MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

V. N. Karazin Kharkiv National University

Karazin Institute of Environmental Sciences

ECOLOGY IS A PRIORITY

Annual student`s scientific conference

Visegrad Fund

ERASMUS+ INTENSE

Co-funded by the Erasmus+ Programme of the European Union

Kharkiv - 2021

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
V. N. KARAZIN KHARKIV NATIONAL UNIVERSITY
KARAZIN INSTITUTE OF ENVIRONMENTAL SCIENCES

Ecology is a priority

Annual student`s scientific conference
Conference March 16, 2021, Kharkiv, Ukraine

Under the General Editorship of
N. V. Maksymenko, DSc (Geography), Prof.,
English Language Supervisor N. I. Cherkashyna

Visegrad Fund
ERASMUS+ INTENSE
Co-funded by the Erasmus+ Programme of the European Union

Kharkiv – 2021

УДК 502/504 (063)
Е20

Approved for distribution on the Internet by the decision of the Academic Council of V. N.Karazin Institute of Environmental Sciences. (Protocol 9 dated 15.03.2021)

The publications contain the proceedings which address the modern ecological state of environment and ecological problems in different regions of Ukraine and other countries and ways of their solution.

Видання містить матеріали, які стосуються сучасного екологічного стану довкілля та екологічних проблем у різних регіонах України та інших країн, а також шляхи їх вирішення.

Ecology is a priority: зб. тез щорічної студентської конференції (Харків, 16 березня 2021). Харків: ХНУ імені В. Н. Каразіна, 2021. 75 с.

Editor: N. V. Maksymenko, DSc (Geography), Prof.
N. I. Cherkashyna English Language Supervisor

Co-funded by the Erasmus+ Programme of the European Union

The publication was prepared in the framework of ERASMUS+ project "**Integrated Doctoral Program for Environmental Policy, Management and Technology – INTENSE**" financed by European Commission. Responsibility for the information and views set out in this publication lies entirely with the authors.

ORGANIZING COMMITTEE

Chairman of the Organizing Committee:

TITENKO Ganna – Director of the Karazin Institute of Environmental Sciences, PhD (Geography), Associated Professor.

Deputy Chairpersons of the Organizing Committee:

MAKSYMENKO Nadiya – Head of the Department of Environmental Monitoring andManagement, DSc (Geography), Professor.

CHERKASHYNA Nadiya – Senior Lecturer of English, Department of English Language, School of Foreign Languages.

Members of the Organizing Committee:

ACHASOV Andrii – Head of the Department of Ecology and Neoecology, DSc (Agrarian Sciences), Prof.

NEKOS Alla – Head of the Department of Ecological Safety and Environmental Education, DSc (Geography), Professor.

UTKINA Kateryna – Deputy Director of the Karazin Institute of Environmental Sciences, PhD (Geography), Associated Professor of the Department of Ecological Safety and Environmental Education.

SAPUN Anastasia – Head of the Student Scientific Society of the Karazin Institute of Environmental Sciences.

Technical group **:**

BASKAKOVA Liudmyla, MIROSHNYK Yuliia, HRECHKO Alina

Adress: 6 Svobody Sq., Kharkiv, 61022, Ukraine

CONTENTS

MODERN ECOLOGICAL PROBLEMS AND WAYS OF THEIR SOLUTION

APPLIED ECOLOGICAL RESEARCH

ECOLOGICAL CONSEQUENCES OF THE CHORNOBYL CATASTROPHE

REVIEW OF ENVIRONMENTAL NEWS OF THE WORLD

MODERN ECOLOGICAL PROBLEMS AND WAYS OF THEIR SOLUTION

FEDYAY Vlad, *student*
MAKSYMENKO Nadiya, *DSc(Geography), Prof.*
V. N. Karazin Kharkiv National University
CHERKASHYNA Nadiya., *English Language Supervisor*

THE MAIN PROBLEMS OF FORESTS IN ZHYTOMYR REGION

Abstract. The article contains an overview of the main problems of forests in Zhytomyr region.The forests of this region are one of the largest forest resources in Ukraine and are certainly extremely valuable and in need of protection.

Key words: forests, Zhytomyr region, pests, amber, contamination.

Zhytomyr region is a region located in the north-western part of Ukraine, in the central part of Polissya. The total area of the region is 2982.7 thousand hectares. It is important to emphasize that the forest cover in the region is 34.1%. This is a forest of a fairly significant value, one of the largest in Ukraine. The main forest-forming species are: pine, birch, oak and alder. Thus, in the Polissya part of the region there are pine-oak-birch forests. In the north-western and northern part there are pine forests. In addition, there are oak and hornbeam forests, where we still find maple and ash. These forests are located in the area that is a forest-steppe zone. However, pine forests are predominant, accounting for more than 59 % of the total forest area. Due to the forests there is quite diverse fauna of the area. Namely, there are such species as red deer, elk, wild boar, common squirrel, as well as common fox, hare-squirrel, hare-rusak and others. Forests are the habitat of many species of animals in the area. They perform the environment formative function by ensuring the interaction of living organisms. In addition, they are a place for recreation and hiking [3].

But so far there are a number of problems that worsen the condition of the region's forests. One such problem is the illegal, unauthorized extraction of minerals such as amber. The main negative factor is that large areas of forests are cut down and burned for mineral extraction. There is also an absolute violation of the soil cover, as deep canals (up to 10 meters) are dug through which water is pumped. And after the «black diggers» leave these areas, they simply turn into swamps in which the remaining trees rot. Thus, extremely large areas of pine and other forests perish in the region. Extraction is carried out even within the unique territories, included in the nature reserve fund of Ukraine.

An example is the case of illegal amber mining in the Poyaskivsky reserve of national importance, located in the Olevsk district of Zhytomyr region. The forests in this reserve are extremely unique, as there are trees

with a trunk diameter of more than 5 meters. Sanitary felling is not even carried out here to preserve the unique condition. And illegal amber miners are transforming this territory beyong recognition, causing the disruption of these unique ecosystems [1].

The second major problem is the drying out of forests due to damage to trees by pests. The greatest negative influence can be traced from the apical bark beetle. It affects the pine and fir-tree plantations of the region at an extremely fast pace. In the past few years, the situation has escalated. The reason for this is warming and less rainfall in summer. Now the pest has begun to infect even fairly young plantings and plantations growing within the naturally protected areas. These pests, survive long winter frosts, because they have adapted to them. So far, the only way to eliminate them is to carry out sanitary felling. But, of course, this method is ineffective, because only completely affected trees are removed in this way. There are no methods of controlling the impact of pests on young animals yet. [4], [2].

Moreover, a rather significant problem is the sale of radioactively contaminated wood (even despite the ban). The volumes of timber sold are even growing over the years. The forest tracts of the region became contaminated as a result of the 1986 accident at the Chernobyl nuclear power plant. This catastrophe lead to pollution of 440 thousand hectares of forests with radionuclides. One half-life of strontium and cesium has now taken place. On average, the level of pollution is now half that of 1986, but it is still present. The sale of contaminated wood must be banned as it is a hazardous raw material. Now only measures to rehabilitate forest areas can be carried out. [5].

In conclusion, it should be noted that the forests of Zhytomyr region are under significant threat now. There are a number of unresolved problems. This is a powerful violation of forest ecosystems due to the illegal extraction of such minerals as amber, as well as the drying of forests due to the active development of pests. And illegal logging, including even in radioactively contaminated forests are going on for the further sale of wood.

Taking into account all this, the state bodies of forest management of the region should develop programs to protect forests from negative impacts, including certain additional special measures for the protection of unique forests. It is also necessary to develop a program to restore already damaged forests.

References:

1. Nadtochiy P. P. Ecological and economic assessment of the impact of activities related to illegal amber mining on the environment of Zhytomyr region. *Bulletin of Zhytomyr National Agroecological University*. Zhytomyr, 2015 № 1 (1). Pp. 28-50.

2. Andreeva O. Yu. Stem pests in the centers of drying of pine plantations of the State Enterprise Zhytomyr LH of Zhytomyr Region. *Bulletin of Kharkiv*

National Agrarian University V. V. Dokuchaev. Series: Phytopathology and Entomology, 2016 № 1-2. Pp. 7–12.

3. Ecological passport of Zhytomyr region for 2019. *Zhytomyr Regional State Administration of the Department of Ecology and Natural Resources. Zhytomyr*, 2020. URL: http://ecology.zt.gov.ua/Ekopasport_2019.pdf. (date of application 05.03.2021).

4. Big trouble from the little beetle: in the Zhytomyr region pine forests are drying up en masse. *Ukrinform.* 2018. URL: https://www.ukrinform.ua/rubric-regions/2539345-velika-bida-vid-malenkogo-zuka-na-zitomirsini-masovo-vsihaut-sosnovi-lisi.html. (date of application 05.03.2021).

5. Capricorn M. O. Forest protection of Zhytomyr region. *Peculiarities of educational practice of students - ecologists in the conditions of distance education*: materials of scientific practice. conf., Kyiv, June 29-30. 2020 Kyiv: National Pedagogical University named after M.P. Dragomanova, 2020. p. 44-46.

HONCHAROVA Anna, *student*
UTKINA Katerina, *PhD(Geography), Assoc. Prof.*
V. N. Karazin Kharkiv National University
CHERKASHYNA Nadiya, *English Language Supervisor*

POLLUTION OF THE CITY ATMOSPHERE BY FINE DUST OF $PM_{2,5}$ FRACTION

The modern development of society is accompanied by a large population in cities, and hence the growth of economic and energy needs. Emissions of harmful substances from industrial enterprises into the atmosphere, car exhaust gases and the use of CFCs in the home cause the greenhouse effect on the planet, climate change and a large number of diseases in large cities. One of the air pollutants is PM 2.5 particles.

PM (ParticulateMatter) is a widespread air pollutant consisting of a mixture of solid and liquid particles suspended in the air. They range in size from about 10 nm to 2.5 μm. PM is a mixture of physical and chemical characteristics that depend on the location. Common chemical components of PM include sulfates, nitrates, ammonium, other inorganic ions such as sodium, potassium, calcium, magnesium and chloride ions, carbon, water, metals (including cadmium, copper, nickel, vanadium and zinc) and polycyclic aromatic hydrocarbons Surfactants).

These particles are the biggest danger in the city. There is much more in the city and the chemical composition of the fine aerosol in the city is more dangerous than in nature.

According to their origin, the PM is divided into:

• Primary PM - they are released into the air ready. These are the smallest pieces of soot, asphalt and car tires, particles of mineral salts (sulfates, nitrates), heavy metal compounds (mainly oxides). Biological contaminants (some allergens and microorganisms);

• Secondary PM - are formed directly in the atmosphere. One example: nitrogen and sulfur oxides are released into the city air, they form acids when in contact with water, and solid salt particles (nitrates and sulfates) are released from them [1];

Everyone is used to being afraid of harmful gases, because when you inhale them you will be poisoned immediately. But in fact the particles are no less dangerous. People inhale them every day. There is no immediate reaction to small doses of RM, but they accumulate in the body and over time can lead to serious problems. PM particles are so small that they pass through biological barriers in our body: the nasal cavity, upper respiratory tract, bronchi.

The researchers traced the effect of PM2.5 on the human body and identified six main mechanisms of harmful effects of particles:

1. Disorders of pulmonary receptors: increased respiration, cardiac arrhythmia

2. Destruction of pulmonary epithelial cells
3. Development of the inflammatory response
4. Increased blood clotting
5. Destabilization of atherosclerotic plaques
6. Thickening of vessel walls [2].

In the Shevchenkivskyi district of Kharkiv, there are eight enterprises whose activities lead to an increase in the number of RMs in the air: PJSC Pharmstandard-Biolik, SE Chemical Plant of Chemical Reagents, Institute of Single Crystals, TDV Zhytlobud-2, LLC HADO, LLC Tandem-Impex", PJSC" Aviakontrol ", Kharkiv State Research Prosthetic Enterprise, PJSC" Tochprilad" [3].

Due to the fact that these particles are often of anthropogenic origin and have a negative impact on the health of the population, their study is relevant. I observed the dynamics of PM 2.5 particles at three points in Kharkiv.

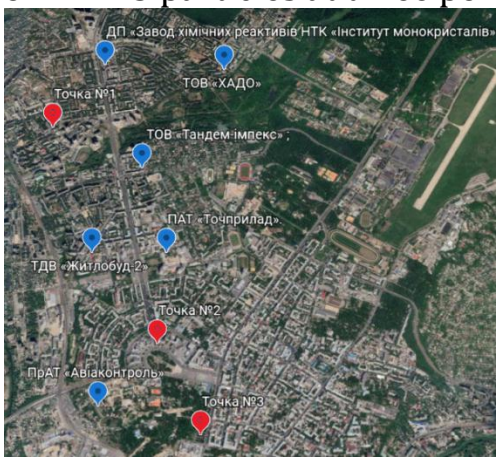


Fig. 2. Locations of the investigation

Measurements were conducted in 2019 in the period from April to July and from October to December.

The level of air pollution PM2.5 was determined according to the international scale of risk to public health according to the Air Quality Index (AirQualityIndex, AQI), proposed by the European Environment Agency, according to which the permissible daily average value is 25 mg / m3 [4].

Figure 2. The average values of PM 2.5 for each observation site

The time variation of the calculated average values of mass concentrations of PM2.5 indicates an increase in the concentration of dust in the air from November to December. It was in December that the highest average value was 65.1 μg / m3. The lowest averages are in the spring months, which may be due to more rainfall in those months. 40.6 μg / m3 in April and 43.6 in May.

Therefore, fine dust poses a high threat to city dwellers, due to its ability to easily enter the human body through the respiratory tract itself due to its size. Once in the human body, it increases the risk of cardiovascular and respiratory diseases. The severity of the disease directly depends on the duration of exposure, due to the accumulation of dust in the body.

Reference:

1.World Heals Organization Regional office for Europe Health effects of particulate matter. UN City, Marmorway 51, 2013. p. 2-6

2. A report by the Committee on the Medical Effects of the Air Pollutants Department of heals (DH). February 2006. p. 272-283

3. Shevchenkivskyi district. Entrepreneurship and consumer market of Kharkiv: website. URL: https://ppr.kharkov.ua/en/shevchenkivskyi-district

4. European Air Quality Index. GIS Map Application. European Environment Agency: website. Retrieved from https://www.eea.europa.eu/themes/air/air-quality-index

HONCHAROVA Anna, *student*
UTKINA Katerina, *PhD(Geography), Assoc. Prof.*
V. N. Karazin Kharkiv National Universit
CHERKASHYNA Nadiya, *English Language Supervisor*

CITY SECURITY: ASSESSMENT AND OPPORTUNITIES FOR IMPROVEMENT

Abstract. The publication presents research data on the amount of fine dust in the surface layer in the atmosphere of the city of Kharkiv. The study was conducted in the period from 04/01/2019 to 07/31/2019.

Key words: fine dust, atmosphere, air pollution, particulate matter (PM).

Current trends in human development are aimed at increasing the number of inhabitants in cities, so today there is a question of cities' environmental safety. Air quality is an important component of this safety, as air pollution is one of the priority environmental issues that pose a threat to human health and all living things. Namely, the vast majority of sources of air pollution are usually concentrated in cities. The city of Kharkiv is one of the largest industrial centers in Ukraine, so this problem is relevant for this area.

One of the main air pollutants in large cities is fine dust $PM_{2.5}$. Solid particles of PM (Particular Matter) denote those solid particles and liquid droplets that are in a suspended state in the air. PM particles can consist of a number of components, including acids, organic chemicals, metals, soil, dust, and the like. The particle size determines the permeability. $PM_{2.5}$ is called «Small particles» - a PM with a size of less than 2.5 microns [1].

There is no immediate reaction to small doses of PM, but they accumulate in the body and over time can lead to serious problems. PM particles are so small that they pass through biological barriers in our body: the nasal cavity, upper respiratory tract, bronchi. The greatest impact on the human body is due to prolonged exposure to $PM_{2.5}$. Prolonged exposure to fine dust increases the risk of cardiopulmonary dysfunction and death by 6-13%. People with pre-existing lung or heart disease, as well as the elderly and children, are particularly vulnerable [2]. Also $PM_{2.5}$ affect not only the receptors in the walls of the airways, but also the cells of the pulmonary epithelium. And this effect is especially dangerous in the area of the alveoli - pulmonary vesicles entangled in a network of capillaries [3].

To investigate the content of fine dust in the surface layer of air, we selected 3 control points in the Shevchenkivsky administrative district in Kharkiv with different nature of anthropogenic load: housing, a park and intersection of highways.

The research was conducted in the period from 04/01/2019 to 07/31/2019 (4 months). Measurements were taken, using a mobile device «Nova SDL307 Laser $Pm_{2.5}$ Monitor».

The level of air pollution $PM_{2.5}$ was determined according to the

international scale of risk to public health according to the Air Quality Index (AQI), proposed by the European Environment Agency, according to which the permissible daily average value is 25 mg / m³ [4] .

