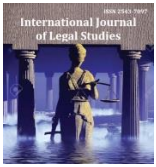

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ZALEŻNOŚĆ JAKOŚCI POWIETRZA ATMOSFERYCZNEGO UKRAINY OD LICZBY TERENÓW ZIELONYCH. ROZWIĄZANIA PRAWNE I EKOLOGICZNE

THE DEPENDENCE OF QUALITY THE ATMOSPHERIC AIR OF UKRAINE ON THE NUMBER OF GREEN SPACES. LEGAL AND ECOLOGICAL SOLUTIONS

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Streszczenie
W artykule rozważono prawo każdego obywatela do bezpiecznego środowiska życia oraz zdrowia. Konstytucja Ukrainy gwarantuje prawo każdego do bezpiecznego środowiska życia i zdrowia oraz do odszkodowania za szkody spowodowane naruszeniem tego prawa. Prawo to poprzedza obowiązek państwa do zapewnienia bezpieczeństwa ekologicznego i zachowania równowagi ekologicznej na terytorium Ukrainy, zgodnie z art. 16 Konstytucji Ukrainy. Celem niniejszego artykułu jest przedstawienie aktualnych badań autorów dotyczących przestrzegania Konstytucji Ukrainy w odniesieniu do ochrony dóbr naturalnych terenów na Ukrainie.
Słowa kluczowe: Konstytucja Ukrainy, bezpieczne środowisko życia i zdrowia, bezpieczeństwo ekologiczne, powietrze atmosferyczne, tereny zielone, najmniejsze kwadraty zwyczajne

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Abstract
The article considers the right of everyone to a safe environment for life and health. The right of everyone to a safe environment for life and health and to the compensation for the damage caused by the violation of this right. This right is preceded by the duty of the state to ensure environmental safety and maintain environmental balance on the territory of Ukraine, as stipulated in article 16 of the Constitution of Ukraine. The purpose of this article is to present current research of authors regarding the observance of the Constitution of Ukraine with regard to the protection of natural assets in Ukraine.
Keywords: Constitution of Ukraine , a safe environment for life and health, the environmental safety, the atmospheric air, the green spaces, the Ordinary Least Squares

Introduction

Health and quality of life entirely depends on the state of the environment. The current level of the civilization has led to the understanding that this wealth presented to us cannot be treated only from the point of view of the consumer approach. At the moment nature is in great need of our careful attitude to it and help and the solution of this problem does not depend on each individual, and should be considered at the level of States and even their associations.

Article 50 of the Constitution of Ukraine (KonstytutsiiaUkrainy) proclaims the right of everyone to a safe environment for life and health and to the compensation for the damage caused by the violation of this right. This right is preceded by the duty of the state to ensure environmental safety and maintain environmental balance on the territory of Ukraine, as stipulated in article 16 of the Constitution of Ukraine. The definition of the concept of "environmental safety" is enshrined in article 50 of the Law of Ukraine "On environmental protection" (Pro okhoronunavkolyshnohopryrodnohoseredovyshcha), according to which environmental safety is a state of the environment, which provides for the prevention of environmental worsening and the threat to human health. There in article 5 it is stated that the objects of juridical protection of the environment are as follows: the environment as a set of natural and natural and social conditions and processes, natural resources, as involved in eco-

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nomic circulation, and unused in the economy in the current period (land, deposits, water, air, forest and other vegetation, wildlife), landscapes and other natural complexes. And article 20^2 legislates control in the field of environmental protection, rational use, reproduction and protection of natural resources, and it separatelydetermined, including the protection of atmospheric air; protection, defense, use and reproduction of forests; protection, maintenance and use of green spaces; use, protection and reproduction of flora.

The basic in system of environmental rights is the right to a safe for life and health environment. This right means, first of all, the possibility to live in such an environment that does not cause harm to health, as well as the opportunity to enjoy natural benefits (breathe clean air, drink clean water, etc.) (Pro zabezpechenniasanitarnoho ta epidemichnohoblahopoluchchianaselennia). Article 1 of the Law of Ukraine "On ensuring sanitary and epidemiological welfare of the population" defines the concept of "safe conditions for a person": this is the state of the environment, in which there is no danger of harmful effects of its factors on a person. With regard to the environment, its state, is considered safe when it does not affect negatively human health and the processes of functioning of living organisms, in which the presence of chemical, physical, biological and other elements, do not violate the natural balance of communication human and environmental, do not exceed the safety standards established by the legislation.

Thus, the right to a safe environment for life and health is a legal and guaranteed by the state possibility of the subject to live in an environment that does not cause harm to health, to use for safe natural benefits satisfaction of their vital physical and spiritual needs, to demand from the state, as well as from other individuals and legal entities, to meet the requirements of environmental safety, and in case of their violation to apply to the competent authorities for protection of the violated right.

