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O 45.   ASSESSMENT OF TRANSPORTATION-ORIGINATING AIR POLLUTANTS WITH GIS

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ABSTRACT: Air pollution shows itself as an important problem especially in big cities. The amount of pollutants released into the atmosphere, residence times and sedimentation in soil as a result of atmospheric events, causes it to reach negative concentration values in terms of human health. Considering the size and population of Konya province, such negativities are frequently observed. Air pollution measurements and soil analysis in certain regions, accurate estimation of pollutant concentrations will be effective in reducing the negative effects of pollution or taking necessary measures. In this study, based on Konya province, PM, CO_2, CO and noise measurements were made separately in summer and winter months with the CEM DT – 9880, IAQ-CALC 7575 and Testo 816-1 devices used in the field of Konya province. Evaluating the obtained results, maps were prepared with the ARCGIS program and analyzed. In addition to this, 15 pieces of soil samples were taken from the surroundings of the Air Quality Monitoring Stations of Konya and its districts and junctions and heavy metal measurements were made. The data obtained were evaluated instantaneously from the National Air Quality Monitoring Network site of the Ministry of Environment and Urbanization, together with air quality emissions from air monitoring stations. According to HKDY, the limit value has been exceeded by Pb, Fe, Ni elements in KOS and İnnopark regions. In fact, KOS region has 2 times more lead than its Innopark. According to TKKNKKSDY and WHO, soil samples taken from intersections have high values in 8 regions of Konya. Especially the average of 156.2% Fe pollution, exceeding the limit value, the highest value of KOS region with 176.7% and the lowest value of 5.2% Innopark indicates the presence of soil pollution due to air pollution in Konya.

Keywords: *Air pollution, Heavy metal, Noise pollution, Soil pollution, Transportation.*

INTRODUCTION

Today, environmental problems are increasing and diversifying, threatening nature and people. Air pollution is one of these problems. Air, the main source of life Air, as the main source of life, is indispensable for humans and other living things. For this reason, air pollution causes regional problems in human communities.

Air pollution; solid, liquid and gaseous impurities in the air is the presence in the atmosphere of the amount, density and long time that will harm human health, living life and ecological balance. In the light of the last 5 years' data and prepared reports, it is seen that air pollution in Turkey continues to increase with each passing year.

According to the data of the Organization for Economic Development and Cooperation (OEDC), at least 30,000 of our citizens die every year due to diseases caused by air pollution (TMMBO Chamber of Environmental Engineers, 2019).

In order to prevent air pollution, it should be measured and monitored using appropriate methods. As a result of these measurements, it is necessary to determine the sources of pollution and take them under control.

There are 3 main sources of urban air pollutants. These are considered as industrial facilities, vehicles (traffic), residences (domestic heating). Industrial facilities are important pollutant sources of volatile organic compounds (VOC), particulate matter (PM), SO_2, NO_2.
These industrial emissions are controlled under the Regulation on Control of Industrial Air Pollution. Within the scope of this regulation, Emission Permit Certificates are given to the facilities that meet the emission limit values. The activities of the facilities that cannot obtain this document are not allowed.

Within the scope of the Regulation on the Control of Air Pollution Resulting from Heating, a Clean Air Plan is prepared and the criteria for the coal to be used for heating are determined. CO, PM, VOC emissions from vehicles are controlled within the scope of Exhaust Gas Emission Control and Gasoline and Diesel Quality Regulation (Kara, 2016).

Pollution of the soil in various ways as a result of human activities; It creates a toxic effect and harms the plants living in the soil and the creatures that feed on these plants.

Heavy metal indication in the soil reduces the capacity/efficiency of the soil's assimilation capacity and the soil becomes polluted. Since heavy metal pollution in soil pollution has gained more importance than other pollutants, recent studies have focused on this problem.

