gas, indicating the content of hydrogen sulfide. Many elemental sulfur consumes the rubber industry for the vulcanization of rubbers. Sulfur vulcanizing agents included in the group, ensures the vulcanization, i.e., the transformation of plastic and viscoelastic rubber compounds in highly elastic

rubber due to the formation of a uniform spatial with the sulfur atoms linking the individual chemical bonds of the macromolecules rubber.

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The experiments have shown that the technology of mixing, processing of rubber mixtures and vulcanization is virtually indistinguishable from the standard mode, used in normal practice. Vulcanization of the samples was conducted at a temperature of 1550C for 15 utes. As can be seen in figure 1 when using cengizkoy purified sulfur a decrease in abrasion of the rubber frame, which shows an improvement of elastic properties. From the experimental data shown in figure 2, with the addition of polymeric sulfur in the compounding of the mixture is observed a significant increase lasting properties characterized by conventional tensile strength and bond strength between rubber and textile cord carcass rubber.

Thus, the results showed that the use of of polymer sulphur leads to improving the strength properties of the rubber frame by increasing the number of intermolecular bonds in elastomeresmatrix, since all used in the recipe of the rubber mixture, the sulfur reacts to better physico-mechanical properties and quality of tire rubbers.

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http://dx.doi.org/10.35630/978/3.00.032886.2.12

PROSPECTS FOR USING SOUTH KAZAKHSTAN PLANTS

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Republic of Kazakhstan practically has no its own pharmaceutical industry. Almost 90% of pharmaceuticals is imported from far and near abroad countries. A vast amount of money in foreign currency is spent in the state scale. At that, quality of imported preparations does not always meet GOSTs and technical conditions. Pharmaceuticals prepared from plant raw materials are especially effective at treatment of chronic diseases, do not cause ghost effects at their usage and are non-toxic in comparison with pharmaceuticals derived synthetically. Probably, therefore, recently in such developed countries as America, Japan and countries of European Union, basic components for production of pharmaceuticals are natural compounds of plant and animal origin. More than 20 thousand kinds of plants grow in Kazakhstan, 6 thousand of them contain biologically active substances. 600 kinds from these 6 thousand can be used as semi-finished products for production of pharmaceuticals, ready pharmaceuticals can be produced from more than 500 kinds. However, available technologies for production of pharmaceuticals have very labor intensive, multistage and expensive processes. Besides, purity of these products leaves much to be desired, therefore, they are not competitive in the world market.

Such pharmaceuticals as codein, papaverine, etc., are produced at Shymkent chemical pharmaceutical factory from plant raw materials by means of extraction, and accompanying alkaloids flow to waste, as some of them toxic, others – inefficient, and some have no physiological activity. Up to the present moment these byproducts are stored in storage facilities unrealized. However, structures of these alkaloids allow produce on their basis known or new biologically active substances by modification of their structure, by introduction of new functional groups -OH, $-OCH_3$, $-OC_2H_5$, $-NO_2$, etc. When producing pharmaceuticals in the usual manner, yield of the target product is not high. Offered by us technology for extraction of valuable biologically active substances raises the yield of the product up to 80% at the high purity. It is offered to use drug plants of South Kazakhstan for production of biologically active additives. However, mentality of Kazakhstan population is such that the people does not like use dietary supplements, thinking

that they are pharmaceuticals. Therefore, we offer principally new solution – take the dietary supplements in the form of herbal teas with different actions: from hypertension, vitaminized, calming, for improvement of digestion, etc.

The growth in the production and consumption of soft drinks in Kazakhstan is mainly due to increase in the share of drinks based on artificial flavors, dyes and sweeteners. Recently, along with increase in output of products, changes have been observed in the direction of their quality, expansion of assortment, increase in the share of production of drinks based on natural juices, sugar, as well as new types of special-purpose drinks, including low-caloric and energy drinks.

It is proposed to use natural supplements using SKO drug plants in this paper. Such composition of cold drinks allows not only to allay thirst, but also to compensate necessary vitamins and other useful substances in a human body.

There are other compounds in the composition of plants that are not desirable in the composition of drinks. Therefore, it is very important to separate and obtain necessary biologically active compounds, which positively influence the useful and organoleptic properties of drinks. We have studied trends and prospects of the market of various soft drinks in Kazakhstan and abroad. The assortment of vitaminized drinks or as they are called "tonics" is increasing every year, since these drinks can relieve fatigue, have a thirst-quenching effect, and also have other medical properties.