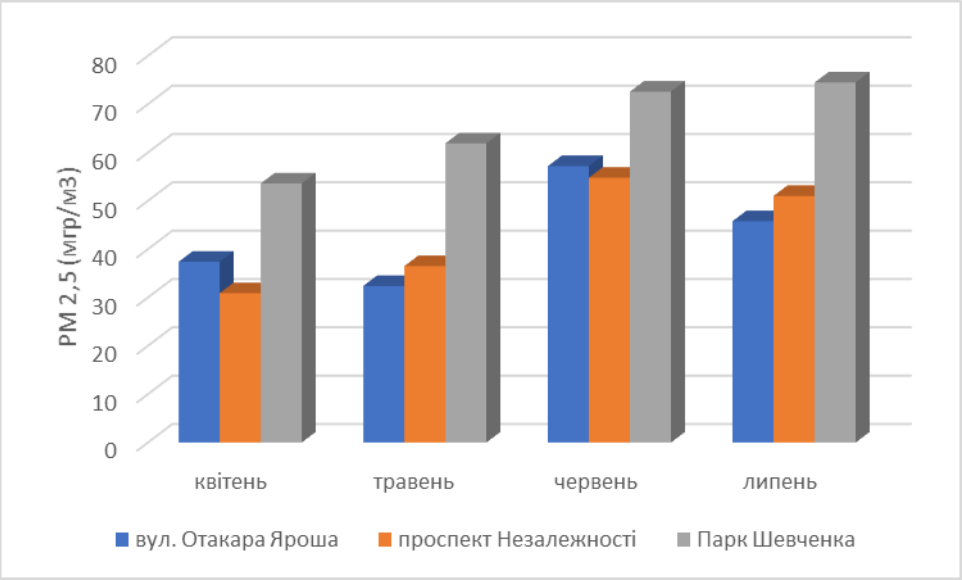


Fig.1 - Average monthly values of PM $_{2.5}$ in the air for the observation period

Fig. 1 shows that the highest average concentrations of $PM_{2.5}$ are characteristic in June for all these points (54.8–72.6 μg/m³). Tracing the spatial variation of air pollution by points, we note that the lowest concentrations of $PM_{2.5}$ (30.9–54.8 μg/m³) were recorded at point № 2 (Independence Avenue), and the highest (53.6–74.5 μg/m³) - at point № 3 (Shevchenko Park). There is an increase in dust content in the air from May to June at each point. In general, for the entire period of observations, exceedances of the average daily MPC were detected at all sampling points.

Therefore, fine dust poses a high threat to city dwellers due to its ability to easily enter the human body through the respiratory tract due to its size. Once in the human body, it increases the risk of cardiovascular and respiratory diseases. The severity of the disease directly depends on the duration of exposure due to the accumulation of dust in the body.

Based on the study of air pollution in Kharkiv, the authors argued that in the period from 04/01/2019 to 07/31/2019 exceeding maximum concentration limit $PM_{2.5}$ were recorded. It should also be noted that the selected points for the study are located in the city center, adjacent to highways. You can solve the problem of air pollution and make the city more comfortable for people to live in by regulating transport and creating green corridors.

References:

1. Borchevsky O. O., Dobrovolsky O. L. Solid particles as environmental pollutants and sources of their formation in the car. *SCIENTIFIC AND PRODUCTION JOURNAL* № 4 (234) July - August 2013 p.10-11 Solid particles

as environmental pollutants and sources of their formation in the car
2. World Heals Organization Regional office for Europe Health effects of particulate matter. UN City, Marmorvej 51, 2013. p. 2-6
3. Eleonora Longhin, Jorn A Holme, Kristine B Gutzkow, Volker M Arlt, Jill E Kucab, Marina Camatini and Maurizio Gualtieri. Cell cycle alterations induced by urban PM2.5 in bronchial epithelial cells: characterization of the process and possible mechanisms involved. Particle and Fibre Toxicology, 2013. p. 1-17
4. European Air Quality Index. GIS Map Application. European Environment Agency: *website*. Retrieved from: https://www.eea.europa.eu/themes/air/air-quality-index

KOBETS Tatiana, *student,*
KHYZNIAK Anna, *student*
GOLOLOBOVA Olena , *PhD(Agriculture), Assoc. Prof.*
V. N. Karazin Kharkiv National University
CHERKASHYNA Nadiya, *English Language Supervisor*

SELF-ASSESSMENT OF NATURE MANAGEMENT COMPETENCES BY OWNERS OF PRIVATE HOUSEHOLDS

Abstract. The authors conducted research, using their own survey methodology. It allows us to determine a self-assessment level of the nature management competence by the homeowners. The results indicate that the competence status of the owners of private estates in the field of nature management is insufficient, the issues of mastering the competences of nature management are relevant for the respondents.

Key words*:* competence of nature management, household plots, self-assessment of competence.

In the system of rural economy a special place is occupied by the economy of the household. Within the family-individual sector of households in rural areas, land use of homesteads and personal farms predominates. Land use of citizens in Ukraine as a whole is 20.5 million hectares or 41.4 % of the total area of the country, and 48 % of the area of agricultural land. Farms account for up to 50.000 farms and land use - 9.5 % of the area of agricultural land, personal subsidiary farms number 6.6 million rural households. Their land use reaches 30% of agricultural land, homesteads of rural citizens are about 10 million farms with a total area of almost 1.5 million hectares. Households produce 48-52% of all gross agricultural output, while farms produce 6-7 %. Thus, the land use of homesteads and personal farms of citizens in a decisive degree form the economy of rural households, in fact, the whole way of life in the countryside. Therefore, to study the economics of land use in agricultural households seems very relevant [1].

In recent years, land use by rural households has been increasing. Their average land area increased from 1.08 hectares in 2005 to 1.21 hectares in 2011. The area of land use of more than 1 hectare increased from 2005 to 2011 by 6 %. In the economy of rural economies the so-called consumer production is developed better than in the city. Of these, a larger proportion of food is grown at home. And this is because of the nature of agricultural products and also because in the countryside there is less money and you need to save, and home food is cheaper. It should also be borne in mind that in rural areas catering has always been less developed. [1].

The structure of households by size of land area was formed in accordance with existing standards of the Soviet and post-Soviet periods. In rural areas, on the territory of collective farms, the population was given 0.41 hectares of land, on the territory of state farms - 0.15 hectares each, settlements and cities - 0.06 hectares each. Cooperatives were given plots of

land with an area in the range of 0.04-0.12 hectares for gardening, orchards and cottages. The peak of garden and country cooperatives growth occurs in the 80s and early 90s of the twentieth century. Over time, many owners abandoned them because there was no need for them, or because of insufficient fertility of the land. The average size of such plots is: width - 10-40 m, length - 20-100 m. The use of tractor units on them is limited and is carried out in most cases for furrow plowing in areas over 0.10 hectares. All other work is done manually. In 2013 in Ukrainian households land was cultivated by: 93.3 % - manually, 30 % - by horses and oxen, 75.7 % - by tractors. The most commonly used fallow plowing and spring cultivation with tractor units, followed by tillage by hand or by manpower. Manual work predominates in small contour areas [2].

In order to conduct a scientifically sound comprehensive assessment of the nature management competencies of the owners of homesteads located in small settlements of Kharkiv region, we have developed an author's questionnaire for their survey. The age of respondents varies from 16 to 52 years. 100 respondents took part in the survey. A comprehensive survey system includes respondents' answers, assessing their competencies in ecology, agronomy, legal regulation of land use. Respondents were asked to choose a score from 0 to 10, which characterizes, in their own opinion, the level of awareness in a particular area. Table 1 provides the average scores received by respondents from each locality, conducting a self-assessment of their competencies in ecology, agronomy, legal regulation of land use.

The results indicate that the respondents consciously conducted self-assessment,they have a desire to improve their own competencies, necessary for effective balanced use of their own land. Yes, to the question: «Do the city (village, village) council in the department of land management, communal property and ecology need plant protection specialists?» 78 % of positive responses were received from residents of the village Ostroverkhivka, 80 % - from the village Tymchenky, 73 % - from the residents of Dergachi, - 85 % from the respondents of the village Rogan.

Table 1.

Self-assessment of respondents on the level of competencies, points.

Question: Assess your competency level in ____.	Rogan	Dergachi	Tymchenko	Ostroverkhivka
ecology	7	5	5	5
agronomy	7	4	5	4
legal regulation of land use.	6	6	5	5

92% of the residents of Ostroverkhivka, 90 % of Tymchenky, 93 % of

Derhachi residents – 95 % of respondents in the village Rogan would attend free seminars on agronomy, landscape design, ecology in the winter.

Thus, based on the results of the study, it is possible to draw the following preliminary conclusions: the competent status of the owners of private estates in the field of nature management is not sufficient, the issues of mastering competencies are relevant for the respondents. Therefore, it is advisable to conduct seminars, trainings with the participation of ecologists, agronomists, plant protection specialists, landscape design specialists, etc. in small settlements by the departments of land management, communal property and ecology of the city (settlement, village) councils.

References:

1. Drugak V. M. Economics of land use of households in rural areas: concept and essence. *Land management, land cadastre and monitoring*, 2013. P. 34-39
2. Ovsyannikov S. Agricultural households of Ukraine: problems and prospects. *Machinery and technologies of agro-industrial complex*, Vol. 12 (63) December 2014, P. 16-20

MISHCHENKO Viktoriia, *student*
V. N. Karazin Kharkiv National University
MAKSYMENKO Nadiya, *DSc(Geography), Prof.*
CHERKASHYNA Nadiya, *English Language Supervisor*

ANALYSIS OF POPULATION MORBIDITY AND ENVIRONMENTAL IMPACT ON HUMAN HEALTH IN POLTAVA REGION

Abstract. As a habit, lifestyle, heredity, human health depends on the ecological state of the environment. Many chemicals have been introduced into the environment recently, most of them not previously found in the ecosystem, and therefore either extremely slowly oxidized and metabolized. Because the human body takes some time to adapt to changes in the environment, it can be said that the level of pollution is closely linked to the physical and psychological well-being of man.

Key words: man, population, health, morbidity, environment.

There were positive rates of population growth in the administrative region in Poltava region for the period 2018-2019. According to the Main Department of Statistics in Poltava region, an important problem of the population is the mortality rate. As of 2019, 22 915 deaths were registered, including 11 029 men and 11 886 women. Compared to the total number of deaths in 2018, the mortality index decreased by 744 people, or 3.1%. Thus, the lowest mortality rate was determined in the cities of Hadiach and Poltava, the highest - in Globinsky district.

As for morbidity and mortality, they may depend on the following indicators: social, economic and, of course, environmental. Human health is affected by all components of the environment - air, water, soil and biotic component.

In the structure of morbidity of the population of the district the leading places continue to be occupied by diseases of the circulatory system, neoplasms, injuries, poisonings and some other results from the action of external causes (Diagram 1).

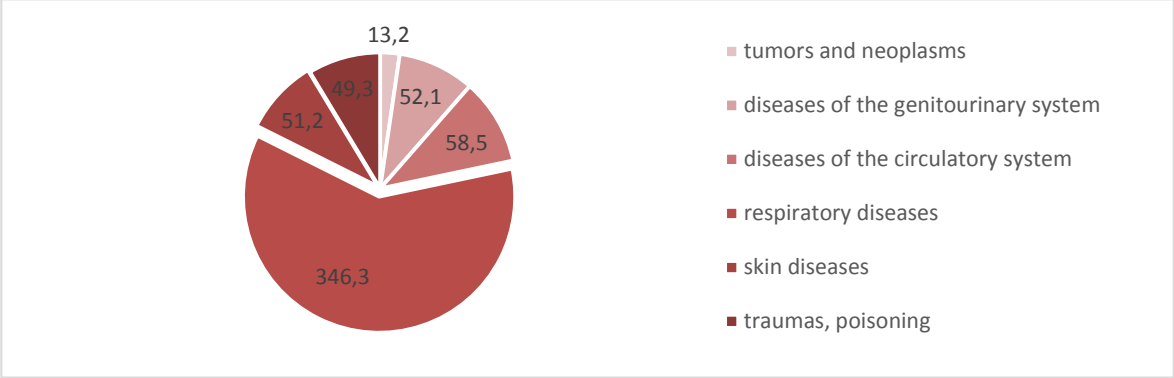


Diagram 1 – Structure of morbidity of population of the Poltava area (thousand population) in 2017

As can be seen from the diagram, the first place in terms of diseases is occupied by diseases of the respiratory system, in second place - diseases of the circulatory system, and in third place - diseases of the genitourinary system.

Environmental factors, according to the International Agency for Research on Cancer, cause the development of 80 % of all malignant neoplasms, with 70-80% of them associated with chemical carcinogens. [2].

According to the WHO, the contribution of industrial and chemical compounds as environmental factors in the development of allergic diseases is 45.2 %, bronchial asthma in particular – 20 %. In this case, the sensitization of the body with exotoxins occurs even at low concentrations of toxic substances [3].

The main ways to ensure a healthy population are:

- transition to material- and energy-saving technologies, and in the long run to closed, waste-free production cycles;
- rational use of nature, taking into account the characteristics of individual regions;
- expansion of nature reserves;
- environmental education and upbringing of the population.

The solution to the problem of health of man is in a man himself, in knowledge and understanding of problems, and also in ability to adhere to the rules of healthy way of life. A significant place in the formation of environmental awareness is occupied by environmental education, which warns of environmental threats from preschool age.

Thus, the highest incidence in Poltava region is observed in diseases of the circulatory system, respiratory system, skin, tumors and injuries. One of the factors influencing the health and life expectancy of the population - the environment, namely the state of air, water, soil, climate. Therefore, the prevention of the negative impact of the polluted environment on the population is very important.

References:

1. Main Department of Statistics of Poltava region: morbidity of the population. URL: http://pl.ukrstat.gov.ua/ (date of application 09.03.2021)
2. References of Performance Indicators of Poltava Region Medical and Preventive Treatment Facilities (2005–2010) / Poltava: Regional Information Analysis Centre of Medical Statistics, 2006–2010. [in Ukrainian]
3. Toronchenko O. M. Ecologically dependent pathology in assessing the state of the environment of Poltava region. *Bulletin of Mykhailo Ostrogradskyi KrNU.* Issue 6 (77), 2012

OSTROUSHKO Maksym, *student*
NAZARUK Mykola, *Dr. Geogr. Sciences, Prof.,*
Ivan Franko National University of Lviv

MAN-MADE HAZARDS AND ENVIRONMENTAL ISSUES OF KRYVYI RIH. MEASURES TO IMPROVE THE SITUATION

Abstract. The assessment highlights environmental issues and man-made hazards of Kryvyi Rih and describes the ways of their solution.

Key words: man-made hazards, mining industry, mining landscapes, quarries, stockpiles, karst landscapes.

The objective is to find the reasons for man-made hazards and environmental risks of Kryvyi Rih, show the problems' magnitude and suggest the measures for its solution.

Kryvyi Rih is one of the most ecologically dangerous cities in Ukraine. Mining and processing enterprises, which are caused by the city's development, are also its huge problem. The volume of manufactured products on enterprises reaches 33 % of the total production of Ukraine, and pollutant emissions caused by complex enterprises are more than 1,500,000 tons, or almost 32 % of the total emissions in the country, according to unofficial data. It becomes clear, that an enormous ecological load is put toward the 600,000 population and environment of the industrial city.

Since the Kryvyi Rih region is distinguished by its industrial component, it becomes obvious that the mining industry has impacted the region for 150 years. Due to the development of iron ore mining through open-pit mining, or quarrying, we see the results of this activity today through quarries, stockpiles and tailings ponds. They occupy the vast majority of the land comparable to the lands of many large cities of Ukraine.

That is why anthropogenic landscapes appear, being the consequence of strip mining and mining operations, storage of waste rock, waste processing and mineral processing, underground voids in mines with their subsequent filling and displacement of fake blocks of the Earth's crust.

That is the reason for the significant environmental problem of Kryvyi Rih. Today there is no technology for tailings disposal and waste rock disposal in Ukraine. Thus, the only possible way is to accumulate the rock in tailings ponds, stockpiles, and take up more land.

Quarries are negative landforms of technogenic origin, where open-pit mining takes place. There are 54 quarries (operating, decommissioned, with re-operation) in Kryvyi Rih: 41 iron ore, 4 granite, 6 sand, 3 clay. The main condition for open-pit creation is the shallow bedding of the mineral deposit and overlaying insignificant level of sediment.

Karst landscapes formation is based on stockpiles. Stockpiles are the form of anthropogenic relief which is formed as a result of surface waste rock and

other mineral processing products (tailings that come from quarries formation). Stockpiles are formed of surface waste rock with no further processing. Meanwhile, tailings are the leftovers of the separation process of a magnetic fraction on a magnetic separator. The process takes place during ore dressing on mining and processing plants. Finally, tailings are transferred and stored in tailings ponds.

Types of stockpiles include tailings ponds (tailings dams), friable (loamy, sandy loamy), rocky, mixed. Overall, there are 104 low (a height is up to 20 m) and high (the majority with a height of 110-130 m) stockpiles. The area of stockpiles varies from very small (up to 50 ha) to large (more than 300 ha). The area of the largest tailings pond of Northern GZK is 1242 ha.

Karst landscapes is the third group of anthropogenic landscapes formed during iron ore mining and displacement of bedrock blocks. There are two types of karst landscapes in Kryvyi Rih: shear zones and sinkholes (dissolution holes). Overall, there are 26 zones.

The total area of mining landscapes of Kryvbas is 201 km^2 (the area is comparable to the area of Lviv which is 182 km^2 and Mariupol - 244 km^2).

The structure of the city's mining landscape is as follows:

- The area of quarries is more than 42 km^2;
- The area of stockpiles is 70 km^2;
- The area of tailings ponds is 55 km^2;
- The area of mining sinkholes and shear zones is 34 km^2.

The numbers are constantly changing due to the continual operation and expansion of mining and stockpiles.

