

Original Article

Research Concerning CO Emissions from Unauthorized Garbage Pits. A Case Study: Aiud Town

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Abstract

Quantifying the CO emissions, taking into account the temperature and humidity conditions, from the unauthorized garbage pit from the peripheral area of Aiud town, county of Alba, was the aim of this study. The research was carried on during 12.04.2011 – 15.05.2011. The samples were daily collected, two times by day (in the morning and evening), with a SafeLog100 gase analyzer. The data were processed with STATISTICA v.6.0 programme. The weekly averages of temperature emphasize the biggest temperature of 37.60 °C and humidity within the interval 53 – 40%. The average value of the CO emissions during entire experimental interval was of 1142.73 ppm. Negative to moderate correlations are reported between CO emissions, temperature and humidity averages. Moderate correlation between the CO emissions humidity and temperature ($R = 0.711$), with a representativeness of 50.60%. The calculation of the regression line ($Y = 1049.366 + 5.533X_1 - 1.562X_2$) allow us to make scenarios for predicting the intensity of CO emissions function of cumulate influence of temperature and humidity.

Keywords: temperature, humidity, correlations, regresion line, multiregresion analyze

1.Introduction

In general, due to the lack of improvement and deficient exploitation, landfills are among the objectives recognised as generating impact and risk to the environment and public health [2].

The main forms of impact and risk arising from the domestic and industrial waste, in the order they are received by the population, are: changes of scenery and visual discomfort; air pollution; pollution of surface waters; changes of soil fertility and biocenosis composition in the adjoining land [4, 9]. Pollution of air with the smell and suspension driven by wind is particularly evident in current municipal deposits areas, in which the operation

is not carried out on cells and cover with inert materials is not practiced [1, 5].

In the structure of municipal solid waste in Romania, the largest proportion is occupied by household waste (75 - 80%), followed by stradal waste (10 - 12%), municipal sewage sludge (7 - 9%), and other waste products, such as those from construction and demolition (7 - 9%), excavations (3 - 4%), etc. Over 90% of such waste is disposed of by storage [3, 6, 7, 8, 9].

The study was carried on with the aim of quantifying the CO emissions, taking into account the temperature and humidity conditions, from the unauthorized garbage pit from the peripheral area of Aiud town, county of Alba.

The city is located on the depresional passage from the middle course of the Mureș River, at the meeting of the three geographical areas: Transylvanian Plane at North - East, the Plateau of

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Transylvania, to the South - East, to the West, is located on both sides of the Aiudului Valley, as well as on the Mureşului terraces with the following gographical coordinates: 46° 10' Nordic latitude and 23° 43' Estic longitude [9].

2.Material and Method

The research was carried on during 12.04.2011 – 15.06.2011. The samples were daily collected, two times by day (in the morning and evening), with a gase analyzer SafeLog100 type, which also records the temperature and humidity of the environment.

Descriptive statistics was used in order to emphasize the average CO emissions by entire period with minimum and maximum values, and the weekley averages of the temperature and humidity. Correlations between CO emissions, temperature

and humidity are also emphsized, and multiregression analyze was conducted for elaborating possible scenarios considering the environmental influences.

The data were processed with STATISTICA v.6.0 programme.

3.Results and Discussions

The weekly averages of temperature and humidity during the experimental period, emphasizes the biggest temperature of 37.60 °C, in last weeke of the interval (June), the minimum of 10.47 °C in the beginning of the interval (April), with almost linear evolution (fig. 1). The humidity recorded the bigger values in the first week of the studied interval (April), 53 – 40%, respectively and the smallest in the 5th wek (May), with a minimum of 28% (fig. 2).

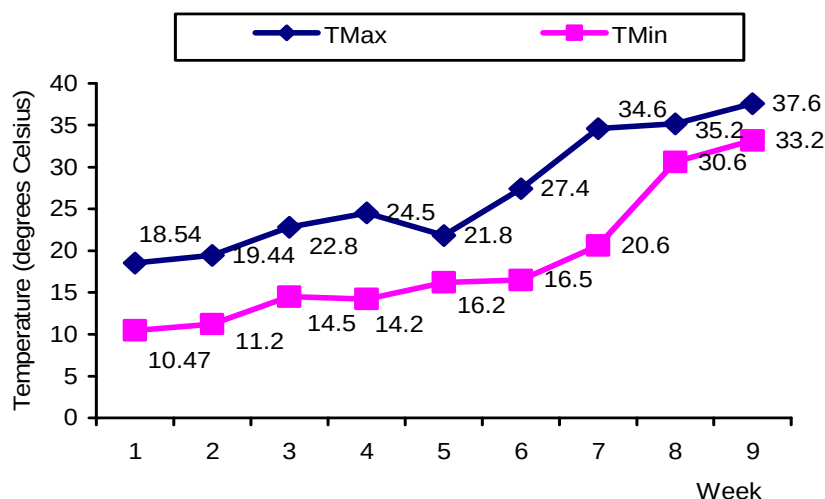


Figure 1. The temperature maximum and minimum values during experimental period 12.04.2011 – 15.06.2011