It is established that a man is adapted to the consumption of a large number of biologically active substances, the sources of which are representatives of more than 300 plant genera. With plant food, a man receives necessary nutrients, as well as vitamins and minor elements, and not only that. Studies in recent years have identified the need for many minor components of plant food to preserve health and, to a greater extent, reduce the risk of developing a number of chronic diseases. These components are called chemoprotectors or chemopreventers. Among the most intensively studied natural chemopreventive compounds are flavonoids, food indoles and isothiocyanates, dietary fibers, etc. Although the clinical picture of phyto-compounds' insufficiency is not established, their low concentration in the diet is accompanied by a significant increase in the risk of developing cardiovascular, oncological diseases, diabetes. Some researchers even consider such diseases as manifestations of the state of maladaptation as a result of the constantly low intake of components with food that are absolutely necessary to ensure the protective-adaptive capabilities of a human body. Exceptionally important and the only reliable means of improving the structure of nutrition and achieving the optimal balance of the diet of the population is use in daily

diet of healthy and sick people the biologically active additives to food (dietary supplements). In our work we tried to analyze advantages and disadvantages of biologically active additives, and also reflect state of the dietary supplements in Kazakhstan and the most pressing problems associated with production and sale of this product through the pharmacy network.

For production of dietary supplements, food and drug plants are used that contain a rich complex of biologically active substances such as bioflavonoids, vitamins, polysaccharides, amino acids, minor elements, etc. Modern technologies and equipment allow not only extract the whole complex as much as possible, but also preserve its natural combination. Often this leads to the fact that bioavailability and effectiveness of each of the biologically active substances is greatly enhanced. For example, phenolic compounds are more active in combination with polysaccharides, vitamin C is more effective in combination with flavonoids (rutin).

Concentration of biologically active substances in extracts from plants is such that it allows then to use the obtained food additives in relatively small amounts (doses), sufficient for both prevention and complex therapy of diseases.

Use of a large assortment of drug plants containing various natural substances allows create dietary supplements to food with wide possibilities for correcting various disorders in a human body

We have studied trends and prospects of the market of various soft drinks in Kazakhstan and abroad. The developed recipes for enriched cold drinks using dietary supplements derived from SKO drug plants have high biological activity. The obtained cold drinks will be the first domestic products, obtained with the use of SKO drug plants.

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http://dx.doi.org/10.35630/978/3.00.032886.2.13

AIR POLLUTION AND PUBLIC HEALTH IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT

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The outcome document of the Rio+20 Conference, in the context of sustainable development of cities and human settlements, notes the importance of supporting adequate air quality as air pollution has a negative impact on human health. According to the World Health Organization (WHO), air pollution represents a significant environmental risk to public health. Globally, this risk accounts for 7 million premature deaths annually and more than 0.5 million in the WHO European Region. Due to increased risk of respiratory and cardiovascular diseases, as well as lung cancer, the negative impact of air pollution reduces life expectancy in the WHO European Region by an average of 1 year. The costs associated with disability due to air pollution in 2010 in the WHO European Region were about $1.6 trillion; and the annual economic loss of 2015 due to morbidity and premature mortality caused by air pollution in 44 of the 48 countries of the WHO European Region was estimated to be equivalent to 1% of their gross domestic product. Subsequently, the WHO resolution "Health and Environment: Addressing the Effects of Air Pollution on Health" recognized the right to clean air as a fundamental human right. In 2016, the age-standardized mortality rate attributed to indoor and outdoor air pollution (per 100,000 population) is almost 35 in the WHO European Region, 15 in Germany, 50 in the Russian Federation and 70 in Ukraine. Thus, the problem of clean air, public health and sustainable development is also relevant for Ukraine.

The purpose of the study was to identify the impact of polluted air on the health of the population in the zone of influence of the northern industrial hub of the city of Kremenchuk, as well as the factors and conditions that contribute to the strengthening of this impact.In May, August and September on the territory of the residential development sampling of atmospheric air showed excess content of pollutants, in particular: benzopyrene (from 0,35 to 0,53 at maximum permissible concentrations (MPC) 0.1 μg per 100 m3), benzanthracene (0,015 at MPC 0.005

mg/m^3 for working area (!)), vanadium (from 0.002 to 0.004 at MPC 0.002 mg/m^3), gasoline (8 at MPC 5 mg/m^3) and saturated hydrocarbons C_{12}-C_{19} (25 at MPC 1 mg/m^3).