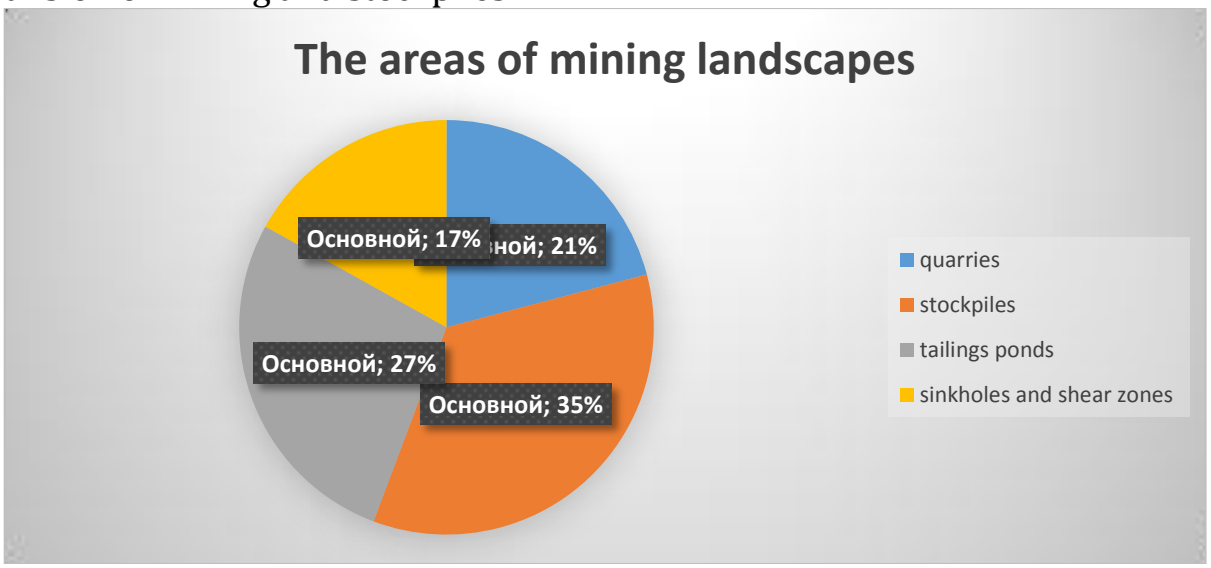


Fig. 1- The areas of mining landscape

Summary

Ore extraction, groundwater pumping, a huge amount of artificially-created deposits cause unavoidable geological processes and might be the reason for a technogenic disaster of the region.

That is why there is a need to take action to reduce a technogenic load on the environment:

Modernization of the existing production facilities and dust and gas cleaning systems by industrial enterprises;

Construction of new efficient dust and gas cleaning systems, as well as dust suppression technologies on stockpiles and tailings ponds;

Cooperation with specialized scientific organizations on the development, consideration and implementation of new dust suppression technologies, including green technologies.

Overall, all the measures require permanent strict control by the government.

References:

1. Kazakov V. L., Anthropogenic landscapes of Kryvbas. *Diversity of landscape complexes of Ukraine and ways of their rational use and preservation: methodological and applied aspects*. Coll. Science. works of sciences. conf. Kyiv, 2000. p. 41-46
2. Kazakov V. L, Gerasimchuk O. O. Underground mining landscapes of Kryvbas mines as an object of study of anthropogenic landscape science: problem statement. *Geographical researches of Kryvbas*. Vol. 3. Kryvyi Rih: KSPU, 2008. p. 6-13
3. Smetana M. G., Provozhenko T. A. To the classification of anthropogenic landscapes of Kryvbas. *Environmental protection: ecological, medical, educational aspects*: mater. 2nd All-Ukrainian conf. Kryvyi Rih, 1997. p. 3-5
4. Tobacconist Y. G. Identification, structure and classification of landscapes of urbanized territories. *Geogr. and nature. resources*. 1991. № 3. p. 22-28.
5. Ecological passport of the city of Kryvyi Rih, 2017, p. 32-35.

SAPUN Anastasiia, *student*
NEKOS Alla, *Dr. Geogr. Sciences, Prof.,*
V. N. Karazin Kharkiv National University
CHERKASHYNA Nadiya, *English Language Supervisor*

SMALL ARCHITECTURAL FORMS AS AN ADDITIONAL FACTOR, CREATING THE VISUAL ENVIRONMENT OF URBAN GEOSYSTEMS

Abstract. The publication presents the results of a study of small architectural forms and their impact on the visual environment. Public opinion on the role of small architectural forms in urban development has been established in the article. It has been determined that landscaping is the most optimal solution to visual problems created by commercial small architectural forms.

Key words: small architectural forms, urban ecosystem, visual environment, public opinion, green infrastructure, landscaping.

In the process of development, humanity significantly changes their habitat. There are large cities, where the construction of new residential areas, public and business centers, wholesale and retail trade, as well as small architectural form are located. However, the development of urban infrastructure has led to the destruction of the visual environment. Therefore, given the current processes of urbanization, it is important to take into account public opinion on the quality of the visual environment. Thus, in October 2020 a sociological online survey was conducted among the residents of the Kholodnogirsk district of Kharkiv, where citizens were asked: «In your opinion, what can improve the visual environment of your residence area?». The results show that a significant proportion of respondents are dissatisfied with the number and location of small architectural forms and suggest «their complete destruction».

Small architectural forms is one of the important elements of the city infrastructure because each architectural object plays an active role in shaping the visual environment. Depending on the functional purpose, they are: commercial - pavilions, kiosks and non-commercial - public transport stops, decorative forms (fountains, park sculpture), and small architectural forms for temporary recreation (alcoves, playgrounds, park benches).

Considering the placing of small architectural forms in the space of a modern city, there is a problem of interaction of the formed urban space with the attributes of modern life. After all, now the urban space oversaturation problem with small architectural forms of the commercial purpose at the low aesthetic level is very acute. A certain conceptual approach to solving this problem does not exist yet, except for simple demolition. Therefore, it is very important to take into account the requirements of video-environmental aspects, when designing the urban space. In our opinion, the approach should be methodical, gradual, meet certain scientifically sound criteria.

Thus, to solve this problem, we propose to integrate small architectural forms with elements of green infrastructure. As we know, the presence of landscaping in the urban environment is a means of harmonizing the textures of architectural surfaces.

World experience shows that the problems of each urban situation require the development of targeted solutions for urban landscaping. After all, a variety of situational techniques and technologies for landscaping the urban environment allows you to abandon the traditional framework and form a different approach to urban development. The lack of territories makes an interesting proposal to interpret the designs and technologies of vertical landscaping, creating various permanent and temporary small architectural forms. Now it is a generally accepted world practice to move parks, gardens, boulevards from ground level to the roofs or facades of buildings. Thus, the green architecture makes the city not only environmentally friendly but often hides the vagueness of architectural facades behind the "mask" of vegetation [1].

Consequently, important elements of landscaping are the introduction of new natural elements in the visual environment: planting along city overpasses; small urban green areas (gardens or microparks) and green playgrounds; city lawns; green routes for walks; recreational and urban gardening facilities (sports, games and school grounds).

***References*:**

1. Litovchenko A. A., Lapshina E. A. An integrated approach to urban greening in the Primorsky Territory. 2018. Vladivostok. pp. 128-142.

APPLIED ECOLOGICAL RESEARCH

BEZUHLA Kateryna, *student*
KRYVYCKA Ivetta, *PhD (Biological), Assoc. Prof.*
V. N. Karazin Kharkiv National University
CHERKASHYNA Nadiya, *English Language Supervisor*

THE STUDY STATUS, USING TEST OBJECTS IN THE BIOMONITORING SYSTEM

Abstract. The publication presents the results of comparison of methods used in environmental quality monitoring. The advantages of the biological method over the physical and chemical ones are presented in the research. The combined use of chemical and biological methods will simultaneously determine the degree of environmental components' contamination and their ability to self-healing.

Key words: monitoring, biological method, phytotoxicity.

In the current system of environmental monitoring based on studies of changes in the structure and function of organisms, reflecting the cumulative effects of environmental quality, there is a tendency to move from pure chemical control to biological control. Compared to chemical and physical methods, biological methods, which can be used to assess the quality of environmental components, have many advantages. Organisms can display all changes in the environment and respond to various natural and human factors (including pollutants). Test organisms have certain requirements: they must be sensitive to toxic substances and easy to reproduce in the laboratory [1].

Plant test systems are very reliable and convenient in determining the degree of toxicity of some pollutants, as well as allowing to assess the overall impact of different types of pollutants. The most useful data on the environmental risk of heavy metals for the soil ecosystem is the determination of phytotoxicity - the ability of soil to have a depressing effect on plants, leading to the destruction of physiological processes and vegetation degradation [2].

High effectiveness of plant test systems is due to many advantages over other organisms for testing, the most important of which are:

- higher eukaryotic plants, which can extrapolate test results to other eukaryotes, including humans;
- the tests are relatively cheap, short-lived, easy to use, and highly sensitive;
- appropriate methods have been developed and standardized;
- plans do not require sophisticated laboratory equipment, so the use of test systems in developing countries is particularly promising;

- individual substances and complex mixtures can be used in tests under various environmental, pH and temperature conditions;

- higher plants are sensitive to carcinogens [3].

Therefore, modern methods based on plant test systems provide opportunities for environmental toxicity assessment of environmental components in different regions of Ukraine. The combined application of chemical and biological methods will simultaneously determine the contamination degree of environmental components and their ability to self-repair.

References:

1. Shkirko A. S. S. Biotesting ecological-toxicological state of natural surface waters using test objects. Poltava, 2016. 288 p.

2. Dzhura N. M. Possibilities of using plant test systems for biomonitoring of oil-contaminated soils. Lviv, 2011. P. 183 – 196. (ISSN 1996-4536).

3. Dovgaluk A. Pollution of the environment by toxic metals and its indication with plant test systems. P. 197 - 204 - (Studia Biologica). (ISSN 1996-4536).

BUCHYNSKA Daryna, *student*
KARTSEVA Victoria, *student*
V. N. Karazin Kharkiv National University
KRAVCHENKO Natalia, *Senior Lecturer*
CHERKASHYNA Nadiya, *English Language Supervisor*

COMPARATIVE CHARACTERISTICS OF ECOLOGICAL AND ECONOMIC DAMAGES FROM ATMOSPHERIC AIR POLLUTION IN DNIPROPETROVSK AND KHARKIV REGIONS

Abstract. The publication presents the results of the preparatory analysis of students to compare the degree of impact on the air of the enterprises of Dnipropetrovsk and Kharkiv regions, as well as a study of environmental and economic losses.

Key words: atmospheric air, emissions, environmental and economic damages.

The issues of rational nature management and emergency protection are in the center of attention of the world community. The importance of caring for natural resources is constantly proclaimed in the resolutions and legislation of the Ukrainian government. Interest in the problems of nature management is not accidental - it is caused by the growing scale of human economic activity, the involvement in the economic process of huge natural resources, increasing trends in environmental pollution. From the correct solution of these problems depends not only the current state of nature, but also the economic development of the country in the future [2,3].

Analyzing the materials of observations of the regions - Dnipropetrovsk and Kharkiv for the last 3 years, we note a tendency to deteriorate in the state of atmospheric air emissions of pollutants from stationary and mobile sources in the Kharkiv region (in 2019 amounted to 106.5 thousand tons (in 2018 - 44.7 thousand .ton, in 2017 - 45.0 thousand tons)), in the Dnipropetrovsk region stable indicators with improvement in 2019. (576.9 thousand tons of harmful substances were received, which is 37.4 thousand tons (6 %) less than in 2018), respectively (Figure 3). Indicators of Dnipropetrovsk region are outstripping and exceed 5 times the number of harmful substances in Kharkiv, this is due to the great development of industry [2, 3].

The main air pollutant in Kharkiv is Zmiivska TPP PJSC with a gross emission for 2019 – 57 302,505 tons, the lowest in PJSC «Kharkiv CHP-5» – 1245,983 tons [2, 3].

The great development of industry in the Dnipropetrovsk region contributes to large-scale air pollution. In 2019, the main pollutants were metallurgical and mining enterprises and electricity producers (PJSC «ArcelorMittal Kryvyi Rih», PJSC «DTEK Pavlogradugol», PJSC «Dnipro Metallurgical Plant») with emissions - 230800 t / year, 124 130 t / year, 124 130 t / year, 78100 t / year, respectively. The most environmentally dangerous was the enterprise KP «Kryvbasvodokanal» with a rate of 1932 t / year, which is 1.5 times higher than the lowest rate in PJSC «Kharkiv CHP-5».

The composition of pollutants in the Dnipropetrovsk region is dominated by carbon monoxide, and the smallest share is occupied by nitrogen compounds, as in the Kharkiv region, but the rate of sulfur dioxide is the highest [2,3].

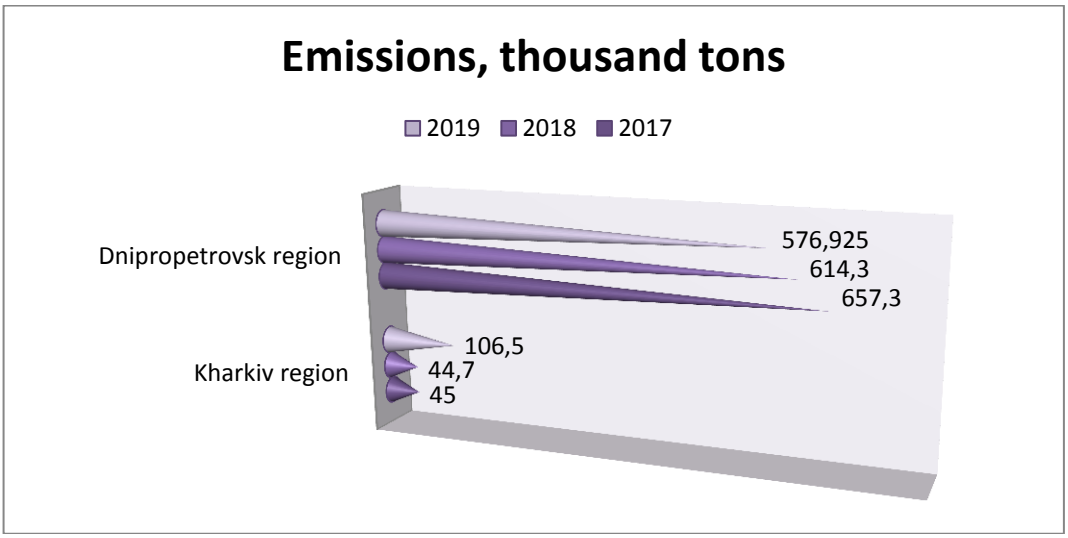


Figure 1 – Dynamics of pollutant emissions from stationary and mobile sources of Dnipropetrovsk and Kharkiv regions for 2017-2019 thousand tons

The authors performed calculations using two methods - the standard method for determining the economic efficiency of environmental measures and assessment of economic losses from environmental pollution (Table 1) and the method for determining the damage from air pollution according to Danylyshyn B.M. Hvesik M.A., Golyan V.A. (Table 2) [1,4].

Table 1

Calculation of ecological and economic damages by the temporary method [4]

Indicator	Kharkiv region	Dnipropetrovsk region
Environmental and economic losses from annual emissions	250 295 769 UAH / year	635 749 273 UAH / year
	94,167 UAH / year / person	200, 13 UAH / year / person

Table 2

Calculation of ecological and economic damages by the method according to Danylyshyn B.M. Hvesik M.A., Golyan V.A. [1]

Substance	$У_{atm}$ (Dnipropetrovsk region)	$У_{atm}$ (Kharkiv region)
Sulfur dioxide	4 021,99 UAH / year	3 442,16 UAH / year
Nitrogen dioxide	47 394,55 UAH / year	15 002,31 UAH / year
Carbon monoxide	16 815, 201 UAH / year	773,14 UAH / year
Dust	3 441,93 UAH / year	1 257, 52 UAH / year

Thus, comparing the results of environmental and economic losses obtained, we used two methods: 1) a typical method of determining the economic efficiency of environmental measures and assessment of economic

losses from environmental pollution and 2) a method of determining the damage from air pollution by Danylyshyn B. M., Hvesyk M. A., Golyan V. A. Thus, we can draw conclusions from the calculations and note that the data are not equivalent. This can be facilitated by factors that take into account the location of the emission source and the height of the emission, the scattering coefficient of impurities, which depends on the fractional composition and the settling rate of the parts. The most accurate, effective and efficient is a typical method of determining the damage from air pollution.

***Referenses*:**

1. Danilishin B. M. Economics of nature management. Textbook, Kyiv: «Condor», 2009. 465 p.
2. Regional report on the state of the environment in the Dnipropetrovsk region for 2019. *Department of Ecology and Natural Resources*: web-site. URL: https://adm.dp.gov.ua/pro-oblast/ekologiya-pro-oblast/ekologiya.
3. Report on the state of the environment in the Kharkiv region in 2019. *Department of Environmental Protection and Nature Management*: web-site. URL: https://kharkivoda.gov.ua/oblasna-derzhavna-administratsiya/ struktura-administratsiyi/strukturni-pidrozdili/486/2736/105379?sv.
4. Temporary standard method for determining the economic efficiency of environmental measures and assessing the economic damage caused to the national economy by environmental pollution. Moscow: Economics, 1986

DOBRONOS Pavlo, *student*
MAKSYMENKO Nadiya, *DSc(Geography), Prof.*
CHERKASHYNA Nadiya, *English Language Supervisor*

REDWOOD NATIONAL PARK AS A RECREATIONAL RESOURCE FOR SILICON VALLEY RESIDENTS

Abstract. Based on our own experience, the possibilities of using Redwood NPP as a recreational resource for recreation of IT companies are shown. It is proved that the restoration of physical and psychic - emotional state of a person in unique natural landscapes is the most promising. The advantages of this protected area for the residents of Silicon Valley are analyzed in the paper.

Key words: recreational resource, rest, national park.