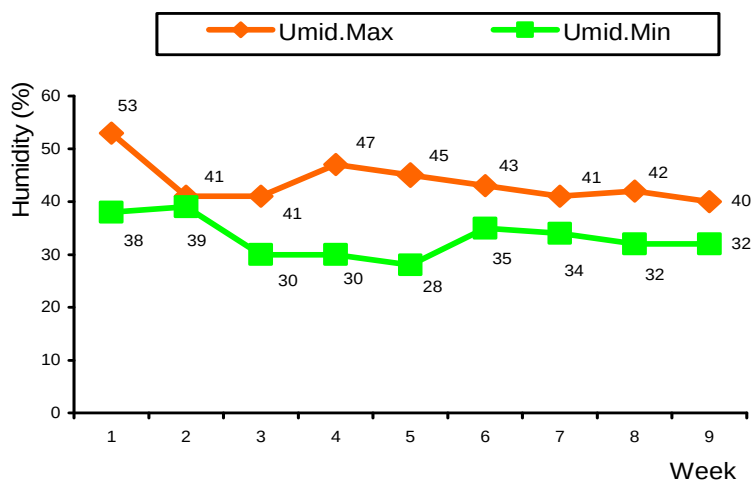


Figure 2. The humidity maximum and minimum values during experimental period 12.04.2011 – 15.06.2011

The average value of the CO emissions (fig. 3) during entire experimental interval was of 1142.73 ppm, with a minimum of 1067 ppm in the

first part of the interval (April – May) and a maximum of 1219 ppm in the last part of the experimental period (May – June).

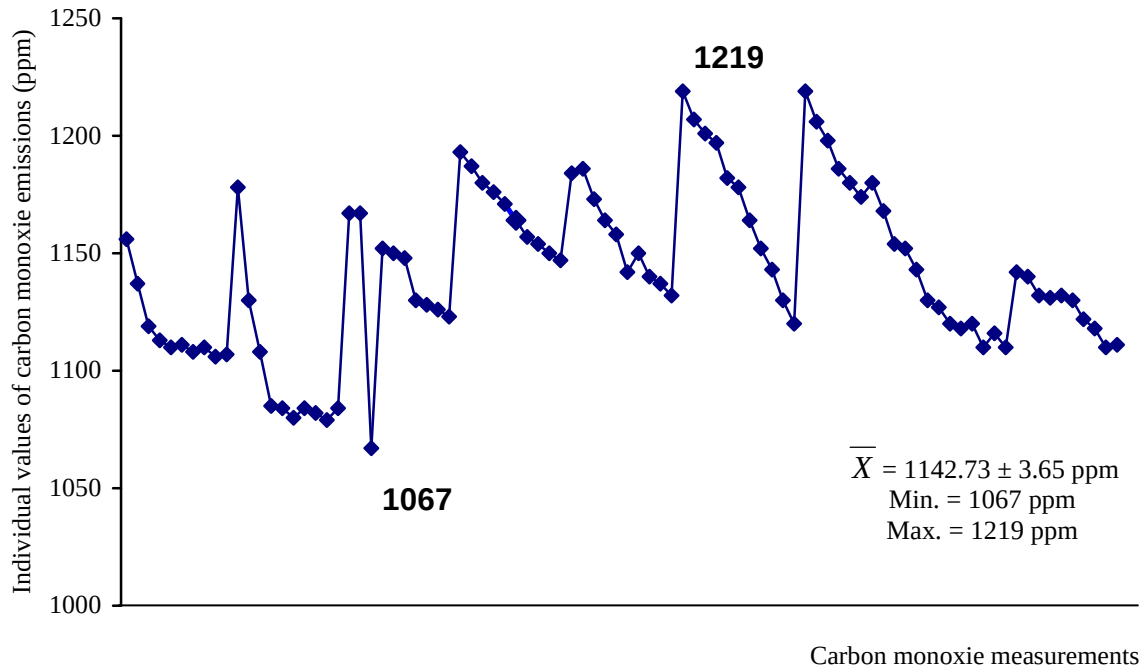


Figure 3. The CO emission values during experimental period 12.04.2011 – 15.06.2011

Negative moderate correlations are reported between CO emissions, minimum and maximum temperature (fig. 4a, and b), and between CO emissions and minimum and maximum humidity (fig. 4c, and d).

