Stanislav GRISHIN, Oleg SCHIPTSOV

TARGET FINANCING EFFECT ON THE ECOLOGICAL SITUATION IN LATVIA

Key words: ecology, ecological statistics of Latvia, analysis of statistics

Forests disappear from the Earth’s surface dramatically fast, about several hectares a minute. The topsoil suffers the consequences and 44 hectares per minute are damaged. The low level of the oxygen is the result of the forest area reduction. Over the last hundred years air oxygen value has reduced from 20.95% to 20.8 % and dropped to 20 % in big cities. About 20 billion tons of carbonic dioxides (CO$_2$), 300 million tons of carbon monoxide (CO), 50 million tons of nitrous oxide (N$_2$O), 150 million tons of sulfur dioxide (SO$_2$), 4-5 billion tons of hydrogen sulfide (H$_2$S), 400 million tones of dust, ashes, soot and etc are thrown out in the atmosphere every year. About 600 billion tons of industrial and domestic wastes and more then 10 million tons of petroleum and mineral oil are poured out into water annually [1]. The most serious pollution is provided by the developed countries. The highest index of carbonic dioxide atmospheric emission per person is in the 7 European countries, oil-producing countries, Australia, Brunei and Singapore. It exceeds 10 million tons per year. However, the pollution index in the countries mentioned above amounts only one third (1/3) of the pollution index in the United States of America. The pollution problem in the USA is urgent and is under consideration. Basic ecological laws accepted on federal principles have created the basis for the system where no one state can establish less rigid requirements in comparison with the national ones. The local government not only supervises the ecological norms compliance but also provides the basic service of nature protection (water supply and water purification, processing of a firm waste and recreational arrangement). Municipality’s services assume payment by the enterprises, the so-called «utilization payments». To sum up, for this activity category, they cover up to one third (and sometimes more) of all the expenses of municipalities [2].

The environmental problem is urgent in Latvia, therefore improvement of then ecological situation in the country in regions, separate cities is taking place. In fig. 1 and fig. 2 the diagrams show time shifts, the ecological index and volumes of financing of the ecological programs (the period of time equals approximately ten years) are being considered. The diagrams are constructed by the results of processing the statistical data in the collections [3].
Fig. 1. Quantity of various kinds of emissions (tones) in current of 1994-2006

In the graph is shown how the differentiated component of emissions has been changed in time from 1994 till 2006. The dependence represented in the diagram, shows that there is no tendency to lowering the nitrous oxides component NO\textsubscript{x}.

Fig. 2. Financing of the ecological programs depending on the calendar years

From fig.1 it is clear that financing volume has a tendency to increase (with growth of proportional factor in Riga). To evaluate the interaction between financing of ecological programs and the ecological situation in Latvia, it is appropriate to use the correlation analysis. The selective pair factor of correlation characterizing the narrowness of communication between sizes x and y, is defined under the formula [4]:

\[
\rho(x, y) = \frac{M[(x-\bar{M}_x)(y-\bar{M}_y)]}{\sigma_x \sigma_y},
\]  

(1)
where $M_x$ and $M_y$ are the expected values of $x$ and $y$, but $\sigma_x$ and $\sigma_y$ are their root-mean-square deviations. Using statistical data from [3] we have defined the following value of the pair correlation: $\rho(x, y) = -0.73$. As it is negative and close to -1, it means that between the ecological situation and the expenses on the ecological programs there is a close inverse relationship. Hence, with the increase of the volumes of financing, the levels of harmful substances tend steadily to decrease. The characteristic features of financing of the ecological programs in Latvia (1994-2006) is that they are directed at reducing the influence of the stationary sources of pollution, but do not assume the suppression of influence of such mobile sources of pollution as transport.

On the basis of the regression estimators, the dependence of influence of the enclosed resources (funds) on the ecological programs can be determined. For this purpose it is necessary to use an estimation of the regression equations [4]:

$$
\hat{y} = b_0 + b_1 x,
$$

where

$$
b_1 = \frac{\sum_{i=1}^{n} x_i y_i - \frac{1}{n} \sum_{i=1}^{n} x_i \sum_{i=1}^{n} y_i}{\sum_{i=1}^{n} x_i^2 - \frac{1}{n} \left( \sum_{i=1}^{n} x_i \right)^2},
$$

$$
b_0 = \frac{1}{n} \sum_{i=1}^{n} y_i - b_1 \frac{1}{n} \sum_{i=1}^{n} x_i = \bar{y} - b_1 \bar{x},
$$

where $\bar{x}$ and $\bar{y}$ are average values of random $x$ and $y$.

The result of the calculations (according to all the available statistical data) is:

$$
\hat{y} = -0.008754 + 4521.6 \cdot x
$$

From the equation (5) it is seen that with the increase of financing of the ecological programs by one thousand LVL, the level of air pollution of Latvia reduces by 4521.6 tones.

Calculating the elasticity coefficient (it is defined under the formula $e_1 = b_1 \frac{\bar{x}}{\bar{y}}$), we have received that $e_1 = -0.15$. It shows that with the financing increase at 1 % pollution level falls by 0.15%.

**CONCLUSION**

1. Ecological problem is a challenge to the mankind. Each country must solve it and serious financial support is required for its solution. This paper contains the statistical data of the ecological problem budgeting and of the harmful substance emission volume in Latvia.
2. Over the period of ten years the dynamics of influence of financing the ecological situation in Latvia has been established. Based on the Latvian ecological statistical data, sample correlation and flexibility coefficients are computed and the regression level is determined.
3. Due to the absence of the data about the transport streams influence, the given statistical data about the ecological situation in Latvia is not complete.
REFERENCES


Reviewer: dr hab. inż. Tadeusz Cisowski, prof. Wsei

Authors:
inż. Stanislav GRISHIN - Transport and Telecommunication Institute, 1 Lomonosov Street, Riga LV-1019, Latvia

Dr inż. Oleg SHCHIPTSOV - Transport and Telecommunication Institute, 1 Lomonosov Street, Riga LV-1019, Latvia