Redwood National and State Parks reside on the North Coast of California and Oregon. Redwood National Park protects the unique landscape with the tallest trees in America and on earth and prairies, oak forests, river paths, and the Pacific Ocean coast (fig. 1).

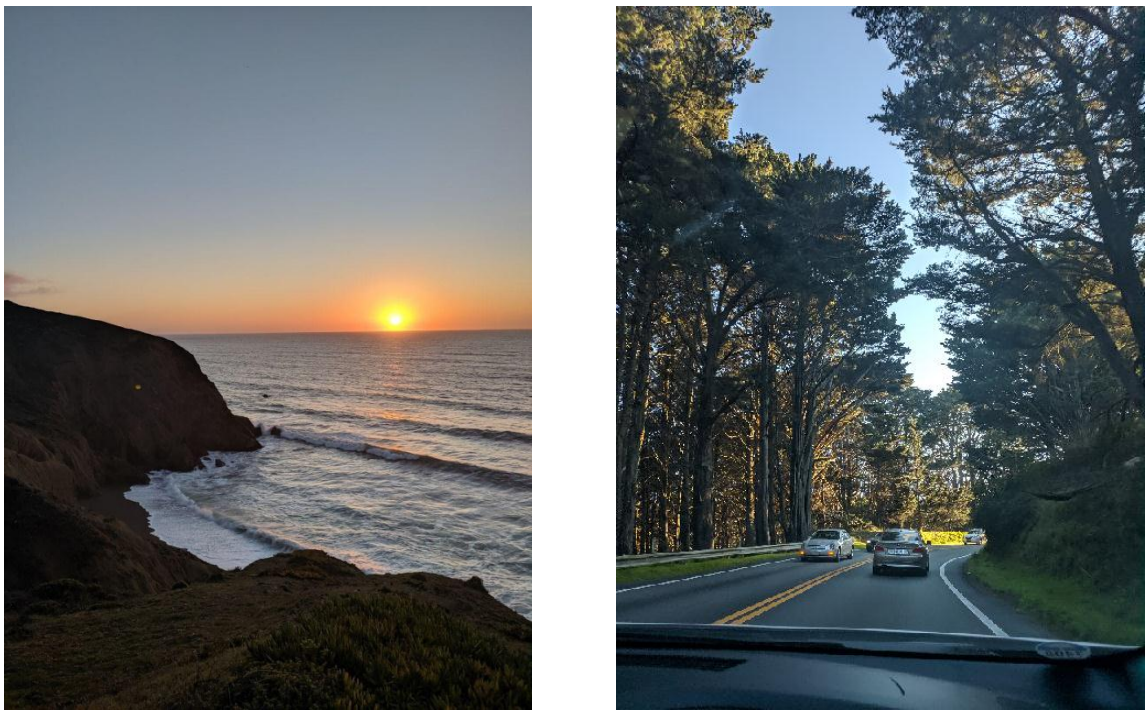


Fig. 1. Redwood National Park

Due to its location along the coast of northern California, the weather in Redwood National Park is relatively constant throughout the year - from 8 to 28 degrees Celsius with relatively high humidity and the chance of rain.

Every day park activities include hiking, cycling, kayaking, and exploring the area's unique tidal micro-ecosystems.

The park also offers various organized activities, and local Native American tribes hold demonstrations of traditional dances throughout the summer.

Silicon Valley residents are employees of IT companies. They have a sedentary job and, therefore, need active recreation. Redwood National Park is located near Silicon Valley towns, which contributes to its use as a recreational resource. The park staff offers various leisure programs for different needs (fig. 2).

Fig. 2. The recreational resource of Redwood National Park

Besides, you can organize your own outdoor activities. We used archery to relieve stress from work (fig 3).

Fig. 3. Archery at Redwood National Park

DMITRIEV Svyatoslav, *student*
RESHETCHENKO Svetlana, *PhD*
V. N. Karazin Kharkiv National University
CHERKASHYNA Nadiya, *English Language Supervisor*

DETERMINATION OF THE TOURIST AND RECREATION POTENTIAL OF THE PSEL RIVER BASIN WITHIN UKRAINE

Abstract. The publication presents the results of studies on the tourist and recreation potential of the Psel river in Poltava and Sumy regions. It was found that this water object can be used for a development of local economy.

Key words: tourism, Psel river, recreation, potential, climatic conditions.

At the beginning of the 19th century, more or less systematic studies of the water regime of the largest rivers in modern Ukraine began, primarily in the Dnieper, and since the late 1870s the research program has expanded considerably. As for the Psel river basin, its scientific study began in 1914. Since then, the basin principle has been preserved in hydrological research, ie all watercourses are studied not outside the administrative boundaries, but within the river basins.

Issues of assessment of water recreational resources are thoroughly covered in the works of Yu. S. Vasylieva,, B.O. Kukushkina, V. F. Danylchuka, G. M. Aleinikova, G. Ya. Bovsunovska, S. M. Golubnycha, L. V. Ilyina, O. V. Ilyina, M. S. Myronenka, M. M. Bocharova, H. B. Fomenko [1].

The implementation of the integrated basin model of water resources management is one of the main principles of the Water Framework Directive 2000/60 / EC (EU WFD) [1], adopted in 2000 after a 5-year process of restructuring European water policy. The directive has become a guiding document for setting water protection goals in the 21st century. Given modern climate change and its impact on water resources, the issue of their protection has become very important in the XXI century.

The Psel River is one of the longest left tributaries of the Dnieper. The river originates in Russia, in the Prokhorovsky district of the Belgorod region, near the village of Prigorki. The river enters the territory of Ukraine near the village of Zapsillya, Krasnopil district, Sumy region. The mouth of the river Psel is located between the settlements of Kremenchuk and Horishni Plavni, Poltava region. The length of the river is 717 km, of which it reaches 502 km in Ukraine. The total catchment area of the Psel River is 22,800 km2 [2], of which almost 75% is located within the Poltava and Sumy regions of Ukraine.

The river Psel with its tributaries passes through the territory of Ukraine between the parallels 49 ° 01 'N. w. and 51 ° 14'N. w., and therefore there are some differences in its heating.

Because the river valley is more elongated from north to south than from west to east, its northern and northeastern parts receive slightly less heat

(less than 4,000 MJ / m^2).

Most of the valley receives total solar radiation from 4,000 to 4,200 MJ / m2 per year. The south-western part of the valley warms up the most during the year (more than 4200 MJ / m2) and receives as much heat as the northern part of the steppe.

Radiation balance in general repeats the total radiation in its degree in the river basin

The balance is characterized by an increase from northeast to southwest from values less than 1750 MJ / m2 in Sumy to almost 1800 MJ / m2 near the mouth of the river Psel.

It should also be noted that the percentage of direct and scattered radiation is not the same in different parts of the basin and is characterized by an increase in the share of scattered radiation moving to the northeast due to increasing number of cloudy days, accompanied by more precipitation.

Thus, the Psel river valley is characterized by average values of solar radiation for Ukraine, but its length determines the uneven heating in the valley itself and determines the higher values of total radiation and radiation balance in the southwest.

The temperature regime of the study area is determined by the available radiation supply. The ratio of the duration of the seasons is different in different parts of the valley - from northwest to southeast increases the duration of the main seasons of the year (winter and summer) and decreases the duration of the transitional (autumn and spring). On average, in the Psel river valley, the seasons are as follows: winter - 115-125 days, spring - 55-65 days, summer - 115-125 days and autumn - 65-75 days.

The humidity regime of the territory is determined by the prevailing wind currents. Since moisture is brought here by westerly winds, its quantity will increase in the westerly direction, which is confirmed by the enclosed map. It can be seen that the amount of precipitation decreases in the south and southeast - from 650 mm / year in Gadyach in the northwest of the valley to 450-500 mm / year in Kobeliaky in the southwest of the Psla valley.

Regarding the intra-annual distribution of precipitation, the wetter summer (especially June and July) is clearly distinguished, while other months receive almost the same amount of precipitation, and the minimum amount of precipitation is in February, April and October, and this distribution is typical for all surveyed weather stations. Accordingly, the month with the minimum amount of precipitation among the winds is dominated by east or north, blowing from continental anticyclones and bringing dry weather with frosts in winter and spring and hot weather in summer.

Among the objects that could be of interest to tourists, in the basin of Psel is the city of Gadyach - a climatic resort of the forest zone, located on the banks of the river Psel and Myrhorod - a flat spa and mud resort of the forest-steppe zone.

In addition, there are 169 territories and objects of the nature reserve

fund on the territory of the region: 46 reserves, including 11 of state importance, 92 natural monuments, among which - 1 of state importance, Ustymivsky arboretum, 20 parks - monuments garden and park art, 4 of them are of state importance, 10 protected tracts. Of the above facilities, about 20% are in the Psel River Basin. In the Sumy region, 45 objects of the nature reserve fund are located in the Psel basin.

Favorable climatic conditions, dense network of peaks, numerous reservoirs in combination with picturesque landscapes, the presence of mineral waters, relatively low level of urbanization form a significant recreational potential of the basin. But the low level of transport and hotel and restaurant infrastructure remains a significant problem.

Thus, the Psel river basin has a significant tourist and recreational potential, consisting of both nature and anthropogenic objects. An important obstacle to the development of tourism in the region is unsatisfactory transport routes and almost complete lack of marketing activities, which is mainly regional in nature. One of the main tasks is to advertise the tourist attractions of the pool, aimed at foreigners. The region is extremely rich in unique terrain, and the local landscapes have preserved their natural state with well-thought-out groves, floodplains and protected tracts. The cultural heritage is also rich and diverse, but its current status is not suitable for serious tourism activities.

References:

1.Klimenko V. G., Brezhnev A. Yu., Kotenko Yu. I., Ugryumova Yu. O., etc. Recreational tourism potential of the Siverskyi Donets River basin (within Kharkiv region). *Problems of continuous geographical education and cartography*. Kharkov, 2016. P. 41-47.

2. Poltava.Historical sketch. Poltava: PoltavaLiterature. 280 p.

3. Danilchenko O. S. Environmental assessment of water of the Vorskla and Vorsklytsa rivers within the Sumy region for the period 1999-2015. OS Danilchenko. Poltava, 2016. 37 p.

FILATOV Victor, *student*
V. N. Karazin Kharkiv National University
KRYVYCKA Ivetta, *PhD(Biology), Assoc. Prof.*
CHERKASHYNA Nadiya, *English Language Supervisor*

ECOLOGICAL ASSESSMENT OF SOIL STATE IN RECREATION ZONES OF KHARKIV CITY

Abstract. The publication contains research results of ecological assessment of soil state in recreation zones of Kharkiv city. This research includes a comparative analysis of soil samples for heavy metals and mineral substances.

Key words: heavy metals, soil, recreational zone, mineral resources, plant security, MAC.

The recreational zone of the city is a buffer zone, which protects the residents of the city from the negative impact of industrial enterprises. Pollutants from industrial enterprises and motor vehicles contain toxic substances that affect the health of people and their level of productivity, as well as may lead to the emergence of diseases of various nature.

Recreational areas of the city include green spaces such as parks, squares and alleys. Vegetation and soil reduce a certain dose of pollutants, keep them away and decompose spores of hazardous chemicals to simple elements, due to the living activity of the receptors. Vegetation takes part in purification and enrichment acid air due to the process of photosynthesis. These processes play an important role in maintaining the balance in the environment of the city.

The analysis of the state of soils in recreational areas included 3 stages - cameral, laboratory and analytical.

For soil sampling we selected 3 parks with different anthropogenic influences: the park «Machine-Builders», the park «Peremoga» and the park «Yunist». Two samples were taken in each park - one in the middle of the park, the other at the end of the park, near the freeway. A total of 6 samples were taken according to GOST 17.4.3.01 and GOST 17.4.4.02 [2].

Among the indicators that were studied were hygroscopic water content, acidity, mineral reagents and heavy metals. The productive water content in the samples of the soil is in accordance with the state of readiness according to GOST 28268. In terms of acidity the soils have a neutral or weak pH [4].

Diagnosis of nitrogen consumption by the plants was determined by the mineral nitrogen – nitrate and ammonium. The analysis shows that the supply of nitrate nitrogen to the plants varies from very low to medium concentrations in different samples of soil, and the supply of ammonium nitrogen to the plants is low.

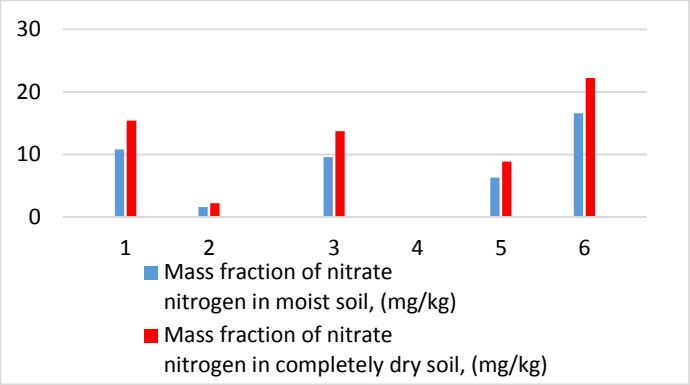


Figure1 – Mass fraction of nitrate nitrogen in the soil

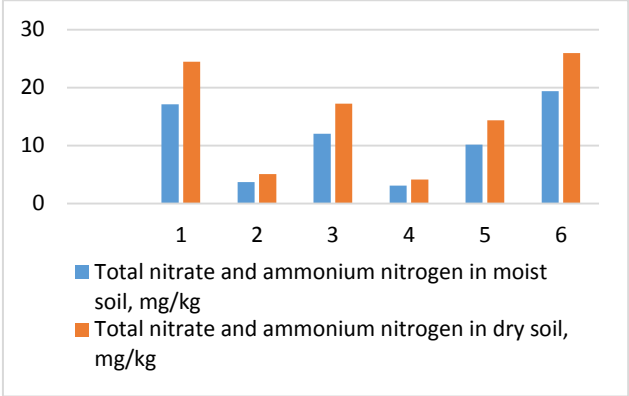


Figure 2 –Mass fraction of the sum of nitrate and ammonium nitrogen in the soil

On average, the supply to plants of mineral nitrogen is low [5]. Concentration of recycled calcium varies between low and medium. The content of moving phosphorus spores showed its high availability for plants [1].

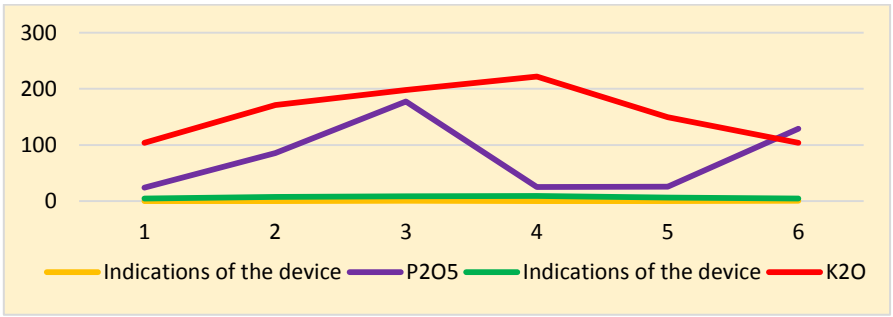


Figure 3 – Amount of moving phosphorus and calcium in the soil

The presence of heavy metals in the soil was determined by the atomic absorption method on a spectrophotometer in the laboratory of chemical and analytical investigations, the Educational and Scientific Institute of Ecology [3].

Table 1

Concentration of heavy metals in the soil

Score	MAC	Background Value	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6
Lead, mg/kg	6	1	0,04929	3,649485	2,620675	1,836565	3,31518	0
Zinc, mg/kg	23	0,5	**30,8391**	**33,51523**	22,89167	16,7232	**30,197**	**92,089**
Copper, mg/kg	3	0,5	0,04019	0,04452	0,002807	0,01918	0,01421	0,08446
Cadmium, mg/kg	-	0,1	0,04592	0,042255	0,05225	0,492355	0,02426	0,02296
Chromium, mg/kg	6	0,1	0,0045	0,0025	0,002	0,0005	0,0005	0

All of the investigated chemical elements did not show exceeded maximum allowable concentrations (MAC), except for zinc. We can see that zinc exceeds MAC in two samples from the park «Machine-Builders» in Slobidsky district and two samples from the park «Yunist» in Kholodnogirsky district.

Zinc concentration in the soil sample from the center of the park «Machine Building» is 30.8 mg/kg, and near the road - 33.5 mg/kg, which is more than 1.5 times higher than the limit concentration. The park is limited by such enterprises as: Turboatom, plant named after Malyshev, Kharkiv plant, Kharkiv TPS-3.

In the park «Yunist» zinc concentration in the park center is 30.2 mg/kg, and near the road - 92 mg/kg, which is 4 times higher than the established standards. The park has a very narrow shape, which creates a narrow contact with the highway on Poltavsky Shlyah Street, leading to Zalyutino Street and Zalyutino bridge. This is where heavy traffic is found. Such high indicators of zinc content in the soil may be due to its accumulation during the winter, as the samples were taken during the growing season.

According to the comparative analysis of three Kharkiv parks with high anthropogenic pressure, there is a concentration of zinc in the ground in the park "Machine Building" and «Yunist», due to the pollution from industrial enterprises that surround the park «Machine-Builders» and intensive vehicle traffic in the vicinity of the park «Yunist». In the park «Peremoga» there were no exceedances of MAC for the investigated chemical elements, but the concentration of zinc is close to the permissible limit.

According to indicators of chemical spores (NPK) in all three samples there is a low concentration of mineral nitrogen and calcium, but a high concentration of phosphorus. This may be due to the removal of leaf litter from the vegetation and disruption of the biogenic balance.