Heavy metals mixed with soil; It causes microbiological activity, biodiversity, loss of yield, poisoning in the food chain, environmental and human health problems. Source of heavy metals in the soil; dry and wet precipitation as a result of air pollution, formation order of soil, atmospheric transport, animal excrement, mineral fertilizers, removal of domestic waste, treatment sludge, etc. due to circumstances.

MATERIAL AND METHODS

Air pollution is an important problem especially in big cities. The amount of pollutants released into the atmosphere, their residence time in the atmosphere and their precipitation in the soil as a result of atmospheric events cause negative concentration values in terms of human health.
Considering the size and population of Konya, such negativities are frequently observed. Making air pollution measurements in the determined regions and estimating the pollutant concentrations correctly will be effective in reducing the negative effects of pollution or taking the necessary precautions.
In this study, PM, CO_2, CO and noise measurements were made separately in summer and winter with the CEM DT – 9880, IAQ-CALC 7575 and Testo 816-1 devices used in the field of air quality technology, based on the province of Konya (Figure 1).

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Figure 1. Konya Province Map (Url 2)

The results obtained were evaluated, maps were prepared in the ARCGIS program and analyzed. In addition to this, 15 soil samples were taken from the Air Quality Monitoring Stations and junctions of Konya province and its districts, and heavy metal analyzes were made. The data obtained were evaluated together with the air quality emissions published from the air monitoring stations, instantly from the National Air Quality Monitoring Network (Url 1) site of the Ministry of Environment and Urbanization on the measurement dates.

Soil samples were taken from 15 different regions where the intersections of Konya province and its districts are located, and heavy metal analysis was made in the soil due to air pollution.

Soil samples were taken from 15 different locations. Sampling areas are Konya organized industrial Zone Directorate, OIZ Turkcell Base Station, Innopark, Karkent Station, SGK, Akşehir, Sarayönü, Ereğli, Clean Air Center Directorate, Bus Station, Beyşehir Junction, Meram Yeni Yol, Anıt, Alaaddin and Municipality.

Since Konya is one of the regions where there is a lot of industry, it is intertwined with polluting elements. The most intense areas in terms of industry; It covers OIZ-Directorate, Turkcell Base Station, Innopark, SGK regions. Sampling points were determined according to the critical points that are dense in terms of industry and traffic in Konya.

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After that, the soil samples taken from the 15 determined points were dried in the natural environment in the laboratory, and then brought to constant weighing in an oven at 1100ºC for 24 hours. EPA 3051 Method was used in the preparation of the samples for analysis. For extraction, 0.5 g of soil sample was weighed and 6 ml of HCl and 3 ml of HNO3 were added. This mixture was kept in a microwave oven at 1800C for 30 minutes and the extraction process was applied. The solutions taken in the microwave oven were completed to 50 ml with distilled water and heavy metal determination was made in FAAS.

CEM brand DT-9880 model device was used for particulate matter measurements (Figure 2). Measurements were made simultaneously with the LCD screen and camera feature of the device. IAQ-CALC brand 7575 model device was used for carbon dioxide and carbon monoxide measurements, noise measurements were made using Testo Brand 816-1 Model Noise Measurement Device (Figure 2). It measures and records the CO, CO2, temperature and humidity values in the air and calculates the fresh air % value. Calculates dew point and wet bulb temperature.

Şekil 2. CEM Brand DT-9880 Model Particle Measurement Device, IAQ-CALC Brand 7575 Model Air Quality Meter Device, Testo Brand 816-1 Model Noise Measurement Device

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CONCLUSIONS AND RECOMMENDATION

As a result of the measurements made in this study, air pollution was generally below the limit values. Although the measurement points are the biggest and busiest intersections of Konya, the pollution values are low. The biggest reason for this is the pandemic process caused by COVID-19.