However, in spite of this, one of the most pressing issues today is the deterioration of forest plantations in Ukraine. The decrease of the Ukrainian forest area and the cutting down of the oldest forests are evidenced by the images from space (Inter-

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aktyvnakartavyrubok). According to these pictures, you can see that in some areas forests are becoming more, but in most cases, their area is significantly reduced. And if you do not take measures to restore forest cover and expand their areas, Ukraine may be facing an environmental disaster. Loss of forests is not just a loss of green land, it is also a serious climate change, changes in river levels, activation of erosion processes. It is important to realize that the forest is not just a set of trees, but a complex ecosystem that unites plants, animals, mushrooms, microorganisms and affects the climate, the state of drinking water, air purity and is the "lungs" of the planet Earth.

Student of Kharkiv specialized school №80 Lemekhova Alona in the framework of the Ukrainian competition-protection of research works of students-members of the Small Academy of Sciences of Ukraine decided to investigate the dependence of quality the atmospheric air of Ukraine on the number of green spaces by mathematical methods. It is a known fact that as forest plantations decrease, the state of atmospheric air deteriorates, which leads to an increase in the number of diseases and deaths of people, it would seem that large-scale deforestation would have to stop. Unfortunately, we can see a completely different trend. So according to the information and analytical portal Info-light (Info-Light) only in Ukraine in 2016 the area of cut down forests amounted to almost 1,900 hectares.

For the mathematical processing of the results of the study, theOrdinary Least Squares (OLS) was applied. According to the Main statistics Department in Kiev (2016) (MaterialyiGlavnogoUpravleniyastatistiki) we have the following values:

Table 1.

Years	**2007**	**2008**	**2009**	**2010**	**2011**
Area forests of Ukraine, million ha, x_i	9,53	9,48	9,43	9,37	9,31
Emissions of pollutants, million tons, y_i	11,3	10,6	10,4	9,7	9,8

Table continuation 1

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Years	2012	2013	2014	2015	2016
Area forests of Ukraine, million ha, x_i	9,26	9,22	9,18	9,13	9,08
Emissions of pollutants, million tons, y_i	9,8	9,2	7,9	7,0	9,14

We have composed an auxiliary table for further calculations.

Table 2.

Years	2007	2008	2009	2010	2011
x_i	9,53	9,48	9,43	9,37	9,31
y_i	11,3	10,6	10,4	9,7	9,8
x_i^2	90,82	89,87	88,92	87,8	86,68
$x_i y_i$	107,69	100,49	98,07	90,89	91,24
y_i^2	127,69	112,36	108,16	94,09	96,04

Table continuation 2

Years	2012	2013	2014	2015	2016
x_i	9,26	9,22	9,18	9,13	9,08
y_i	9,8	9,2	7,9	7,0	9,14
x_i^2	85,75	85,01	84,27	83,36	82,45
$x_i y_i$	90,75	84,82	72,52	63,91	82,99
y_i^2	96,04	84,64	62,41	49	83,54

Let us compose a system of equations that contains unknowns a and b at linear correlation

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$$\begin{cases} \sum_{i=1}^{n} y_i x_i = a\sum_{i=1}^{n} x_i^2 + b\sum_{i=1}^{n} x_i \\ \sum_{i=1}^{n} y_i = a\sum_{i=1}^{n} x_i + nb \end{cases}$$

from which we have

$$a = \frac{n\sum_{i=1}^{n} y_i x_i - \sum_{i=1}^{n} x_i \sum_{i=1}^{n} y_i}{n\sum_{i=1}^{n} x_i^2 - \sum_{i=1}^{n} x_i \sum_{i=1}^{n} x_i}$$

$$b = \frac{\sum_{i=1}^{n} x_i^2 \sum_{i=1}^{n} y_i - \sum_{i=1}^{n} x_i \sum_{i=1}^{n} y_i x_i}{n\sum_{i=1}^{n} x_i^2 - \sum_{i=1}^{n} x_i \sum_{i=1}^{n} x_i}$$

$$\sum_{i=1}^{n} x_i = 92{,}99; \quad \sum_{i=1}^{n} y_i = 94{,}84; \quad \sum_{i=1}^{n} x_i^2 = 864{,}93; \quad \sum_{i=1}^{n} y_i x_i = 883{,}37$$

$$a = \frac{10 \cdot 883{,}37 - 8819{,}17}{10 \cdot 864{,}93 - 8647{,}14} = \frac{14{,}53}{2{,}16} = 6{,}73 ;$$

$$b = \frac{864{,}93 \cdot 94{,}84 - 92{,}99 \cdot 883{,}37}{10 \cdot 864{,}93 - 8647{,}14} = -\frac{114{,}62}{2{,}16} = -53{,}1 .$$

Thus, the equation of the linear correlation between the values of X and Y will have the form: $y = 6{,}73x - 53{,}1$.

The equation of increasing straight line ($k > 0$) is obtained, but this is only because in recent years the content of pollutants in the atmospheric air of Ukraine decreases, due to the closure or transfer to part-time work of many industrial enterprises, and we are dealing with two values that decrease or increase as in Fig. 1, since the dependence from 2016 to 2007 is shown.

