

EVALUATION OF AIR QUALITY IN KONYA CITY CENTER AFTER THE NEW CORONA-19 OUTPUT AND WITH ITS CAUTION

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ABSTRACT

As in the changing conditions throughout the world, urbanization in Turkey, energy supply and the use of energy resources create significant effects on a global scale, and as a result, air pollution is an important environmental problem. It is known that the factors that cause air pollution have significant effects on human and environmental health. In order to reduce these effects, improving air quality is important all over the world. Scientists and relevant authorities are working on monitoring the values of pollutants to find solutions to air quality problems, to follow an effective path or to determine a strategy. It is also important to measure air pollutants and monitor the quality, and to determine the causes and sources of pollution. It is very important to spread or model the analysis processes over a wider area. It is possible to reach these parameter limits with the measures to be taken to improve the air quality parameters. In recent years, new stations have been established in addition to 4 air quality measurement stations in the center of Konya, and the daily average data obtained from these are evaluated in this study. It has been observed that some local factors are also effective, as all parameters change depending on seasonal conditions. In general, it is understood from the results of studies that the air quality decreases and the size of pollution increases in cold winter seasons. It is necessary to reduce the pollution values, to control the pollutant rate arising from the activities of industrial enterprises, to reduce the use of fossil fuels, to encourage urban public transportation, to protect nature, and to make legal arrangements in human activities that reduce air quality. The studies to be carried out for this purpose should be started by the relevant authorities in order to reduce the factors causing pollution and to protect the air quality. It should be the duty of humanity to take measures to protect the life of all living things, especially human health.

Keywords: Konya, Air Quality, PM, COVID 19, outbreak

INTRODUCTION

Clean Air Action Plan determined in Turkey in 2014. It is thought to cover the period between 2020-2024 and plans have been made by Konya Metropolitan Municipality to support this plan. It has also been finalized with the contributions of the Provincial Directorate of Environment and Urbanization and the South-Central Anatolian Clean Air Central Directorate. It is planned to make arrangements in this regard by obtaining the approval of the Ministry and discussing it in the Provincial Local Environment Committee.

The project was prepared in Konya with the contributions of the Ministry of Environment and Urbanization, Konya Metropolitan Municipality, Provincial Directorate of Environment and Urbanization, and other scientific research centers, and it was thought that the work to be done would cover the years 2012-2019. In order to measure, evaluate and improve the air quality of Konya province, it is planned to prepare a new clean air action plan covering the years 2020-2024. In this context, a draft plan was created by meeting with Konya Governorship (Provincial Directorate of Environment and Urbanization), Konya Metropolitan Municipality, South Central Anatolia Clean Air Center Directorate and other officials.

In all provinces of Turkey, at least one station and 2 parameters (SO₂ and PM) are measured in more than one station and more than two polluting parameters. The measurement results obtained in Konya city center have been examined in many previous studies. In some years, measures were taken to increase the air quality depending on the concentration of pollutants. The air quality values obtained in the following years turned out to be an indicator of efforts, and new regulations and new target values were developed in air quality limit values.

Air pollution, which is known to have very important effects on human health and environmental impact, is an increasing environmental problem in Turkey, especially in metropolitan areas with a high population and urbanization rate. In order to prevent or reduce the damage caused by air pollution to human health and the environment in order to improve air quality in urban centers, air quality targets should be achieved with regulations on pollution control. In this current study, it is aimed to investigate the effect of the onset of the new Covid-19 epidemic and the related measures on the air quality by evaluating the temporal and spatial changes of air pollutant parameters in the last two years in Konya city center.

MATERIALS AND METHOD

Study area

Konya is the largest city in Turkey in terms of surface area and has a surface area of 38,257 square kilometres. The city center is built on an old lake bed and there are high mountain ranges in the south-southwest region. The main economic resources of Konya are based on agriculture, animal husbandry and industry, as the lands of Konya are generally flat. The province of Konya consists of plains and plateaus as the land form with the highest surface area. Konya is under the influence of the traditional continental climate zone. The summer season is very hot and dry without precipitation, the winter season is quite cold, windy and relatively snowy. Konya province is seen as one of the least rainy provinces in Turkey with an annual precipitation of 326 mm. Konya Provincial Population is over two million and the city center is around 1.5 million.

Pollutants

If we put in a general order the frequently encountered air pollutants that deteriorate the atmospheric natural air composition and quality; They can be listed as Sulphur, Nitrogen oxides, Suspended particulate matter (dust and aerosols), Ozone, Carbon monoxide, Organic substances (Hydrocarbons). At least SO₂ and PM₁₀ are measured at 5 stations in Konya city center, and in addition to these, NO_x, PM_{2.5}, Ozone and CO values are measured at some stations. While the number of stations in the city center is increasing, studies are continuing to increase the number of measured parameters.