The analysis of prevalence of diseases of the adult population of Kremenchuk in the period from 2012 to 2016 established the growth of indicators of the population morbidity with allergic rhinitis in 1.1 times, chronic bronchitis in 1.3 times, bronchial asthma in 1.3 times. Bronchial asthma was 1.3% higher than the regional rate and obstructive lung diseases was 4.7% higher. The analysis of the levels of adult population primary morbidity, compared to 2012, found a gradual increase in allergic rhinitis by 1.3 times and chronic bronchitis by 12 times; excess of the average region indicator for allergic rhinitis by 3.3%, chronic bronchitis by 6.1%, bronchial asthma by 0.7%, obstructive lung diseases by 6.3%. Between 2012 and 2015, there was also a 3-fold increase in the incidence of chronic bronchitis and an 11-fold increase in allergic rhinitis among children.

On the impact of meteorological conditions, urban planning factors and environmental laws of development on air pollution status. It is established that air pollution, as a form of environmental degradation, is an indicator of an imbalanced ecosystem. Air pollution is caused by the accumulation of harmful substances in the atmosphere as a result of anthropogenic activities and climate change. Due to climate change, some regions of Ukraine have experienced significant changes in meteorological conditions since mid-1990s, affecting the atmosphere's self-cleaning ability. This increases the negative impact of polluted air on human health. Deterioration of natural conditions of atmospheric dispersion of pollutants in the region, especially in July-October, is felt by the population of Kremenchuk and causes numerous complaints of people, the climax falls exactly on the summer period (for Kyiv the climax falls on September-October). Approaches to placing the industrial enterprises and rationing of the sizes of their sanitary-protective zones, the majority of which has been drawn up till the middle 90th years of the XX century, need revision. At designing of inhabited objects it is necessary to consider presence of tendencies to growth of negative influence of industrial clusters on adjoining territories.

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http://dx.doi.org/10.35630/978/3.00.032886.2.14

LANDSCAPE PLANNING AS AN ECOLOGICAL BASIS OF TERRITORIAL PLANNING, EXPERIENCE OF GERMANY AND UKRAINE

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The main resource of any country is its population and territory. Since the most organized is always the territory within which the level of contradiction between population, production and nature is minimized, the issue of green-oriented spatial planning comes to the fore. In this aspect, the issue of the use of environmental guidelines for sustainable development in the field of urban development and land use becomes relevant. An important tool for European spatial planning which largely provides solutions to these challenges is landscape planning, as a key planning tool aimed at preserving nature and managing the landscape. In the European Landscape Convention, the term "landscape planning" is defined as perspective planning, which involves the improvement, restoration and formation of landscapes that are favorable for the life of the population.

The most interesting for Ukraine is the experience of landscape planning in Germany, firstly, the organization of the territory and the system of territorial planning in Germany is closest to the territorial organization of Ukraine; secondly, this country has a significant historical experience of "building a landscape", which was already widespread in Germany in the XIX century. Landscape planning in Germany today is an instrument of planning, protection and care for the environment. Its object is the whole territory where protection, development, care of nature, individual landscapes and their components are carried out. In developing prospective plans for urban development of territories in Germany, to take into account the requirements of nature conservation and the development of measures for the protection of landscapes. When elaborating or making changes to the documents on landscape planning, an environmental strategic assessment of the environmental impact is also required. The research revealed the specifics of the processing of documents for landscape planning, which: contain a large amount of data that can be used both for environmental assessments and for the development of spatial development plans and programs; are executed, agreed and integrated with other documents of spatial development, and also have their

legal force; the development of documents on landscape planning is " before " or "simultaneously" with other documents of the territorial (spatial) planning.