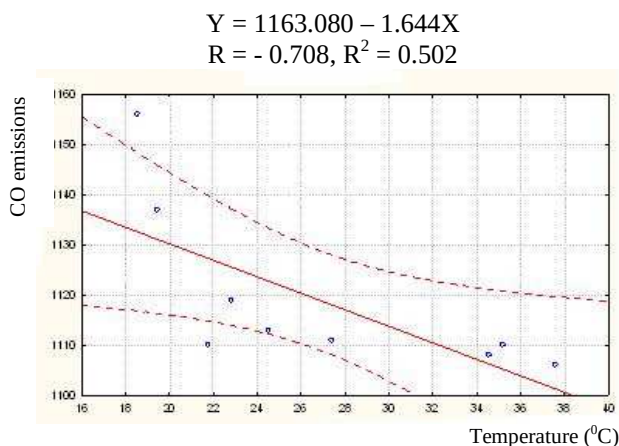


Figure 4a. The correlation between CO emissions and maximum temperature averages during experimental period 12.04.2011 – 15.06.2011

$$Y = 1143.154 - 1.304X$$

$$R = -0.632, R^2 = 0.401$$

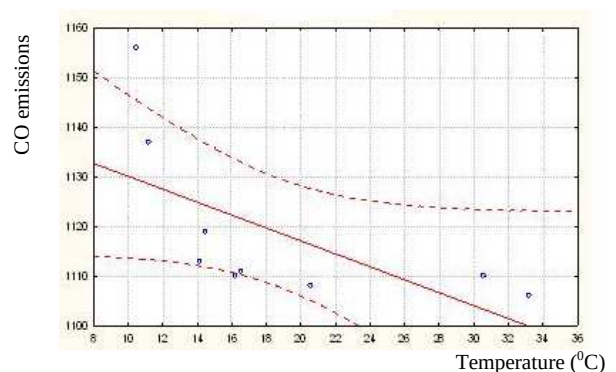


Figure 4b. The correlation between CO emissions and minimum temperature averages during experimental period 12.04.2011 – 15.06.2011

Low correlation between CO emissions and temperature, and moderate correlation between CO emissions and humidity during entire experimental period (fig. 5a, and b).

$$Y = 1000.151 - 2.733X$$

$$R = 0.653, R^2 = 0.426$$

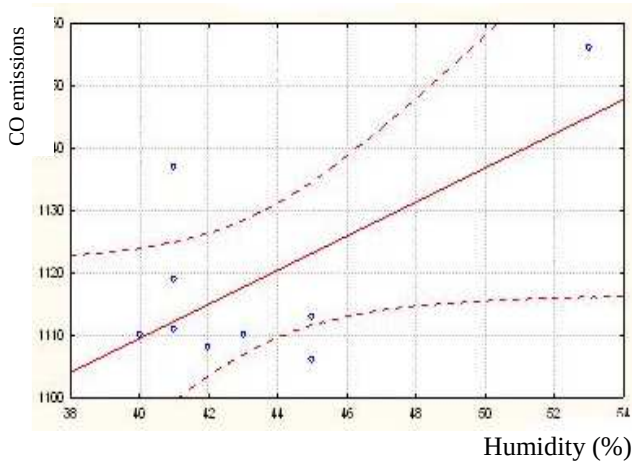


Figure 4c. The correlation between CO emissions and maximum humidity averages during experimental period 12.04.2011 – 15.06.2011

$$Y = 1033.351 - 2.043X$$

$$R = 0.508, R^2 = 0.258$$

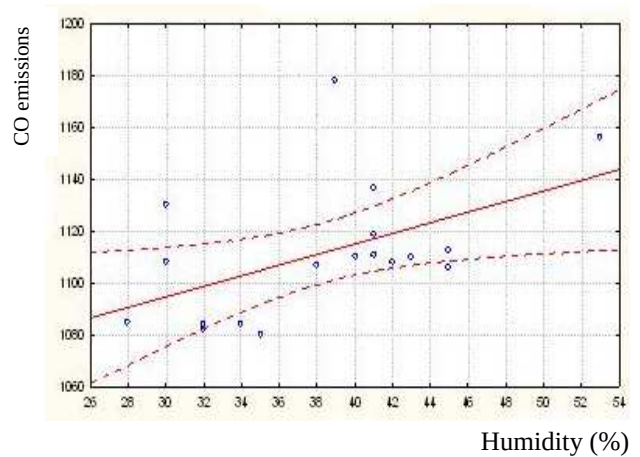


Figure 5b. The correlation between CO emissions and humidity during experimental period 12.04.2011 – 15.06.2011