References:

1. Determination of phosphorus and potassium spores by the modified Machigin method. BZ NO. 5 – 2002/299.2002.
2. Nature conservation. Soils. General Guidelines for Sampling: GOST 17.4.3.01-83: 1983. [Official Gazette of 1984-07-01]. Moscow: Derzhkomgidromet, 2008. 9 p.
3. Soil quality. Determination of the amount of moving spores of manganese (zinc, cadmium, iron, cobalt, copper, nickel, chromium, lead) in soil in buffer ammonium-acetate vitriol at pH 4.8 by atomic absorption spectrophotometry: DSTU 4770.1-9:2007.
4. Soil quality. pH material in modification of the NSC IGA O. N. Sokolovsky. Derzhspozhivstandart of Ukraine. 2012. P. 4.
5. Soil quality. Determination of nitrate and ammonium nitrogen in modification. NSC IGA O. N. Sokolovsky /V. I. Kisil, A. O. Khristenko, B. S. Nosko and others. Derzhspozhivstandart of Ukraine. P. 14.

FROLOVA Yuliya , *student,*
UTKINA Kateryna, *PhD (Geography), Assoc. Prof.*
V.N. Karazin Kharkiv National University
CHERKASHYNA Nadiya, *English Language Supervisor*

INFLUENCE OF ZAPORIZHZHYA NUCLEAR POWER PLANT ON WATER QUALITY OF KAKHOVKA RESERVOIR

Abstract. The publication presents information from surveys conducted in the summer and winter of 2020. The research was conducted to determine the impact of the Zaporizhzhia NPP on the ecological status of the Kakhovka Reservoir. 4 water samples were taken in different places and at different periods; they were analyzed by biotesting. In summer, the samples showed no chronic toxicity, and in winter - the presence. This requires further research to identify the causes and develop conservation measures.

Keywords: Zaporizhzhia NPP, biotesting method, Kakhovka reservoir, chronic toxicity.

Zaporizhzhia Nuclear Power Plant is located near the Kakhovka Reservoir. Undoubtedly, the power plant affects the water quality in it.

The purpose of the study is to determine the impact Zaporozhzhia NPP for water quality of Kakhovka reservoir. The impact we determined through analysis on chronic toxicity of selected water samples.

Research methodology: chronic toxicity of selected water samples was determined using biotesting techniques using crustaceans as test objects. [1] The method of determining chronic toxicity is based on establishing the difference between the survival and (or) fertility of ceriodaphnia in the analyzed water (experiment) and in the water in which ceriodaphnia are kept (control). The criterion of chronic toxicity is a statistically significant reduction in the survival and (or) fertility of ceriodaphnia in the experiment compared with the control during biotesting. The duration of biotesting is (7 ± 1) days. The results are taken into account if during the biotesting the number of dead ceriodaphnia in the control did not exceed 10%. Water quality is assessed by the level of its chronic toxicity and the degree of pollution according to the classification scale [2].

The study of water quality in the water body was conducted in the summer and winter of 2020. Each time, 2 water samples were taken from the Kakhovka Reservoirnear nuclear power plants. Sampling sites are located at different distances within (maximum distance - 9 km) from the Zaporozhye NPP, sampling points are shown in Fig.1.

Figure 1– Map-scheme of water sampling sites

The first point, the area of the Albany recreation area - the distance from the nuclear power plant is 8.4 km, the second sample was taken.

The samples were analysed in the educational and research laboratory of analytical ecological and toxicological researches of V.N.Karazin Kharkiv National University. The results of the study are shown in table 1.

Table 1

The results of the study of chronic toxicity of water samples taken in summer and winter 2020

№	Place of sampling	Date of sampling	The results of the determination of chronic toxicity Water quality class The degree of contamination
1	Albanov district	06/12/2020	I Clean
2	DACHI Street 1	06/12/2020	I Clean
3	Albanov district	12/08/2020	II Slightly polluted
4	DACHI Street 1	12/08/2020	II Slightly polluted

Analysis of water samples for chronic toxicity, using test organisms of crustaceans, gave the following results: in 1 and 2 samples - chronic toxicity, undetected toxicity level ranges from 1.0, which allows to classify these areas as "clean". But we also observe that in the winter of 08.12.2020 the situation changed in 1 and 2 tests chronic toxicity revealed the level of toxicity in the range of 1.1-1.2 degree of pollution "slightly polluted". The indicators could be influenced not only by the Zaporozhzhia NPP facility, but most likely low

temperature and deceleration processes self-cleaning.

Conclusion: To determine chronic toxicity, 4 water samples were taken in summer and winter. The result of the study showed the following: in summer 1 and 2 samples - chronic toxicity level ranges from 1.0, which allows to classify these areas as "clean". But in winter we observe that the situation changed in samples 1 and 2, chronic toxicity detected a degree of contamination as "slightly polluted". The indicators could be influenced not only by Zaporozhzhia NPP facility, but most likely low temperature and deceleration processes of self-cleaning.

References:

1. Krainyukov O. M. Algorithms and methods for determining the levels of acute lethal and chronic toxicity of water. *Man and the environment. Problems of neoecology*. № 1-2 (25), 2016. pp. 14-19.

2. Aristarkhova E. O. Biotesting of chronic water toxicity of surface water supply sources on Seriodaphnia affinis Lilljeborg and Allium sulfur L 2018, *Bulletin of Agricultural Science*№1 (778). Pp. 65–69.

KOVAL Fedir, *student*
V. N. Karazin Kharkiv National University
KRYVYTSKA Ivetta, PhD (Biology)
CHERKASHYNA Nadiya, *English Language Supervisor*

ESTIMATION OF AIR QUALITY INDEX FOR THE YEAR IN THE VILLAGE OF PODVIRKY

Abstract. The publication presents the results of research on the value of air quality according to the formula NowCast (US EPA) particles of fine dust fraction PM 2.5.
Keywords: AQI, NowCast, Ultrafine particles.

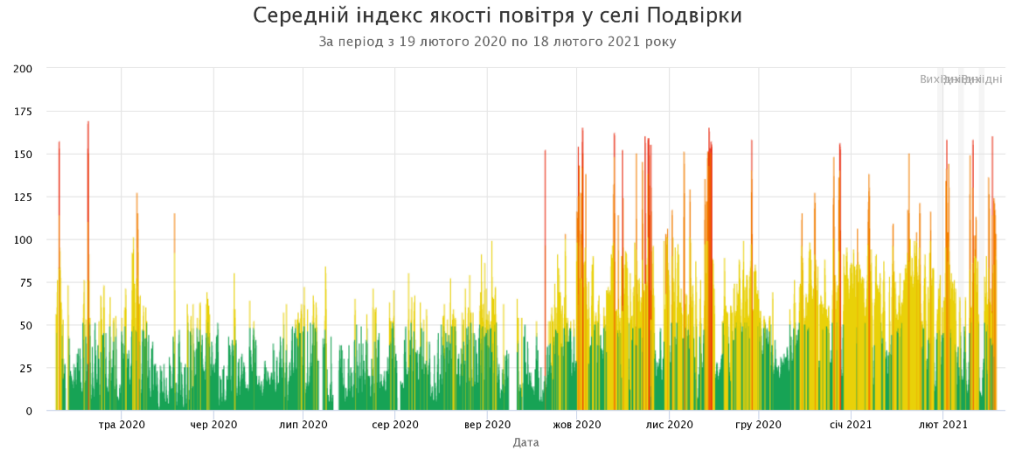
Increasing content of fine dust in the PM 2.5 fraction can worsen respiratory and cardiovascular diseases, so such studies should be performed to control the situation.

PM NowCast is an algorithm for determining the weighted average of the hourly air monitoring data used by the US Environmental Protection Agency (USEPA) for real-time air quality reporting (AQI) for PM 2.5 [2].

The study was conducted in the village of Podvirky, Kharkiv region, in the period from February 19, 2020 to February 18, 2021.

The measurement was performed with a laser sensor PM100-SDS198 - which uses the principle of laser scattering to obtain a mass concentration of suspended particles in the air from 1 to 100 microns. It uses imported high-performance lasers and supersensitive light systems to provide stable and reliable data [1]. The calculation of the results was performed on the basis of PM NowCast.

The results of the study are presented in Figure 1, the arithmetic mean value of the air quality index in the village Podvirki.



Legend:
unhealthy category fraction 151-200 µg / m3;
unhealthy category for sensitive groups fraction 101-150 µg / m3;
moderate category fraction 51-100 µg / m3;
good category fraction 0-51 µg / m3.

Fig.1 – the arithmetic mean value of AQI in the village Podvirki

According to the classification table of the US Environmental Protection Agency (USEPA), the data show that concentration of fine dust fraction is PM2.5 151-200 μg / m3, which belongs to unhealthy category observed 16 days for the entire observation period: in February (2020) 1 day, March (2020) 1 day, October (2020) 6 days, November (2020) 3 days, December (2020) 2 days, February (2021) 3 days .

The concentration of fine dust of PM2.5 fraction 101-150 μg / m3, which belongs to the unhealthy category for sensitive groups, was observed for 36 days during the whole observation period: in May (2020) 1 day, in September (2020) 1 day, in October (2020)) 7 days, in November (2020) 7 days, in December (2020) 5 days, in January (2021) 9 days, in February (2021) 6 days.

The concentration of fine dust of PM2.5 fraction 51-100 μg / m3, which belongs to the moderate category, was observed for 106 days during the whole observation period: in February (2020) 2 days, in March (2020) 3 days, in April (2020) 4 days , in May (2020) 10 days, in June (2020) 5 days, in July (2020) 7 days, in August (2020) 12 days, in September (2020) 13 days, in October (2020) 10 days, in November (2020) 12 days, in December (2020) 7 days, in January (2021) 13 days, in February (2021) 4 days.

The concentration of fine dust of the PM2.5 fraction 0-51 μg / m3, which belongs to the predominant good category, was observed for 178 days.

Therefore, the concentration of fine dust of the PM2.5 fraction belonging to the unhealthy category was observed for 16 days during the whole observation period; the concentration belonging to the unhealthy category for susceptible groups was observed for 36 days during the entire observation period; the concentration belonging to the moderate category was observed for 106 days during the whole observation period. Such concentrations are present in the autumn and winter seasons when the vegetation period of vegetation is almost absent and emissions from stationary and mobile sources reach their peak. In the spring and summer seasons with the existing growing season, we observe a concentration of 0-51 μg / m3, which belongs to a good category.

References:

1. Laser PM100 Sensor specification--SDS198. URL: http://inovafitness.com/en/a/chanpinzhongxin/96.html
2. U. S. Environmental Protection Agency // https://www.epa.gov/

KROTKO Andriy, *student*
MAKSYMENKO Nadiya, *DSc (Geography), Prof.*
V. N. Kharkiv National University
CHERKASHYNA Nadiya, *English Language Supervisor*

CONCENTRATIONS OF FORMALDEHYDE IN THE CITY OF KHARKIV FOR 2014-2018 YEARS

Abstract. This article analyzes the data on the average annual formaldehyde content obtained from stationary monitoring points for air pollution in the city of Kharkiv for 2014-2018 years. It was determined that the highest concentrations of formaldehyde during the studied years were at PSZ №9 and №11, and the lowest - at PSZ №12 and №24.
Keywords: concetrations, formaldehyde, average content, air pollution.

The source of formaldehyde emission into the atmosphere is the work of enterprises and transport. The average daily maximum concentration limit for formaldehyde is 0.003 mg/m^3, and the maximum single dose is 0.035 mg/m^3. In Kharkiv, formaldehyde is determined at 7 pollution monitoring points. In the theses we analyze the dynamics of average annual content of formaldehyde for each PSZ from 2014 to 2018.

Anthropogenic load on the territory near PSZ №9 is average. During the study, the average annual concentration of the substance ranged from 0.002 to 0.003 mg/m^3. From 2014 to 2017, it was 0.003 mg/m^3, and in 2017 and 2018 it decreased to 0.002 mg/m^3.

PSZ №11 is located in the city center, where there is an average level of anthropogenic load. The average annual content of formaldehyde from 2014 to 2018 was 0.002-0.003 mg/m^3. In 2014 and 2018 - 0.002 mg/m^3, from 2015 to 2017 it increased and amounted to 0.003 mg/m^3.

PSZ №12 is located in the "sleeping" area in the northeast of the city. The load on the post is low. The average annual formaldehyde content was 0.001-0.002 mg/m^3. In 2014, it was 0.001 mg/m^3, and since 2015 it has increased to 0.002 mg/m^3. In the diametrically opposite south-western part of the city there is PSZ №16, where the average annual content of the substance during 2014-2018 was 0.002-0.003 mg/m^3. The same indicators are inherent in PSZ №17, located on the street. Derevyanka - Belgorod highway. The load on this post is average.

PSZ №18 is located on the southern border of the city. The load on the post is average. The average annual values of formaldehyde ranged from 0.001 to 0.003 mg/m^3. In 2014, they amounted to 0.001 mg/m^3, in 2015 - 0.002 mg/m^3, in 2016 - 0.003 mg/m^3, and since 2017 - 0.002 mg/m^3.

PSZ №24 is located at 46 Akademika Pavlova Street. The load on the post is low. From 2014 to 2018, the average annual formaldehyde content was 0.001-0.002 mg/m^3. In 2014, it was 0.001 mg/m^3, and since 2015 it has been 0.002 mg/m^3.

Thus, it was determined that the average daily concentrations of formaldehyde at all observation points were almost the same, and the average daily maximum concentration limits were not exceeded. From 2016, the average annual concentration of formaldehyde at all PSCs began to decrease, and in 2018 it was 0.002 mg/m^3 at all observation points. The lowest values for the studied years were on PSZ №12 and №24, located in the "sleeping" area of the city, the average annual concentration for them for all studied years did not exceed 0.002 mg/m^3.

MILASH Oleksandr, *student*
V. N. Karazin Kharkiv National University
MAKSYMENKO Nadiya, *DSc(Geography), Prof.*
CHERKASHYNA Nadiya, *English Language Supervisor*

SETTING UP AN EXPERIMENT TO STUDY THE QUALITY OF WATER CLUSTER OF THE ECOSYSTEM IN THE YOUTH PARK IN KHARKIV

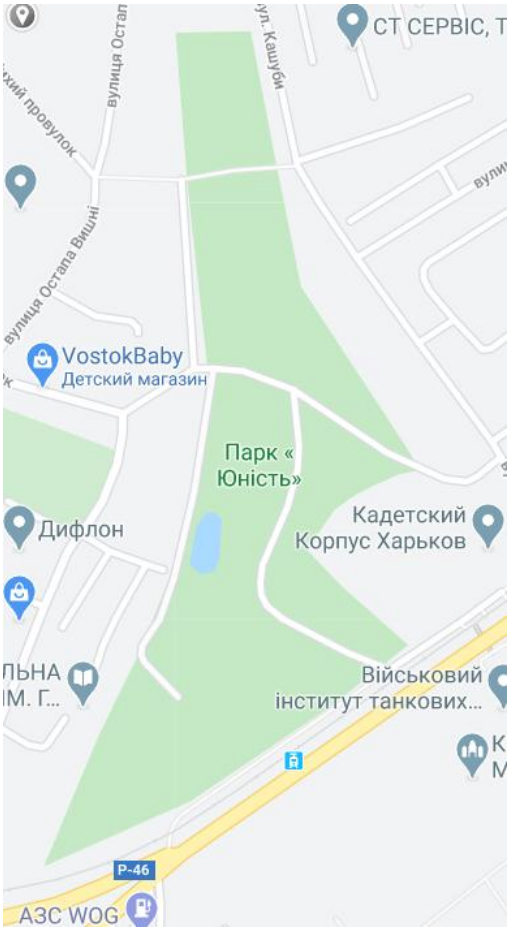
Abstract. To study the role of blue infrastructure of the Youth Park in Kharkiv, an experiment was set up, the essence of which is described in the theses.
Keywords: experiment, blue infrastructure, park, research.

The purpose of the work is to investigate dependence of changes in the ecological quality of the water cluster of the Yunost Park ecosystem on external factors.

Subject of research: changes in the ecological quality of the blue infrastructure of Yunost Park.

Object of research: the blue infrastructure of the Youth Park in different seasons of the year

The study area is shown in the figure.



Tasks for research:

1. Make a brief description of the park.
2. Study the method of conducting water research.
3. Take water samples from the pond, spring and rainwater and submit for analysis to the laboratory.
4. Get the results of laboratory analysis of spring samples of pond water, springs and snow.
5. To form tables for comparison of samples of spring and summer selection. Compare them with each other.
6. Collect photos on the territory of Youth Park of different years and take photos of these places now. Conduct field research in the park with photo fixation of the park, including lawn, sidewalks and paths, parking lots, coast pond, area around the source, flower beds, trees and other places in the park (this will be in the appendices).

In the following photos will be used to analyze the assessment of the impact of external factors on the blue infrastructure of the park.

MYSHKIN Kostiantian, *student*
NEKOS Alla, *DSc(Geography), Prof.*
V. N. Karazin Kharkiv National University
CHERKASHYNA Nadiya, *English Language Supervisor*

TOBACCO SMOKING AND ITS IMPACT ON THE QUALITY OF LIFE AND HEALTH OF SOCIETY

Abstract. The ecological quality of cigarettes and comparisons of domestic brands with foreign brands were studied during the experiment. Heavy metals, such as: Zn, Cu, Cr, Cd, Pb were found. It is determined that American and European cigarettes are many times better than domestic ones.

Key words: heavy metals, cigarettes, tobacco.

A person becomes accustomed to smoking from the age of 15 to 25 and then, all his life, neglecting his health, spends a lot of money on cigarettes. Therefore, the issue of cigarette quality should be extremely relevant.