It should be noted that today in Ukraine there are no legislative and regulatory documents that regulate the mandatory implementation of documents on landscape planning as part of spatial planning materials. However, there are some positive developments in this direction. In 2018, the Law of Ukraine "On Strategic Environmental Assessment" was adopted, according to which, when carrying out work on spatial planning of any level, it is mandatory to carry out an assessment of the impact of the decisions made on all components of the natural environment. That is, in any case, as part of the documentation on spatial planning of the territory, the implementation of the extended section on environmental protection and the assessment of the impact on all its components becomes essential, which is essentially a subject of landscape planning. Proceeding from the above, the possibility of improving and simplifying the existing methodology for the implementation of territorial planning schemes was analyzed.

Based on the integration of environmental principles in the territorial planning of Ukraine and on the basis of the implementation of the landscape plan as a mandatory component in the implementation of regional planning schemes, in 2016 the author team of specialists of the State Enterprise Y.Bilokon Ukrainian State Scientific-Research Institute of Urban Design "DIPROMISTO" and the Institute of Geography of the National Academy of Sciences of Ukraine with the support of the Federal Agency for the Conservation of Nature Germany, on the example of the Cherkassy region, a pilot project was implemented to integrate Landscape planning documents into the regional level scheme. At the stage of transition of Ukraine, as well as of the world community, to sustainable, ecologically balanced development there is a significant advantage of the implementation of the landscape plan as a separate document as a basis for further elaboration of documentation on spatial planning

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http://dx.doi.org/10.35630/978/3.00.032886.2.15

THE ROLE OF URBAN PLANNING IN PLANETARY CLIMATE CHANGE ADAPTATION

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Modern urban planning results in a natural development of society, which is based on the consumer model. Beginning the 20th century, when income growth was prime for society, town-planning issues were of little concern to them. A stabilization of the living standard initiates public curiosity towards external life factors: enhancement, housing quality, infrastructure, etc.

Cities of the Soviet time formed under the Soviet type of life. As per tradition, they have not been sufficiently invested in the development of high-quality housing, infrastructure, services, etc. Reduced investment in the post-Soviet period has brought the Soviet heritage (infrastructure, mass housing and other objects) into an emergency operation. As a result, in the cities there is a sharp discrepancy between the quality of life and the needs of the population.

Since the urban planning history of large and bigger cities of the post-Soviet period is similar, the list of systemic urban development problems is fairly standard: the low efficiency of urban development policies in cities. The reasons lie in the planes of values, political will, priorities, opportunities and effectiveness; transport problems associated with traffic jams, poor public transport, organization of parking; lack of high-quality and affordable social housing, and the fact that the quality of mortgage housing is not able to compete with the best international counterparts; low quality (both functional saturation and aesthetic perception) of urban open public spaces (parks, squares, streets, courtyards, a system of green walking routes, etc.); unbalanced spatial development of cities: areas of multi-story buildings, cottage and country side development are expanding, with insufficiently provided infrastructure and landscaping; the social infrastructure system is developing slowly; almost no public greening facilities are being built; the ecological situation in cities was borrowed from the Soviet period, when the country's leadership did not pay attention to it, and as a result: the presence of an insufficient numbers of green zones on the territory of municipalities, soil pollution, chemical waste, etc., which is aggravated today. Environmental

pollution, in turn, is associated with an increase in population diseases, as well as an increase in mortality of more than 3 times than in car accidents.

But all of the above problems against the backdrop of modern planetary problems of the influence of various space and geological processes on the global climate change state of our planet, the rapid growth of the dynamics of cataclysms, seem insignificant. Today, there is a great risk of misunderstanding and underestimating all the factors and magnitude of planetary changes.

To prevent the irreversibility of further deterioration of the state of our planet and solve the question of survival of mankind can only a radical change in the existing consumer worldview of mankind on a creative worldview, based on the people's reunion and nature in urban conditions, i.e. the creation of BioCities. It has been scientifically proven that the separation between humanity and nature reduces both the physical and mental well-being of people, and also worsens the environment as a whole. If humanity wants to evolve in a rapidly changing climate, this division must be corrected. Steps must be taken to create restorative ecosystems and sustainable cities. BioCities are based on the idea of uniting nature and people, through the formation of mutually innovative and related alliances, as well as the creation of sustainable urban systems between people and restored ecosystems. Such systems must be biologically rich and technologically simple.

Since urban development plays a priority role in shaping the human environment, the ranking of problems should take these factors into account, and environmental problems should of utmost importance. To solve these problems, it is necessary to combine the scientific potential of the world community and strengthen public participation in the urban development process.

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