

Y.O. Kotelnikova, postgraduate student of third year study

A.V. Chugai, candidate of geographical sciences

I.I. Popovich, Lecturer of English
Odessa State Environmental University

ANALYSIS QUALITY OF CONTAMINATION OF THE ODESA AIR BASIN BY DIFFERENT METHODS

Every region is characterized by the presence of point (stationary) and diffuse (mobile) sources of air basin pollution. Progressive increase of industrial production and/or rapid growth of a number of vehicles leads to the rise of pollutants emissions in the air. The environment quality has a direct impact on the human health. That is why it is very important to keep the adequate environmental quality standards and air quality standards as well. It is of vital significance for Odesa region as it is an important resort and recreational centre of Ukraine and has to be paid a great attention to the state of the natural environment.

In this work, a series of studies of Odesa and Odesa region air basin quality have been conducted using common methods. They are: 1) calculation of the atmosphere pollution index (API), which allows to assess the pollution level of certain contaminant or to make the estimation of the background level of air pollution; or 2) a complex atmosphere pollution index (CAPI), which assesses the air pollution level formed by a large number of substances which are observed in the atmosphere of the city; 3) air fouling index (FI) is an estimation criterion of the air pollution in populated areas, which takes into account the ratio of the actual and predictable concentration of a particular substance to the value of the critically acceptable concentration of this substance, and is multiplied by 100 %; 4) anthropogenic load module (ALM), which is calculated by the sum of all types (solid, liquid and gaseous) of weighted wastes from industrial, agricultural and domestic facilities during 1 year divided by the district or region area where these facilities are located (t/km per year).

Calculating API and CAPI observational data from 8 air quality observation stations during 1995-2009 were used. Such data during 2001-2002 were not used because they are absent. The main air pollutants, which were observed in the study are: dust, sulfur dioxide, nitrogen dioxide, carbon oxide and such particular as: phenol, soot, fluoride hydrogen and formaldehyde. The analysis of the results showed that the API of the main and particular pollutants exceed the sanitary and hygienic standards of air pollution. The maximum values of the API are observed for such substances such as dust, nitrogen dioxide, phenol and formaldehyde and they can be a result of the increasing emission growth from motor vehicles. The CAPI calculation of all hazardous substances has shown that there is a gradual decrease of air pollution in Odesa during 2004–2009.

When assessing actual or predictable (which can be calculated) level of air pollution the correlation of the fouling index (FI) of a particular substance or total fouling index of the substances mixture with the critically acceptable pollution index (CAPI) is conducted in this work. Acceptable level is recognized, as it does not exceed the CAPI. Therefore, the calculation results of the fouling index (FI) during 1995-2009 showed that all pollutants had permanent exceeding of the CAPI. The highest level of contamination is observed due to nitrogen dioxide emissions, and the transport sector represent the primary source of such emissions. The sulfur dioxide emissions do not exceed the CAPI so greatly. Substances of summation group – sulfur dioxide and nitrogen dioxide emissions constantly exceed the CAPI primarily due to high content of nitrogen dioxide in the atmosphere.

The last parameter, which is considered in this study, can directly show the man-made impacts on the atmospheric basin of the city. To analyze the effect of mobile and point sources of air pollution the anthropogenic load module (ALM) in 26 districts of Odesa region has been calculated. The amount of pollutants emissions during 2000-2012 was used. In result, five districts where the ALM had the highest values were identified: Ananiiv district (max=3.13), Biliaiivka district (max=3.88), Ovidiopol district (max=5.87), Rozdilnia district (max=3.25) and Reni district (max=6.06). Such situation, in most cases, is caused by a great number of enterprises on these areas, which release the most part of air pollutants. They are: machine building, mining, food processing, production of mineral products and plastics.

So, to make the quantitative analysis of the air pollution level, it is necessary to use more than one method. Moreover, each of these methods has its own uncertainties and gaps related with certain factors. Indeed, the level of air pollution of the city depends on many constituents, which must be considered, such as: the number and place peculiarities of pollution sources of the city, their regime of operation, presence and condition of mobile sources, climate, relief and building system. Without these and other factors, it is impossible to develop effective measures to protect the air quality of the regions.