$$Y = 1014.944 + 3.139X$$

$$R = 0.697, R^2 = 0.487$$

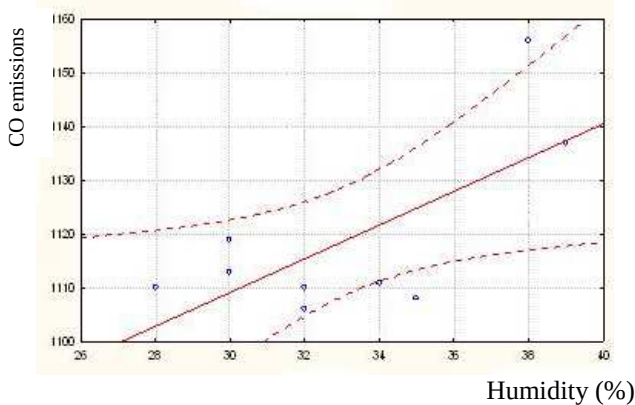


Figure 4d. The correlation between CO emissions and minimum humidity averages during experimental period 12.04.2011 – 15.06.2011

$$Y = 1136.202 - 1.083X$$

$$R = 0.356, R^2 = 0.126$$

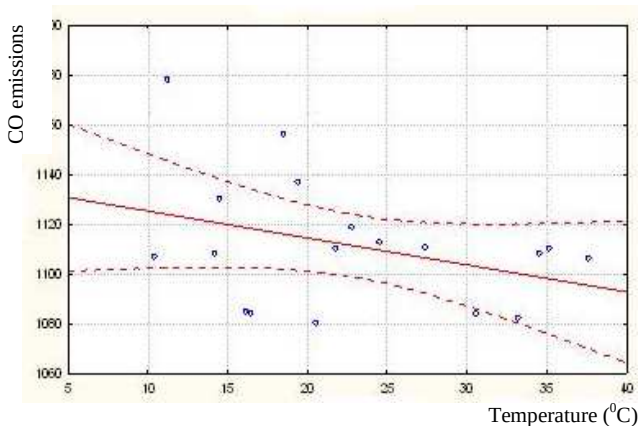


Figure 5a. The correlation between CO emissions and temperature during experimental period 12.04.2011 – 15.06.2011

The regression line allow us to make scenarios for predicting the intensity of CO emissions function of cumulate influence of temperature and humidity ($Y = 1049.366 + 5.533X_1 - 1.562X_2$).

The components of the regression line have different influence on predicting the CO emissions (very significant the free term, and distinct significant both temperature and humidity).

The residual analysis (fig. 6) demonstrates a satisfactory relationship between observed values versus residuals.

$$Y = 1049.366 + 5.533X_1 - 1.562X_2$$

$$R = 0.711, R^2 = 0.506$$

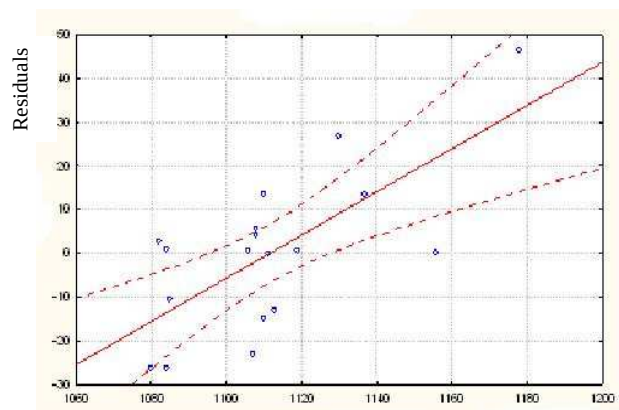


Figure 5. Observed values versus residuals

4. Conclusions

The weekly averages of temperature and humidity during the experimental period, emphasizes the biggest temperature of 37.60 °C, in last week of the interval (June), and for humidity in

the first week of the studied interval (April), 53 – 40%.

The average value of the CO emissions during entire experimental interval was of 1142.73 ppm, with a minimum of 1067 pm in the first part of the interval and a maximum of 1219 ppm in the last part of the experimental period.

Negative moderate correlations are reported between CO emissions, minimum and maximum temperature and humidity averages, and low correlation between CO emissions and temperature, and moderate correlation between CO emissions and humidity during entire experimental period.

The multiregression analyze emphasizes a moderate correlation between the CO emissions humidity and temperature ($R = 0.711$), with a representativeness of 50.60%.

The regression line ($Y = 1049.366 + 5.533X_1 - 1.562X_2$) allow us to make scenarios for predicting the intensity of CO emissions function of cumulate influence of temperature and humidity, while the residual analysis demonstrates a satisfactory relationship between observed values versus residuals.

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