Let us find the sum of the deviations of the empirical data y_i and the values y :

x_i	$y_i - (6{,}73x - 53{,}1)$
9,53	0,2631
9,48	−0,1

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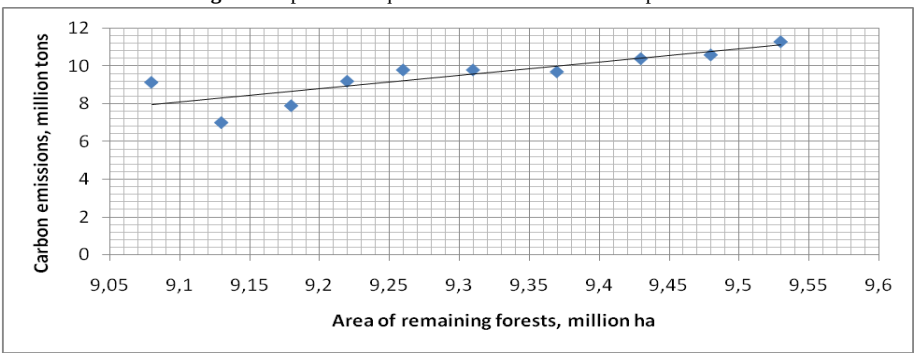
9,43	0,0361
9,37	−0,2601
9,31	0,2437
9,26	0,5802
9,22	0,2494
9,18	−0,7814
9,13	−1,3449
9,08	1,1316
∑	0,0177

The sum of deviations is a small value, so the function obtained in the course of calculations corresponds quite well to the table dependence between the variables X and Y. If you look at the location of the points along the graph of the function, you can say about a rather close correlation.

Fig. 1. Graph of the equation of linear correlation dependence



However, for a clearer answer, we find the correlation coefficient (for the measure of the linear relationship between the quantitative features in the data sample is taken the correlation coefficient, that is, the indicator of the mutual probabilistic effect of two random variables) by the formula:

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$$r = \frac{\overline{XY} - \overline{X}\,\overline{Y}}{\sigma_x \sigma_y},$$

where $\overline{XY}$ is the arithmetic mean of the product of the values of X on the corresponding values of Y, $\overline{X}$ and $\overline{Y}$ is the average signs of X and Y, σ_x, σ_y is the standard deviations of X and Y, respectively.

To find r, let us find the necessary values:

$$\overline{XY} = \frac{\sum_{i=1}^{n} y_i x_i}{n} = \frac{883{,}37}{10} = 88{,}337$$

$$\overline{X} = \frac{\sum_{i=1}^{n} x_i}{n} = \frac{92{,}99}{10} = 9{,}299$$

$$\overline{Y} = \frac{\sum_{i=1}^{n} y_i}{n} = \frac{94{,}84}{10} = 9{,}484$$

The standard deviations are found by the formulas:

$$\sigma_x = \sqrt{\overline{X^2} - \overline{X}^2}\,\sigma_y = \sqrt{\overline{Y^2} - \overline{Y}^2}$$

$$\overline{X^2} = \frac{\sum_{i=1}^{n} x_i^{\,2}}{n} = \frac{864{,}93}{10} = 86{,}493$$

$$\overline{Y^2} = \frac{\sum_{i=1}^{n} y_i^{\,2}}{n} = \frac{913{,}97}{10} = 91{,}397$$

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$$\sigma_x = \sqrt{86{,}493 - 86{,}47} = \sqrt{0{,}023}\sigma_y = \sqrt{91{,}397 - 89{,}95} = \sqrt{1{,}447}$$

$$\sigma_x \approx 0{,}152 \qquad \sigma_y \approx 1{,}203$$

$$r = \frac{88{,}337 - 9{,}299 \cdot 9{,}484}{0{,}152 \cdot 1{,}203} = \frac{88{,}337 - 88{,}192}{0{,}183} = 0{,}79 .$$

Thus, the calculated correlation coefficient $r = 0{,}79$, which indicates rather close correlation between characteristics X and Y . Are obtained using the Ordinary Least Squaresenables to learn the correlation between the decrease in the area of forest plantations and the increase of pollution of atmospheric air in Ukraine and predict if they are not introduced some measures to improve the situation, the environmental condition according to the parameters for the future.

Conclusions

As shown by the calculations carried out in the course of the study, between the area of green spaces and air pollution in Ukraine there is a fairly close linear correlation. The resulting correlation allows to predict the state of air quality, to learn its impact on human health, etc.In order to correct the situation, it becomes necessary to realize that natural wealth is not infinite. It is for sake of our full lifeon the Earth that researches related to the prediction of environmental situations and phenomena, the results of which would provide an opportunity for people to think about whether how to correct the situation that has developed, strengthening the measure of responsibility and legislative level, including.

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