STATISTICAL ANALYSIS OF NO_2 CONCENTRATION IN BRAILA CITY, ROMANIA

Carmelia Mariana Dragomir[1], Mirela Voiculescu[1], Daniel Eduard Constantin[1], Lucian Puiu Georgescu[1]

[1] *Faculty of Sciences and Environment,*
Dunărea de Jos University of Galați,
Str. Domnească no. 111, 800201, Galați, Romania, cdragomir@ugal.ro

Abstract: *This paper presents a five-year data analysis (from 2009 to 2013) of ground-level NO_2 concentration recorded by four air quality monitoring stations in the urban area of Braila city, Romania. The study was based on NO_2 concentration data and seven meteorological parameters (wind direction, wind speed, air temperature, precipitation, relative humidity, solar radiation and atmospheric pressure. Principal Component Analysis (PCA) was used for identifying statistical distribution. The Multivariate Analysis (one-way ANOVA) was used to determine if there are any variation between independent groups and a continuous dependent variable. Principal Components Analysis was used to evaluate the entire set of data consisting in meteorological variables and NO_2 concentration.*

Keywords: *NO_2 concentration, meteorological parameters, statistical distribution models*

1. Introduction

Anthropogenic emissions are particularly attributed to fossil fuel combustion from power generation and transport [1]. In addition, other atmospheric contributions come from non-combustion processes, for example nitric acid manufacture, welding processes and the use of explosives.

Traffic activity has a significant influence on the concentration levels of NO_2 in the urban areas [2].

The concentration of NO_2 may be affected by its emission and by its formation via reaction (NO with O_3). NO_2 is removed from the atmosphere as acid rain or direct deposition on the soil.

According to the EEA 2012 annual report, 22 of the 27 EU Member States exceeded the maximum limits at least at one air quality monitoring station and persons living in areas with heavy traffic are affected by pollution compared to those from other urban areas [3].

To improve air quality in an urban area is extremely required an air pollution monitoring and estimation of future trends.

Different statistical distribution models were used in order to perform a multivariate statistical analysis. Unbiased techniques as Principal Component Analysis (PCA), Analysis of variance (ANOVA) and Multiple Linear Regressions (MLR) were used in the air quality study. This statistical analysis was applied in order to observe a possible dependence of NO_2 on meteorological parameters. This paper focuses on the multivariate analysis of the NO_2 concentration in an urban area.

2. Data and methods

2.1. Study Sites

The air quality in Braila is observed by four fixed stations, which belong to the Environmental Protection Agency of Braila and which measure hourly concentrations of various atmospheric pollutants.