In this process, people did not go out by isolating themselves. For this reason, the number of vehicles in traffic has decreased. The decrease in the number of vehicles has also reduced pollutants and noise levels. In some points, the pollution is above the limit values. The reason for this is the excess number of vehicles during the measurement. At the same time, there is an increase in PM values due to the fact that Konya Metropolitan Municipality, which takes advantage of the empty roads, carries out road works at some points where the measurement is made.

When heavy metal pollution is evaluated in Konya, traffic, heating, unplanned urbanization, scarcity of green areas and industrial factors, as well as natural factors and human factors come together and cause an increase in air pollution in the atmosphere.

Particularly in the winter months, air masses of particulate matter descend on the city and cause inversion and pose a danger. Due to the location of Konya province, the shape of a bowl surrounded by mountains affects the duration of air pollution.

The polluted air that emerges and disperses in the city center is trapped in the neighborhoods and streets for a long time, causing bad odor, appearance, etc. forms its effect. Especially in winter, the Bus Station region shows its true face with its bad smell and blurry and colorful atmosphere in the evening hours, due to unplanned urbanization and less green areas compared to other regions, as well as being crowded in terms of traffic, proximity to industrial areas and exposure to fossil fueled housing heating.

Pollutants coming out of vehicles, industrial enterprises and residences that are active all day are heavy in the atmosphere, and their inability to dilute it at a sufficient level unfortunately brings air and soil pollution as a result of wet and dry precipitation.

The most important factor in the increase of air pollution is carbon monoxide, nitrogen oxides, hydrocarbons and lead emitted from vehicles. By regulating our transportation habits in daily life and paying attention to a few small details, it is possible to both reduce air pollution and protect our budget. We can list the necessary measures to minimize air and soil pollution in Konya as follows.

Primarily, choosing public transportation vehicles is the most recommended method of reducing air pollution, as it reduces carbon emissions per capita. Apart from this, choosing to reach the places within walking distance by walking or by bicycle will be effective in protecting the environment and will also be beneficial for our health and our budget.

Turning off the ignition while you are driving, at stops and waiting times, at the points where traffic is blocked, will not only reduce the emission of toxic substances, but will also provide less fuel consumption. In newly released car models, the Start/Stop feature is optionally available, which enables the engine to be automatically turned off at a standstill and started before starting the movement.

Fuel selection is also among the factors that affect both the budget and the harmful gases emitted to the environment. LPG is the fuel that causes the least air pollution among the fuels used. If the vehicles are gasoline powered, care should be taken to buy clean fuel. It both extends the life of the vehicle and provides less damage to the environment. Electric vehicles, which are planned to become more active in the future, are a method that will eliminate the problem of toxic gas emissions caused by fuel consumption.

With the single-double license plate application, the pollution is significantly reduced. This practice is practiced in some countries during times of high pollution and actively in others. Those with odd numbers at the end of the license plate number should be taken to traffic on some days of the week, and those with even numbers on the remaining days. With this application, less pollutants will be released into the atmosphere with the decrease in the number of vehicles in traffic.

The control of CO_2 emissions from road vehicles depends on taking measures regarding energy consumption efficiency in the production and use stages of vehicles. For this reason, developments in vehicle and engine technologies, the use of alternative fuels, and the provision of optimal traffic conditions in terms of fuel consumption in the use of vehicles are important in the control of CO_2 emissions.

Two important causes of air pollution in Konya are natural factors and human factors. Subsequently, it is caused by factors arising from industry, transportation and residential heating. Since natural factors are not likely to change, we need to look for solutions in human factors, industry, transportation and residential heating.

The values in the regulation should be lowered and the pollutants that are not in the regulation should be added and sanctioned.

The number of 157 cars per 1000 people belonging to the province of Konya should be reduced, and public transportation should be given priority.

Air pollution will be inevitable even if there is no vehicle-induced soil pollution. Therefore, the exhaust gas emission measurement period should be tightened and the level of sanction should be increased to prevent harm to the environment.

Especially in the bus station and KOS regions, vehicles should be kept under control in foggy and cloudy weather.

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