Brands such as Time, Israel, MS in Italy, and Nat Sherman in the United States (UAH 500) were selected for analysis.

The study of heavy metal concentrations in tobacco, filters and tissue paper was performed at the educational-scientific laboratory of analytical ecological research, the educational-scientific institute of ecology, Karazin University, using atomic absorption spectrometer MGA 915 MD.

Based on the experimental studies of atomic absorption analysis of heavy metals concentrations in tobacco and cigarette filters, such heavy metals as Zn, Cu, Cr, Cd, Pb were detected.

From previous studies of the authors, it turns out that the safest cigarettes of Ukrainian brands are "Parliament", so it was decided to compare the quality of tobacco of foreign cigarettes, namely with cigarettes of the brand "Parliament".

Thus, according to the results of previous studies, the authors have determined that there is a tendency to improve the quality of cigarettes depending on the price - the higher the price, the better the quality of tobacco products. If we compare the quality of Parliament tobacco with foreign brands, it is far behind, because the concentration of HM in the tobacco of these cigarettes is tens and sometimes hundreds of times higher than in the tobacco of foreign brands. This applies to the concentration of particularly dangerous elements Pb and Cd. Thus, the research suggests that cigarettes of Ukrainian brands are much more dangerous than European and American tobacco products.

References:

1. Nekos A. N.&Garbuz A. G. (2012). Ecological assessment of environmental objects and food products. Kharkiv: V.N. Karazin Kharkiv

National University (in Russian).

2. Brovinskaya, M.(2019). To dispel smoke: how the Ukrainian cigarette market works. Retrieved from https://project.liga.net/projects/ cigarette_market1_/ (in Ukrainian).

3. In Ukraine, nearly a quarter of the population smokes. Delo.ua Retrieved from https://delo.ua/econonomyandpoliticsinukraine/v-ukraine-pochti-chetvert-naselenija-kurit-issle-347877/.

SYDORKO Andriana, *student*
BUGIL Svitlana, *Candidate of Economic Sciences, Associate Professor*
Lviv National Agrarian University

ECOLOGIZATION OF TOURISM AS A FACTOR OF SUSTAINABLE DEVELOPMENT OF TOURISM DESTINATIONS

Abstract. The publication presents the concepts of ecological tourism development on the territory of Ukraine to ensure ecologically balanced development of this sphere.
Key words: ecologically balanced development, tourism

Intensive development of tourism requires special attention to identifying negative impacts on the environment, finding ways to prevent and minimize it. Tourism can have both a negative impact on nature, and make a significant contribution to its protection and the environment; it can affect the successful development of tourist destinations.

Deterioration of the ecological situation leads to a decrease in the level of tourism attractiveness of the territory and a decrease in demand for tourist products, which, in its turn, is a deterrent to the development of tourist destinations. The global nature of tourism and the predominant focus on the rapid pace and results of economic growth of the tourism business are damaging to the environment and contribute to the aggravation of the subject–object relations in the human–nature system. And this, in its turn, highlights the need to implement the principles of sustainable development of those industries that are relatively less resource-intensive and environmentally unsafe.

The basis of ecologically balanced development is the need to establish a balance between fulfilling of the socio–economic needs of society, protecting the interests of future generations and ensuring quality of ecological status of environment.

To transform the tourism industry into an effective factor in the socio–economic development of a country or region, it is necessary to modernize it, taking into account ecological requirements and in accordance with the principles of sustainable development.

Ecologization will help to find scientifically substantiated, environmentally-oriented ways to develop tourism, provide protection and careful use of natural areas and facilities.

There are several ways to effectively promote tourism such as: wise management, wise use of resources, wise consumption, support for local economic activities and provision of information.

Wise management of the tourism industry can ensure its ecologization by: preserving and promoting natural, historical and cultural diversity, which are an essential part of tourism; inclusion of tourism activities in the sustainable development plans of the region; training of service personnel to

improve the quality of services; marketing analysis and providing detailed information about the tourist object; conducting new research and observations that help to overcome existing problems or open new tourist sites, as well as are necessary for industry and consumers.

At the same time, the ecologization of tourism should not be limited to the development of the most «nature-friendly» types of tourism, such as ecological and rural green tourism. It should be provided with a set of effective measures for all types of tourism aimed at scientifically-substantiated, regionally adapted regulation of recreational load and mandatory compliance with established standards, zoning of recreational and tourist areas, the use of environmentally friendly technologies in infrastructure services for tourists (energy–saving, water–saving, waste disposal, the use of environmentally friendly detergents and packaging materials, etc.), conducting various advocacy and educational activities aimed at raising the level of environmental awareness of tourists.

The Concept of development of ecological tourism in Ukraine should become the leading way of carrying out complex ecologyzation of all tourist branch of Ukraine. Ecotourism will contribute to the improvement of the ecological state of the natural environment in the process of organizing tourism, restoration of disturbed ecosystems, preservation of flora and fauna, as well as perform important ecological and educational activities.

An important component of ecologyzation tourism is environmental education, which should be aimed at raising the level of environmental knowledge and awareness of both local residents (especially tourism workers and youth) and tourists themselves. Based on this, the ecologyzation of tourism management should create such activities of the tourist enterprise, which will be aimed at fulfilling the needs of tourists in recreation, treatment, health, intellectual development (walks, excursions, tours, travel), will be realized through conscious and careful communication with the surrounding. environment based on rational resource consumption and mutual benefit.

In its turn, compliance with standards in the field of tourist services should increase the level of quality of goods, works and services in accordance with the needs of consumers; ensure the safety of tourist facilities, taking into account the risk of natural and man-made disasters and other emergencies.

The point of ecological certification of tourist territories and objects is the need to inventory the main sources of anthropogenic impacts on the environment, compliance with environmental norms and rules in the process of nature management, determining the use of natural resources and developing effective environmental measures based on certification. Environmental passports help to analyze in detail and differentiated the causes of changes in the state of the environment and identify those responsible for environmental damage and the quality of plans to improve the situation.

The organizational aspect of ecological tourism management is focused

on creating a better, ecological tourist product, obtaining economic profit from its implementation. It will include the development and implementation of a set of measures of managerial, organizational, economic, socio–cultural, psychological and pedagogical, logistical, personnel and other nature, which are aimed at tourists and tourism entities in order to increase their environmental awareness and culture.

As a result, tourism ecologyzation is designed to provide the basic ecological principles of balanced tourism, which include minimizing anthropogenic pressures, waste disposal, use of energy and resource-saving technologies and alternative energy, introduction of water purification and reuse systems, reduction of chemical and noise pollution, development of new transport., ecologically-oriented types of tourism

Summarizing the above, we can conclude that the importance of ecologyzation tourism for sustainable development of tourist destinations is to preserve and restore vulnerable, environmentally unstable natural areas; elimination of potential and existing sources of environmental impact in the process of tourism; coordinated planning of tourist activity with other types of economic activity; introduction of ecologically soft technologies in the tourism industry; minimization of pressures on the environment due to the even distribution of tourists (in time and space) and the creation of alternative recreation areas.

References:

1. Golod A.P. Ecologyzation of tourist activity in the context of ensuring sustainable development of the region. *Ukraine: East-West – problems of sustainable development: mater. II round All-Ukrainian Scientific-practical Conf., November 24-25, 2011 - Lviv: RVV NLTU of Ukraine.* 2011. Vol.1. P. 86-88.

2. Rusev I.T. Basics of ecotourism. Odessa: KP OGT. 2004. P. 140-145.

3. Kuzmenko O. Ecological tourism: concepts and features of the organization. *East*. 2002. № 2. P. 68.

4. Khrabovchenko V.V. Ecological tourism: teaching method. allowance. M .: Finance and Statistics. 2003. P. 14-22.

5. Kolbovsky E.Yu. Ecological tourism and ecology of tourism: textbook. allowance. for students. higher textbook head. 2nd ed.,. M .: Izd. Center "Academy", 2008. 256 p.

6. Smirnov I.G. Logistics management of recreational and tourist resources. *Humanitarian Bulletin of Pereyaslav-Khmelnytsky State Pedagogical University named after G. Skovoroda.* Special. output. 2010. P. 270-274.

7. Smirnov I.G. On the attractiveness and logistics of recreational and tourist facilities and resources (in the context of the logistics model of sustainable tourism development. *Geography and tourism*. 2010. Issue 4. P. 106-114.

VASIUKHA Oleksandr, *student*
NEKOS Alla, *DSc(Geography), Prof.*
V. N. Karazin Kharkiv National University
CHERKASHYNA Nadiya, *English Language Supervisor*

CIGARETTE FILTERS AS A FACTOR OF NEGATIVE INFLUENCE ON LIFE AND HEALTH OF SOCIETY

Abstract. Laboratory studies on the ecological quality of cigarette filters of foreign brands have revealed the presence of such heavy metals (HM) as: Zn, Cu, Cr, Cd, Pb.

It has been found that Ukrainian cigarette filters generally have lower concentrations of heavy metals than foreign brands.

Key words: heavy metals, cigarettes, cigarette filters

The tobacco epidemic is one of the most serious threats to public health that has ever occurred in the world; Every year, 8 million people die from the effects of smoking. More than 7 million of them - consumers and former consumers of tobacco, and more than 1.2 million - despite not smoking, are exposed to secondhand smoke.

In order to make cigarettes "safer", the tobacco industry introduced cigarette filters in the 1960s. It is now known that they are not safe, have no health benefits and are one of the main causes of environmental pollution.

It is originally stated that filters reduce the amount of resin and other toxic substances and prevent tobacco flakes from entering the lungs. It has been soon discovered that this was not the case, and cigarettes were just as dangerous with filters.

To determine the quality of cigarette tobacco (availability of HM), such brands as "Time" (UAH 90) were selected - a popular brand of cigarettes in Israel from the manufacturer Dubek of the middle price category, cigarettes of the Italian brand "MS" of the middle price category (UAH 150).

We studied heavy metals concentration in tobacco at the educational and scientific laboratory of analytical ecological research, the educational and scientific institute of ecology, Karazin University, using the atomic absorption spectrometer MGA 915 MD.

Based on experimental studies of atomic absorption analysis of heavy metals concentrations in cigarette filters, such heavy metals as Zn, Cu, Cr, Cd, Pb were detected.

From previous studies of the authors, it turns out that the safest cigarettes of Ukrainian brands are "Parliament". Thus, it was decided to compare the quality of tobacco of foreign cigarettes, namely with cigarettes of the brand "Parliament".

The results the research have shown that the HM highest concentration in the cigarettes filters of the Ukrainian manufacturer are Zn, Cd, and such chemical elements as Cr, Pb have the lowest concentrations. The research

results showed that the highest concentration of HM is Zn, Pb, and such chemical elements as Cd, Cr have the lowest concentrations.

References:

1. The main cause of death, disease and impoverishment. 2020. P. 6-7. URL:https://www.who.int/ru/news-room/fact-sheets/detail/tobacco.

2. Barnsley K., Walters. H., Filters: a cigarette engineering hoax that harms both smokers and the environment. 2017. P. 15-16 URL:https://theconversation.com/filters-a-cigarette-engineering-hoax-that-harms-both-smokers-and-the-environment-85393.

3. Nekos A. N., Garbuz A. G. Ecological assessment of environmental objects

and food products: Tutorial for students. Kharkiv: V.N. Karazin nat. university, 2012.123 p.

4. Vasiukha O.V, Myshkin K.K., Environmental safety and quality of cigarettes

filters. Ecology, neoecology, environmental protection and sustainable use of nature: Materials int. Science. conf. of young scientists., Kharkiv, November 28-29. 2019. Kharkiv, 2019. p. 129-130

LUKOVSKA Nataliia, *student*
MIROSHNYK Yuliia, *engineer*
V. N. Karazin Kharkiv National University
CHERKASHYNA Nadiya, *English Language Supervisor*

ASSESSMENT OF WEATHER PATHOGENICITY IN CITY OF VINNITSYA FOR YEAR 2019

Materials of meteorological observation for 2019 year in Vinnitsya WERE USED IN calculations of such indexes as temperature pathogenicity, changes in atmospheric pressure, air temperature changes , moisture; and the general index of weather pathogenicity was worked out based on the data mentioned above.

It was established that number of days with an sharp pathogenic weather action (J > 25) accounts for almost 50% (182 days). The highest values of weather pathogenic influence index are noticed in winter (183–114); repeatability of days with tangy and irritative action increases in autumn, approaching to winter and decreases in spring with closing in to summer.

Key words: meteorological dependence, pathogenic action, meteo prophylaxis, meteopathic reactions, air temperature, wind speed.

Weather shifts influence people differently. Everything depends on organism's ability to adapt to sharp changes in weather conditions. Statistic shows that almost half of our planet's population are sensitive to meteopathic reactions. Certain changes of meteorological values may cause pathogenetic action. That is the reason why studying impact of pressure, wind activity, air moisture and temperature etc. on human is sufficiently urgent today.

The level of pathogenic weather action for 2019 year in Vinnitsya is calculated according to data of internet sources Gismeteo and Meteopost and based on general index of weather pathogenicity, defined as a sum of constituted indexes of air temperature, moisture, wind speed, pathogenicity of atmosphere pressure and air temperature changing. Results of calculations values of pathogenicity indexes and rate of the weather irritative action in Vinnitsya for year 2019 are shown on Fig. 1.

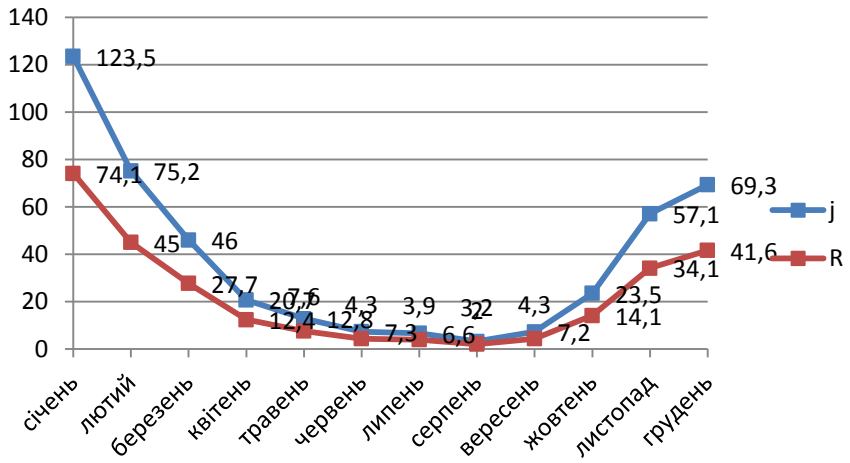


Fig. 1 – Month average values of pathogenicity indexes and weather irritative action rate in Vinnitsya for year 2019

Where

J – a general pathogenicity index; R – a weather irritative action rate

The final stage of research was the evaluation of weather pathogenicity action upon human's organism according to values of general pathogenicity index for Vinnitsya.

Maximal value of general pathogenicity index was observed on the 25th of January; the minimal one was on the 18th of January. Weather irritative action rate for January 2019 in Vinnitsya may be estimated as "sharp".

In February maximal value of general weather pathogenicity detected on the 22nd of February; The minimal one – on 18th of February (36). Weather action was defined as "irritative" on 18th of February and as "sharp" for all other days of the month.

In March maximal impact of pathogenic action upon human's organism was observed on 2nd of March; the minimal one was on 31st of March. Based on values of general index weather pathogenicity was irritative on 8th, 9th and 31st of March and was sharp for the rest of the month.

In April maximal value of general weather pathogenicity index was 53 (on 16th of April) and minimal – 0 (on 24th of April). According to values of general index level of the weather pathogenicity was optimal on 7th, 8th, 9th, 22nd, 23rd, 24th, 25th, 26th, 27th and 28th of April. It was irritative on 1st, 6th, 10th, 21st, 30th; and was sharp for the rest of April.

Maximal impact of pathogenic action on human's organism in May was observed on 8th (56) and minimal was on 23rd of May 2019 (0). On 4th, 12th, 13th, 14th, 19th, 20th, 21st, 23rd, 24th, 26th, 27th, 28th and 29th of weather pathogenicity was at optimal level. It was sharp on 1st, 8th and 9th of May and act irritative for the rest of the days.

Irritative weather action was observed on the 5th, 11th, 15th, 17th, 22nd, 23rd, 24th and 28th. of June. Maximal influence of pathogenic action on human's organism was on the 28th off June (14) and minimal was on the 26th and the 30th of June (0).

Maximal impact of pathogenic action on human's organism was on 28th and minimal on 13th of July. Optimal level of the weather pathogenicity was observed on 12th and 15th of July. Weather acted irritably from 1st till 10th on 11th, 15th, 19th, 31st of July. Weather action was sharp on 28th of July and optimal for the rest of the days.

Maximal influence was observed on the 15th of August (47). Weather action estimated as sharp was on the15th of August, as irritative on the12th and the 13th of August and optimal for the rest of the month.

The most pathogenic impact on human's organism in September was on the 20th day. Weather pathogenicity was sharp on 18th, 19th, 20th, 21st, 28th, 29th and 30th of September and was irritative on 4th, 22nd, 23rd and 27th of September.

Maximal influence on human's organism was noticed on 30th of October. Weather pathogenicity was irritative on the 1st, 10th, 12th, 20th, 21st and 22nd of October. It was defined as sharp from the 4th till 9th on 23rd, 24th, from 25th till 31st of October.

Maximal impact of pathogenic action on human's organism was observed on 22nd of November. The minimal one was on 6th and 7th of November. Optimal level of pathogenicity was on 6th and 7th of November; the irritative one was on 4th and 10th on November. For the rest of the days weather pathogenicity estimated as sharp.