Air Pollution sampling Stations

There are 3 air quality monitoring stations belonging to Konya Metropolitan Municipality in total in Konya, depending on the National Air Quality Monitoring Network. At the stations, parameters such as sulfur dioxide (SO₂), particulate matter (PM₁₀ and PM_{2.5}), nitrogen oxides (NO_x, NO, NO₂), ozone (O₃), carbon monoxide (CO) are measured with automatic devices. Measurements are taken as hourly average values. A total of 9 stations belonging to the Ministry of Environment and Urbanization operate in Konya. Of these stations, 2 Konya Meram and Konya Selçuklu (Karkent) stations can be viewed online at www.havaizleme.gov.tr. Efforts are underway to connect all stations to the National Air Quality Monitoring Network.



Figure 1. The map showing the current settlements of air pollution measuring devices belonging to the Ministry of Environment and Urbanization and Konya Metropolitan Municipality, used in this study to determine the air quality in Konya city center.

Supply of Air Quality Data

Data were obtained from 4 measurement stations with high air pollution parameters in the city center of Konya and air measurements were taken for 4 seasons and analyzed. Inventory information on the characteristics of the pollutant sources causing air pollution has been collected. It is analyzed statistically according to the measurement results of the stations in the required periods. As a result of this, it was aimed to study on what measures should be and what their applications could be in order to reduce their effects with continuously measured parameters by making data evaluation and then plotting them on a graph.

Research Period

Air quality data for 2019 and 2020 were transferred to a chart by taking daily data between 01.01.2019 and 31.12.2020 in order to understand the effect of seasonal conditions and human activities on air quality, and evaluations of air pollutant parameters were made.

RESULTS

Dust Particulate Matter (PM_{10}) means solid particles of 10 μm and smaller in the atmosphere. Solid particles of this size can flow in the atmosphere for a certain period of time by mixing directly into the atmosphere as a result of human activities or due to natural sources. It can react with other pollutants in the atmosphere and form different particulate matter. PM_{10} , the largest naturally occurring source for the PM_{10} parameter is dust lifted from the ground into the air and mixed into the air. Other important sources are traffic, coal and mines, construction sites and quarries. In terms of health effects, PM_{10} may enter the respiratory tract and cause serious health problems by accumulating. It can increase respiratory diseases and even cause death. People with heart or lung diseases, such as asthma, chronic obstructive pulmonary and heart disease, may experience worsened health when exposed to PM_{10} . The elderly and young children are extremely sensitive to PM_{10} exposure. As seen in Figure 1, PM_{10} values are quite high in winter months compared to summer months. Although the values were relatively low during the Covid-19 measures, they are at normal levels after the measures.

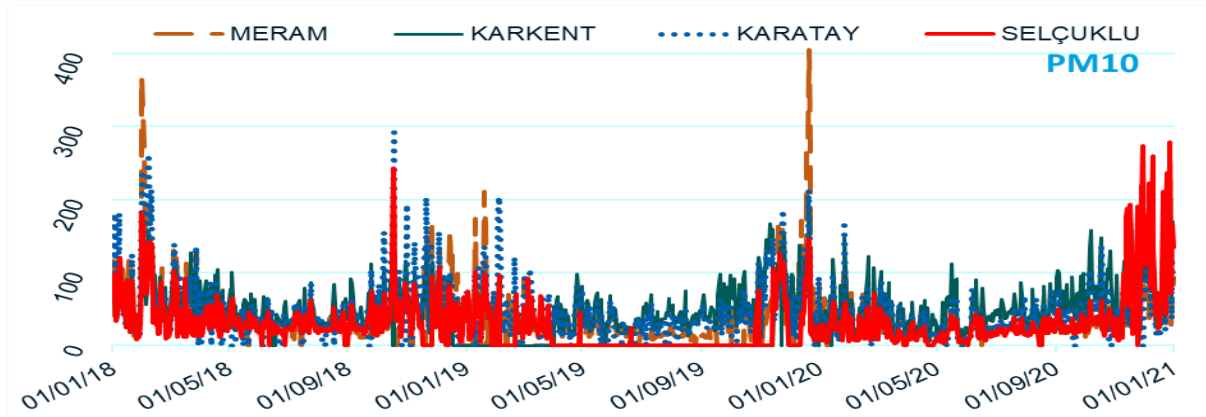


Figure 1. Daily average PM10 data of 4 stations of Konya city center.

Ozone (O₃) is a colorless, odorless gas in atmospheric concentration formed by the combination of three oxygen atoms. Ozone concentration usually occurs in the summer months when the sun is effective, that is, during the high temperatures of the summer. Ozone does not mix with ambient air similarly compared to other pollutants. It occurs at levels close to the earth's surface. It is known as a very strong oxidizing reactant. It can interact with many organic/biogenic substances. It can seriously damage the entire respiratory system. The effect of ozone damage depends on the concentration ratio and exposure time. Children are in the high-risk group. Other risk groups are those who do physical activity outside at noon, asthma patients, lung patients and the elderly. Considering the daily averages in 2020, the change between the period of covid-19 measures and after is seen. In the period when the measures were taken, it is seen that there was a significant increase with the decrease in air pollution in the establishment of PM10 levels.