Maximal influence of pathogenic action on human's organism was observed on the 30th of December; the minimal one was on the 16th of December. Days with optimal or irritative level of the weather action were absent. For whole month pathogenicity was estimated as sharp.

It was established that maximal value of weather irritative action for Vinnitsya was in January of 2019 and minimal one was in August.

According to calculations based on meteorological observation data for 2019 in Vinnitsya the number of days with sharp weather pathogenetic action (J>25) amounted almost 50% (182 days). The highest values of weather pathogenetic action index are observed in winter (183-114). Repeatability of days with sharp and irritative action increases in autumn, approaching to winter, and decreases in spring closing in to summer.

***Reference*:**

1. Weather diary. Gismeteo: web-site. URL: https://www.gismeteo.ua (the date of appeal: 12.03.21)

2. Meteopost: web-site. URL:https://meteopost.com/(the date of appeal: 12.03.2021)

LEBEDEV Oleksandr, *student,*
GOLOLOBOVA Olena , *PhD(Agriculture), Assoc. Prof.*
V. N. Karazin Kharkiv National University
CHERKASHYNA Nadiya, *English Language Supervisor*

ASSESSMENT OF SOME DIAGNOSTIC INDICATORS OF SOIL WITH LONG-TERM GROWING VEGETABLES IN THE CONDITIONS OF DRIP IRRIGATION

There are 47,697 agricultural enterprises in Ukraine, of which 70.6% are farmers. The number of operating farms is 33,682 units. They cultivate 4.439 million hectares of land. In the areas that are exploited, not only field but also vegetable crops are grown: tomato, cucumber, lettuce, radish, etc. [1].

Drip irrigation is an integral part of Ukrainian agricultural production. The advantages of drip irrigation are fully manifested only in strict compliance with all requirements of the technological process of growing crops, because together with the positive effect of drip irrigation even within one field the diversity of soil properties, processes and regimes may significantly increase [2]. The main advantages and benefits of drip irrigation are:

- several times the consumption of water that enters directly into the root zone and moistens the soil only in the places of planting crops;
- the amount of weeds decreases as moisture enters in doses, and technological passages, tracks and aisles remain dry;
- the structure of the soil is preserved, its air regime is improved, the soil crust is not formed. The risk of soil flooding is eliminated, so the root system develops evenly and does not experience oxygen deficiency;
- drip device and the principle of its operation allows you to use this method in areas of different sizes, configurations and layouts;
- simple and fast installation, and also a possibility of fast recovery in case of mechanical damages;
- a well, pond, central water supply or any capacious container can be a source of water. At the same time, the minimum working pressure in tubes and tapes (to 0,5 atm) is enough to start the work.

The main disadvantages are:

- periodic clogging of droppers with salts and impurities contained in water. The water must be protected and filtered;
- from time to time there is a need to adjust the water flow of each of the drips;
- in the open ground, drip tapes and hoses (tubes) can be damaged by insects, rodents and birds - a number of measures are needed to counter this threat [2].

Proper use of drip irrigation systems ensures the highest yields with minimum water consumption per unit area. Drip irrigation systems, if they are

used properly, provide local soil moisture with the supply of irrigation water and fertilizer solutions to the root zone, where moisture is most intensively consumed by plants. Moisturizing the soil in the area of more intensive consumption of moisture by the roots and the possibility of continuous supply of plants with moisture, which eliminates the manifestation of water stress, has a positive effect on the activation of growth processes.

The basic drip irrigation system includes:

- sources of water supply, the capabilities of which are key for further calculations and design;
- main, distribution pipelines - their capacity is taken into account when calculating the maximum possible number of drips operating simultaneously and, as a consequence, the area of the irrigated area;
- irrigation pipes and tapes, connected to the main pipe and placed directly on the beds;
- droppers - the design takes into account distance between the droppers and their performance per hour;
- pressure filters and reducers, connectors, fittings, taps, plugs, starters - in other words, connecting and shut-off fittings needed to create a branched drip irrigation system. If drip irrigation is used to apply easily soluble fertilizers in the form of liquid fertilizer, it is additionally equipped with injectors [1].

The aim of the work is to evaluate some diagnostic indicators of irrigated soils of Zaporizhzhia region during long-term cultivation of vegetable products.

A representative plot of 50 m2 was laid out on the territory of a private estate in the town of Kamyanka-Dniprovska. The territory of the homestead is 490 m2, on which tomatoes, radishes, cucumbers and sweet peppers have been grown for 15 years. During this time, vegetables were grown using drip splicing and fertigation. Mineral fertilizers were also applied to the main tillage. Organic fertilizers were applied once every three years at a dose of 30 t / ha also under the main tillage.

The results of determining the density of the soil in three repetitions are given in table 1.

Table 1

Diagnostic indicators of soil at long cultivation of vegetables

Repetition	Soil density (D), g / cm3	Mark	pH is aqueous	Mark
I	1,04	0	7,95	2
II	1,07	0	7,55	0
III	0,90	0	7,76	0
Average value	1,0	0	7,75	0

The obtained values of diagnostic soil indicators were evaluated according

to the methodological recommendations for the survey of the ecological and reclamation condition of lands under drip irrigation [2]. Soil density corresponds to a value of 1.0 g / cm3, which is the optimal value of this indicator and reflects good soil conditions. According to the assessment of the land condition in terms of acidity, the soils are slightly alkaline, corresponding to good conditions of the soil.

According to the ecological and reclamation assessment of the condition of lands according to these indicators, we note the proper condition of soil, both in terms of acidity and soil density. Soil degradation is not observed according to these indicators.

References:

1. Agro-Smart - agrarian portal of Ukraine [Electronic resource] // "Agro-portal". - 2021. Mode of access to the resource: https://agro-smart.com.ua/news/fermerskikh-khozyaystv-v-ukraine-bolee-33-tysyach.

2. Recommendations for the survey of ecological and reclamation of lands under drip irrigation. Kharkiv: NNTSIGA named after ON Sokolovsky, 2012. 20 p.

RUDENKO Daria, *student*
V. N. Karazin Kharkiv National University
RYCHAK Natalia, *PhD(Geography), Assoc. Prof.*
CHERKASHYNA Nadiya, *English Language Supervisor*

MAIN TRENDS IN CHANGING CHEMICAL COMPOSITION OF THE RIVER PSEL

Abstract. The article considers main trends in changing water chemical composition in the river Psel. Changes in water runoff, mineralization, nitrate, phosphate, HSC, chloride, iron content are important for the present-day environmental situation in the area. These elements and their compounds exceed the recommended environmental standards and may lead to environmental risks in the aquatic ecosystem.

Keywords: Pselriver, river runoff, river water mineralization, nitrates, phosphates, chlorides.

The Psel River adorns the left bank of Ukraine. This is a tributary of the Dnipro River of the first order, which originates in the Middle Upland (Russia), most of the basin is located within Sumy and Poltava regions, which causes a significant impact of a powerful economic complex on its ecological status. The valley of the river in its upper reaches is narrow and strongly dissected, has considerable depth and steep slopes. After the city of Sumy, the river acquires full-fledged features of the plain - a wide (up to 15 km) valley is formed, the flow velocity is reduced to 2 km/h.

At a low slope, the river flows, forming meanders, which helps to retain pollution that comes from the city of Sumy in the water and bottom sediments and worsens its ecological condition.

As one of the main water sources for the city of Sumy, the river is the object of thorough hydrological and environmental research. For example, in 2017, UAH 390,000 was allocated from the Environmental Protection Fund to survey the river. Today the issue of the ecological condition of the river within the Sumy region and, in particular, within the city of Sumy is extremely important. According to the preliminary results of research by local hydrologists and ecologists, the Psel River needs «urgent cleaning», but first of all, research on the state of its pollution and siltation [1, 2].

Within the city of Sumy in 2018 in the waters of the river there is a deterioration of its ecological condition. According to the materials of the laboratory service of the State Ecological Inspectorate, there is an increased content of nitrite ions - 0.4 mg /dm^3 (MPC for footwear - 0.08 mg/dm^3), which indicates persistent pollution and poor cleaning in the aeration tanks of urban treatment facilities; increased content of mineral phosphorus - 0.78 mg/dm^3 (MPC - 0.7 mg/dm^3). The increased content of HSC was recorded in comparison with August 2018 2 times (from 21.0 mg/dm^3 to 49.6 mg /dm^3) [2].

Thorough research of the river Psel was conducted by Pylypyuk V. V. [4]. His work shows a significant increase in the mineralization of the water of the Psel River - from close to natural 441 mg/dm^3 (1937 - 1953) to 564 mg/dm^3 during the years of intensive anthropogenic activity (1961 - 1983) and to indicators within 600-1000 mg /dm (in 1994 - 2004). That is, there is a transition from fresh water to water with high mineralization. And according to the results of our research on water quality indicators, calculated according to the method of determining the water pollution index (WPI) of Pylypyuk. V. concluded that along the entire length of the river Psel to Sumy water is «polluted» and «moderately polluted», and below Sumy after the receipt of treated water from the complex of biological treatment of urban wastewater becomes «moderately polluted», in the effect of water dilution .

In general, there is a tendency to deteriorate water quality in the river. This conclusion can be reached taking into account the results of research conducted by V. G. Smirnova [3], who found that for many years (1927-1940, 1950-2008) there had been a reduction in water flow in the river. The maximum water loss is observed in the spring, the minimum - in the winter. During the observation period. The average water consumption is 54.9 m^3/s, the highest - 1100 m^3/s, the lowest - 0.80 m^3/s [3].

According to the results of our study (2019-2020), the water quality in the Psel River continues to deteriorate. The results of SUMYKHIMPROM wastewater studies entering the Psel River (after treatment) indicate that the maximum concentration limits for nitrates, chlorides and iron have been exceeded. We believe that the reasons for these excesses are the activities of the following departments: granular superphosphate for the production of mineral fertilizers; department of complex mineral fertilizers; department of iron-oxide pigments. We calculated and established a slight depletion of the Psel River (as a result of water abstraction of PJSC «SUMYKHIMPROM») and the basin by calculating the integrated pollution index (CEPI) with a three-stage classification of water, the Psel River is "slightly polluted".

In conclusion, we would like to note the growing trend of deteriorating water quality in the Psel River, which is exacerbated by a number of related hydrological and hydrochemical causes (close groundwater, wetlands in the riverbed, etc.) and most importantly - anthropogenic factors, including the company, which belongs to the highest category of ecological danger - PJSC «SUMYKHIMPROM». Along with intensive agricultural production in the surrounding area, which allows chemicals to enter the water through surface leaching, this increases the risks and, in general, reduces the self-purification of the waters of the Psel River.

References:

1. The Psel River within the Sumy region needs urgent cleaning. Retrieved from: https://www.ukrinform.ua/rubric-regions/2536475-ricka-psel-na-sumsini-potrebue-terminovogo-ocisenna.html
2. On the pollution of the river Psel. Retrieved from: https://sumyvodres.davr.gov.ua/pro-zabrudnennya-richky-psel/
3. Smirnova V. G. Convolutions of the Psel riverbed and their deformation. Hydrology, hydrochemistry and hydroecology. Vol.2 (37), 2015. p. 74-80.
4. Pylypyuk V. V. Hydrological and hydrochemical characteristics and water quality of the rivers Psel and Vorskla: dissertation. Sciences 11.00.07 «Hydrology of land, water resources and hydrochemistry» Odessa, 2016. 170 p.

ECOLOGICAL CONSEQUENCES OF THE CHORNOBYL CATASTROPHE

MANUKYAN Martin, *student*
LOBACH Polina, *student*
V. N. Karazin Kharkiv National University
KOCHANOV Edyard, *PhD (Military)*
CHERKASHYNA Nadiya, *English Language Supervisor*

ECOLOGICAL CATASTROPHE AT THE CHORNOBYL NPP AND ITS CONSEQUENCES (SCIENTIFIC, POLITICAL AND ECONOMIC POINT OF VIEW

Abstract. The scale of the Chernobyl disaster, the worst man-made disaster in human history, is well- known to both scientists and politicians around the world. The environment turned out to be about 3% of radionuclides, which at the time of the accident were accumulated at the fourth power unit of Chernobyl. The accident caused pollution of more than 145 thousand km2 of the territory of Ukraine [1].

Keywords: Chernobyl accident, exclusion zone, radiation levels.

1. Accident

The accident occurred at approximately 1:24 a.m. on April 26, 1986 at Unit 4 of the Chernobyl NPP. An explosion occurred, completely destroying the reactor. The building of the power unit partially collapsed, killing 2 people - the operator of Main Circulation Pump Valery Khodemchuk, and the employee of the commissioning enterprise Vladimir Shashenok.

A fire broke out in the premises and on the roof. Subsequently, the remnants of the core melted. A mixture of molten metal, sand, concrete and fuel particles spread over the reactor premises [2].

2. Causes

The causes of the accident were first formulated by the Government Commission to Investigate the Causes of the Chernobyl Accident and Eliminate Its Consequences. The Commission noted that the reactor emergency protection system did not perform its functions and the accident occurred due to reactor deficiencies, including:

- presence of a positive vapor reactivity coefficient;
- manifestation of a positive total power reactivity coefficient, which should be negative in all normal and emergency modes;
- unsatisfactory design of the rods of the control and protection system of the reactor, which introduced positive reactivity during their initial movement to the core;

– absence in the design of the reactor installation of a device that shows the value of the operational margin of reactivity and warns of approaching the dangerous limit [3].

3. The current situation in the area.

The values of radiation levels in the Chornobyl zone range from normal background values to elevated ones (see Fig. 1-3).

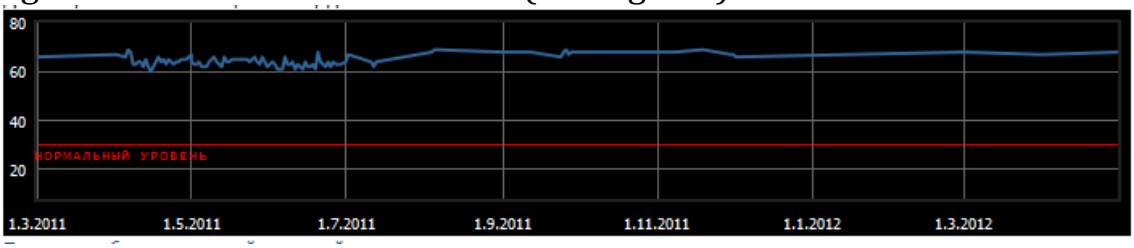


Fig. 1 – Chernobyl NPP, the sensor is located on the Chernobyl industrial site

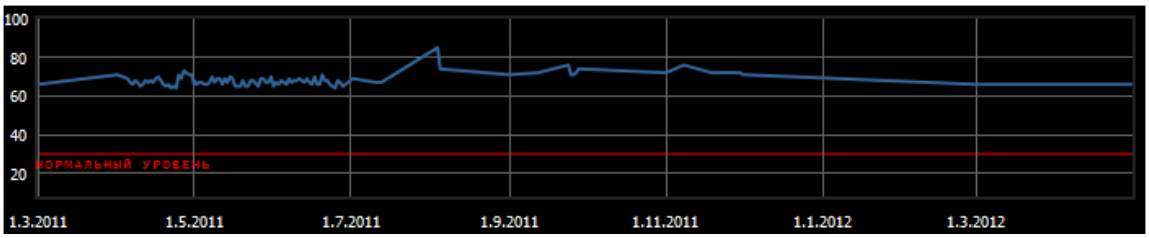


Fig. 2 – Pripyat, the sensor is located at the city checkpoint

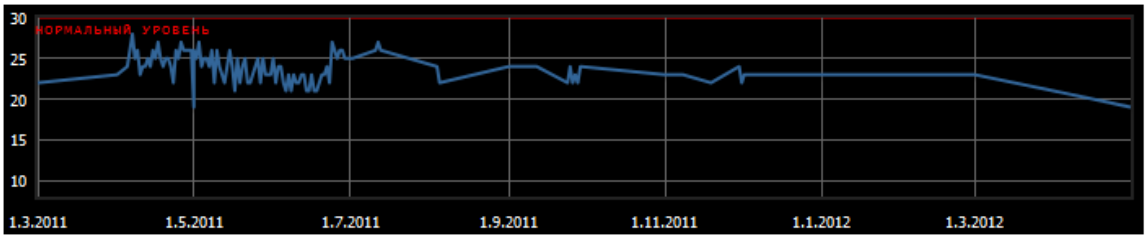


Fig. 3 – Chernobyl, the sensor is located on the territory of one of the enterprises of the city

As we can see, all sensors show levels of radiation pollution that are far from normal, and you can also notice that over time the values either remain in their range or move towards deterioration. Naturally, this is not very beneficial for the people living here.

The demographic situation of the exclusion zone is due to the activities carried out in this area. By gender, men predominate among the population – 77 %. The structure of the personnel of the exclusion zone indicates the predominance of engineering and technical personnel – 35 %. The number of staff working in the field of public catering is about 8%, employees of the medical and sanitary unit – 3 %, and the personnel of the State Fire Service is about 4 %. The main population of the exclusion zone are employees of enterprises. Access to the exclusion zone is permitted with permits and is restricted by personnel performing ChNPP decommissioning works at

radwaste management facilities, or liquidation of consequences of the Chernobyl accident.

In general, about 13000 people work in the exclusion zone. From them: ChNPP staff - 3689 people; contract and seconded personnel of the Chernobyl NPP - 4884 people; staff of enterprises subordinated to the Ministry of Emergencies - 3163 people; staff of enterprises of other ministries of the exclusion zone - 1657 people. Operational personnel generally live in Slavutych, built 53 km northeast of Chernobyl [3].

Nevertheless, a significant number of evacuees returned to their homes after the 1986 resettlement. According to various sources, the total population that returned to the exclusion zone in 1986 is about 1,200 people (out of one hundred thousand evacuees). As of the beginning of 2007, their number is 314 people. «Samosely» do not live compactly in one village or city, but settled in 11 settlements of the exclusion zone.

«Samosely» (or as these people are also called - self-settlers) are elderly people. The average age of a «self-settled» is 63 years. The main reason for the reduction in the number of «self-settlers» in the Chernobyl zone is their old age. At the moment, «self-settlers» live in the settlements: Zalissia, Illintsi, Kupavate, Ladyzhychi, Novosilky, Novy Shepelychi, Otashiv, Paryshiv, Chornobyl, Teremtsiv and Rudnya-Illinetska, which is presented in the map below (Fig. 4).

Fig. 4 - Map of the location of settlements where «self-settlers» live

The main source of livelihood of these people is homesteading, as well as picking mushrooms, berries, fishing, and sometimes hunting. "Self-settlers" sometimes help the enterprises of the Chornobyl Exclusion Zone. Perform building repairs, transportation services, medical examination and treatment. Also State specialized research and production enterprise «Ecocenter» carries

out control of foodstuff which grow «self-settled» on the personal private plots [4].

The consequences of the Chernobyl accident will continue for many centuries for two reasons. First, disorders in the human body under the influence of radiation are often hereditary, genetic in nature. Secondly, the period of decay of radioactive fuel residues is a matter of decades. At the same time, it is not yet possible to clear contaminated areas with available technologies.

References:

1. Skalozubov, V., Oborskiy, G., Kozlov, I., Vashchenko V. and other. A set of methods for re-evaluating the safety of nuclear energy in Ukraine, taking into account the lessons of environmental disasters in Chernobyl and Fukushima. Odessa: Astoprint, 2013. 244 p.

2. Ukraine celebrates the 34th anniversary of the accident at the Chernobyl nuclear power plant. Svidok.info: web site. URL: https://svidok.info/uk/evidence/40631 (date of applicate: 02.03.2021).

3. Twenty-five years since the Chernobyl disaster. Security of the future : National report of Ukraine / edit. Baloga V., Kholosha V., Evdin O. and other. Ministry of Emergencies Of Ukraine. K.: KIM, 2011. 356 c

4. Self-settlers – residents of the exclusion zone. Chernobyl, Pripyat,Chernobyl NPP and exclusion zone: web site. URL: http://chornobyl.in.ua/samosel.html (date of applicate: 05.03.2021)

PROTASOVA Olena, *student*
V. N. Karazin Kharkiv National University
GOLOLOBOVA Olena, *PhD(Agriculture), Assoc. Prof.*
CHERKASHYNA Nadiya, *English Language Supervisor*

REACTIVITY INITIATED EVENT

Abstract. The publication presents the results of studies of "reactivity-initiated" research at the Chernobyl NPP, i.e. the reasons for the increase in reactor speed that caused the global accident.

Key words: Chernobyl, reactor, RBMK, neutrons, reactivity, rods.

The Chernobyl accident was a so- called “reactivity initiated event”, which means that the control over the reactor power was lost, and that the power output of the reactor increased tremendously in a short time period. The power control of a reactor is a complex issue, and even more so in case of an RBMK reactor. There are a number of factors to consider:

The source of power in the RBMK nuclear reactor stems from the uranium-235 in the fuel pellets, which, during operation, is hit by neutrons inducing fission, a process during which thermal energy and further neutrons are generated for further fissions (chain reaction). Those neutrons however, before being able to induce further fissions, must be slowed down (moderated). Unlike light water reactors (which use water for moderation of neutrons), the RBMK reactor uses the graphite block surrounding the fuel channels as moderator (the black tiles in Figure 3). The graphite offers the advantage that a fraction of uranium 235 between 1% and 2% in the fuel is sufficient, while water-moderated reactors need a fraction between 3% and 5%. However, light water reactors have the advantage that the coolant is also the moderator at the same time. If a light water reactor loses its coolant (i.e., a pipeline breaks, the cooling water is lost and the reactor runs dry), the chain reaction collapses and the reactor power is sharply reduced. The RBMK reactor in such a situation has to rely on its neutron absorber rods (control rods), which control the power and have to be inserted into the core.

The power of a reactor is proportional to the number of neutrons, which are

generated in the chain reaction. An important parameter is therefore the so called “reactivity”, a measure of how the generation of neutrons is changing. Positive reactivity means more neutrons are going to be generated and the power will increase. Negative reactivity means that less neutrons are going to be generated and the power will decrease. In principle, the following factors had an impact on the reactivity in the RMBK reactor core:

- Graphite as moderator and its temperature
- Temperature of the fuel elements

- Enrichment and burn-of of the fuel elements
- Presence of xenon in the reactor core
- The temperature and density of the cooling water when entering the reactor and

steam fraction (void fraction) in the cooling channels

- The control rods of the reactor and their positioning.

The Chernobyl accident was a so - called reactivity initiated event, an event in which the reactivity (and the power) increased in an uncontrolled way. All factors mentioned above played a role in the accident, but the last two bullet points were of special importance for the Chernobyl accident.

References:

1. Reinhard Haas, Lutz Mez, Amela Ajanovic.: The Technological and Economic Future of Nuclear Power. 2019.

REVIEW OF ENVIRONMENTAL NEWS OF THE WORLD

KORNEYKO Victoria, *student,*
V. N. Karazin Kharkiv National University
CHERKASHYNA Nadiya, *English Language Supervisor*

CHANGES IN THE NATURAL ENVIRONMENT IN CONNECTION WITH THE COVID-19 PANDEMIC

Abstract. The publication examines the impact of the Covid-19 pandemic on the environment. The pandemic has both a negative impact on the environment, due to an increase in the amount of waste, and a positive one, which is associated with a decrease in emissions into the atmosphere, due to lockdown around the world.

Key words: pandemic, Covid-19, environment, emission, waste.

With the introduction of the quarantine, the cessation of production and transport in some countries, the air is becoming much cleaner, and there is news in the media that wild animals are returning to cities. However, changes in our way of life and consumption do not have such a clear impact on the environment. Restrictions on the use of disposable plastic are being lifted, and in some cities reusable bags and cups are even banned [1].

Beginning in early 2020, the whole world gradually began to introduce quarantine in different countries, depending on the incidence, when partial restrictions did not allow to curb the pandemic, which affected more and more people every day, began to introduce lockdown. The term lockdown means an urgent protocol of action and a system of restrictive measures introduced to curb the spread of the disease.

A speech by Antonio Guterres, UN Secretary-General at Columbia University, said that: 2020 would be one of the three warmest years in history, even with the cooling effect of Hurricane La Niña, and the last decade has been the warmest in human history. Reached a record high, and 80 % of its space affected by extreme heat. In the Arctic in 2020, absolutely high temperatures were recorded, more than 3 degrees Celsius above average, and in northern Siberia - more than 5 degrees, october of this year brought a decrease in the area of Arctic ice decreased to a record value, and now its recovery is underway at the lowest possible rate. In the long run, the melting of Greenland ice continues, losing an average of 278 gigatons per year, emitting methane, a powerful greenhouse gas. Apocalyptic fires and floods, cyclones and hurricanes are increasingly becoming the new norm. Last year, such disasters cost the world 150 billion USA [2].

In fact, there is a local reduction in emissions of pollutants into the air. This can be seen from data obtained from space satellites of NASA and the European Space Agency. In China, for example, as a result of strict quarantine, the concentration of NO_2 pollutants in the air has fallen by 37 % and greenhouse gases such as CO_2 by 25 %. As Chinese industry is responsible for

a large share of global pollution, such a reduction is felt worldwide. Experts say this is the fastest emission reduction they have seen.

A similar situation with regard to NO_2 is observed in northern Italy, as well as in the Spanish cities of Madrid and Barcelona. These are places where the so-called lockdown has been introduced: closed enterprises, no transport, people are ordered to stay at home. If such measures are introduced in Kyiv, we will also be able to notice these phenomena.

In addition, emissions at the global level have decreased due to restrictions on passenger flights. It is also essential for air purification.

The lockdown period brought about changes in the amount of waste. The situation with waste during a pandemic is somewhat different from the situation in the pre-quarantine period. Yes, waste in the city center decreased by 60 % due to the closure of restaurants and other private institutions, but in residential areas increased by 30 %. Studies have shown that such figures are due to quarantine restrictions that oblige people to stay at home. In particular, there has been an increase in plastic containers, as the Ministry of Health has ordered the issuance of orders (products) only in disposable containers and sealed containers. In addition, the use of disposable gloves and masks has increased [3].

Given these facts, it can be argued that the Kovid-19 pandemic has brought no less changes to the environment than to society; however, it is necessary to look for positive aspects.

Reference:

1. Does the coronavirus save us from global warming? How quarantine and the environment are related. *The-village:* web-site.URL: https://www.the-village.com.ua/village/city/eco/295669-yak-koronavirus-vplivae-na-ekologiyu (date of application 12.03.2021)

2. «State of Planet» Secretary-General's address at Columbia University. *Unitied nations Ukraine*: web-site.URL: https://ukraine.un.org/uk/103987-ctan-planeti-zvernennya-generalnogo-sekretarya-oon (date of application 12.03.2021)

3. Garbage and pandemic: how the amount of household waste has changed during quarantine. *See-info*: web-site.URL: https://dyvys.info/2020/10/16/smittya-i-pandemiya-yak-zminylasya-kilkist-pobutovyh-vidhodiv-pid-chas-karantynu/ (date of application 12.03.2021)

NAIDIUK Danilo, *student*
V. N. Karazin Kharkiv National Universit
CHERKASHYNA Nadiya*, English Language Supervisor*

MOUNTAIN BIODIVERSITY IN BRAZIL

Abstract. The high species richness and diversity found in tropical mountain habitats are often related to: 1) an effect of climatic and geological history on biotic evolution; 2) various environmental impacts on species adaptation mechanisms; and 3) the continuous dispersal of fauna and flora in time. However, little is known about how these factors shaped species richness in Brazilian mountains. Official documents on biodiversity in Brazil make no explicit reference to mountains, even though there is a mountain work programme of the Convention on Biological Diversity, which Brazil is a signatory of. This paper discusses the importance of mountain ecosystems in Brazil to show the urgent need to include mountain biodiversity in the national agenda of biodiversity research and conservation.

Key words: mountains, program, biological, ecosystems, vegetation.

According to the Convention on Biological Diversity, mountains are characterized by special abiotic, biotic, social, cultural, economic and spiritual values. The mountains combine physical and biological characteristics: elevation, high or sloping terrain, a varied climate, a relatively high composition of endemic and local species, as well as a degree of vulnerability and remoteness. Mountain ecosystems are found in all climatic zones of the globe. The mountains are very diverse in topographic and geological terms, which is the causal factor for their high biological diversity. In isolated mountains, biodiversity is similar to uninhabited islands.

Mountain vegetation is comparable to oceanic islands. The main threats to the existence of mountain environments, namely in the neotropics are: the sensitivity of soils to anthropogenic activity, the promotion of erosion and instability; removal of buffer vegetation in the surrounding areas, which contributes to impermeability, fire and burning; intensive removal of attractive species of flora, which are often endemic or rare; mining (granite, gneiss, sandstone); expansion of cities.

An example of the development of agriculture in mountainous areas is the cultivation of coffee in some areas of the state of Espirito Santo at an altitude of up to 1200 meters above sea level.

Due to the already existing evidence of the impact on the Brazilian mountains, as well as the lack of knowledge about ecosystems in the mountains, it is necessary to urgently develop a national program aimed at understanding and protecting their complexity and functioning.

The National Mountain Biodiversity Program can integrate and stimulate the ongoing efforts of institutions and scientists to improve the mountain ecosystems of the Brazilian Mountains.

References:

1. Rio de Janeiro Botanical Garden Research Institute, Rua Pacheco Leão. Retrieved from: https://www.scielo.br/scielo.php?pid=s0100-84042007000400005&script=sci_arttext.

POHORILA Mariia, *student*
KHORONKO Yanina, *student*
V. N. Karazin Kharkiv National University
CHERKASHYNA Nadiya, *English Language Supervisor*

THE IMPACT OF CORONAVIRUS ON HEALTH AT PRESENT AND IN FUTURE

Abstract. The global coronavirus pandemic has introduced a lockdown worldwide, calling for an end to all anthropogenic activity, which has led to significant changes in the state of the environment.

Possible homologous recombinations between viruses in a single cell were investigated in order to predict which mammalian species (including wild and domestic animals) could host new strains of coronaviruses.

Key words: coronaviruses, mammals, associations, disease, pandemic, air, environment, anthropogenic activity, motor transport, air temperature.

The global pandemic emerging from a novel strain of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2; COVID-19) has ravaged the world in 2020. This infectious disease has shown to have a significant effect on mortality especially in vulnerable groups such as the elderly, those with cardiovascular disease, diabetes, respiratory diseases and cancer. On the 23 March 2020, the United Kingdom (UK) government imposed a country-wide lockdown, closing businesses and urging people to stay at home.

The generation and emergence of three novel respiratory coronaviruses from mammalian reservoirs into human populations in the last 20 years, including one which has achieved pandemic status, suggests that one of the most pressing current research questions is: in which reservoirs could the next novel coronaviruses be generated and emerge from in future?

A method for predicting associations between coronaviruses and their mammalian hosts identified a total of 126 non-human species with SARSCoV-2.

The most prominent result for a SARS-CoV-2 recombination host is the domestic pig (Sus scrofa), having the most predicted associations of all included non-human mammals additional coronaviruses. The pig is a major known mammalian coronavirus host, harbouring both a large number (26) of observed coronaviruses, as well as a wide diversity.

The pandemic also had a significant impact on the environment. To study the effects of blocking for all countries, simple statistics are created from all sensor data. These data are taken from all stations at agreed intervals 100 days after blocking. Using the same period (listening to a high year), we compare the blocking period with the previous 7 years.

As a result anthropogenic movements, motor vehicle usage radically decreased. The UK Department for Transport reported on the day of lockdown there had already been a reduction in motor vehicle transport to 69% of normal and in the following days, this reached a low of 23% (13 April 2020) before

steadily increasing back to 77% 100 days after the lockdown (30 June 2020). During these 100 days, motor vehicle usage was reduced on average to 52% of normal. In several studies carried out in different countries, its usage drastically decreased the amounts of nitrogen oxides and particulate matter, generally having a positive effect on air.

It is evident that the reduction in motor vehicles and anthropogenic movement had a substantial impact on air quality. However, it is of worthy consideration that, from the 7-year period, 2020 showed the highest temperatures and lower RH values (Fig. 2). From the cumulative distribution functions, it is notorious that, during the first 100 days of lockdown, there have been greater occurrences of higher temperature and lower relative humidity events. On average, during this period, the UK has been 1 °C hotter with ~ 4% less relative humidity (in comparison with the 7-year average).

Reference:

1. Higham, J., Ramírez, C.A., Green, M. et al. UK COVID-19 lockdown: 100 days of air pollution reduction?. *Air Qual Atmos Health* 2021. 14, 325–332. URL: https://link.springer.com/article/10.1007/s11869-020-00937-0

2. Maya Wardeh, Matthew Baylis, Marcus S. C. Blagrove. Predicting mammalian hosts in which novel coronaviruses can be generated. *Nature Communications*, 2021. Vol. 12, № 780. P. 1–12. URL: https://www.nature.com/articles/s41467-021-21034-5

MAKARENKO Uliana
Ukraine, Kriviy Rih, 10B Form School 71,

"EcoTRIP" MOBILE APPLICATION

With the significant technology growth and permanent evolution development people are becoming more adaptive and mature. But everything has its price: while running towards new opportunities men often sacrifice our environmental eco-system. Most inventions have a bad influence on an ecological healthy condition of our planet and adverse consequences may turn to inevitable disasters. Fortunately, it is clear that humanity has to save its own habitat and many measures have already been taken. With the growth of demand on higher levels of life, the eco-conscious awareness raises as well. Nevertheless, there are not enough online adopted programs which allows user to be engaged and informed remotely. By being impressed and involved in eco-saving movement, we gave birth to a new-how of spreading eco-free life.

"EcoTrip" mobile application is a useful tool which allows users all needed data about nearby environmental saving and ecological – free establishments: eco-markets, collection points, electric car charging stations, electric car rental stations, parks and reservations. Besides nearby needed eco-locations, this application has an uploaded map which allows an accurate route planning from the current location to the destination point. Moreover, a variety of useful tips, extra statistics data, advice and donation funds will be presented at this app as a part of a main concept for informational purposes. As a main benefit, downloaded organizations and establishments will provide a number of special unique offers and sales exclusively for "EcoTrip" application consumers but only for those who obtained a paid version of the app. The acquisition cost of the app will be 6$ per month after 3-month free trial period. We consider this app to be a valuable tool of implementing and promoting green strategies into modern peoples' lives through internet platforms, that perform not only as a helpful way to ease your adventure and find needed eco-organizations with individual profits but also to induct eco-consciousness on a new level. "EcoTrip" application has no straight competitors at the market so it may be deservedly called a unique and new idea. Its versatility gives this application bright perspectives of becoming a world-known and making ecological-approving way of life a mainstream.

Наукове видання

«Ecology is a priority»

Збірник тез доповідей

Англійською мовою

Відповідальний за випуск МАКСИМЕНКО Надія
Комп’ютерне верстання ГРЕЧКО Аліна

61022, Харків, майдан Свободи, 6,
Харківський національний університет імені В. Н. Каразіна