Nitrogen oxides (NO_x) consist primarily of nitrogen monoxide (NO) and nitrogen dioxide (NO₂), along with other nitrogen oxides. Nitrogen oxides are usually depleted as NO. NO₂ is one of the most important air pollutants in urban areas, as it is the type of nitrogen that most affects human health. Nitrogen oxide (NO_x) emissions result from human resources and overuse of these resources. The main sources are vehicles in land, air and sea traffic and fossil fuel burning boilers in industrial plants. In terms of human health effects, even brief exposure of healthy persons to very high NO₂ concentrations can cause serious lung damage. Exposure of people with chronic lung disease to this concentration may cause short-term lung dysfunction. Prolonged exposure to NO₂ concentration appears to increase severe respiratory distress. The NO₂ values obtained in this study are shown in Figure 3. It shows an opposite trend when compared with ozone values. When we look at the daily averages of the values of the three stations, it is observed that the curfews initiated with the measures taken during the pandemic period caused the air quality to increase, and the NO₂ values decreased in parallel.

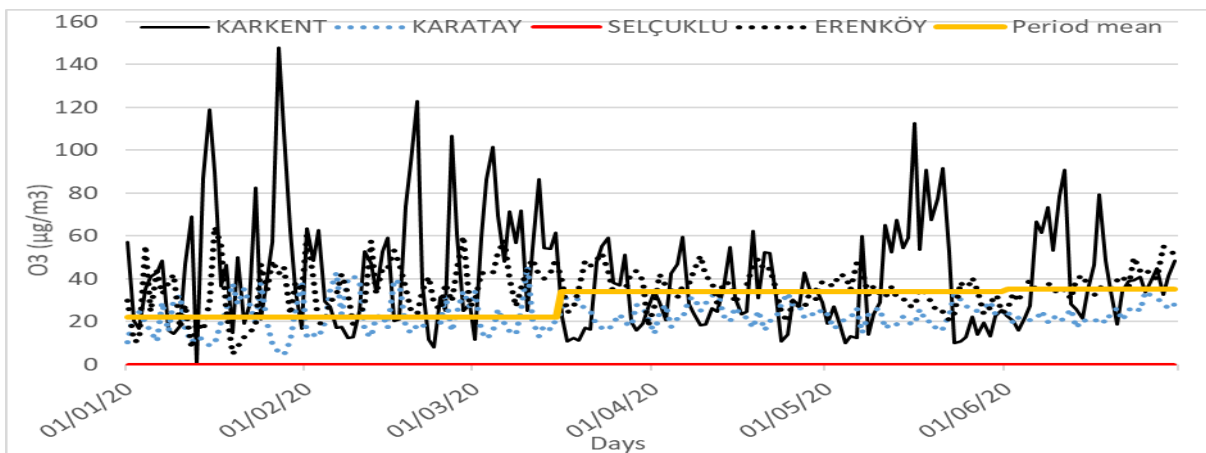


Figure 2. Daily average O₃ levels of 4 stations in Konya city center

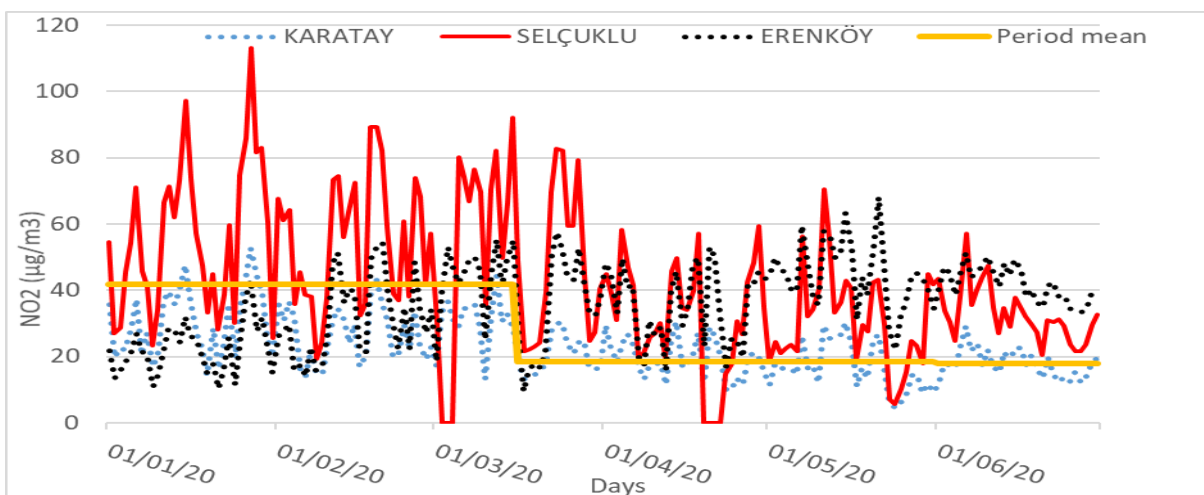


Figure 3. Daily average NO₂ data of 3 stations of Konya city center

In the atmosphere, sulfur dioxide (SO₂) is a colorless and slightly sour-feeling gas. After reaching the atmosphere, it is rapidly oxidized and turns into sulfate and sulfuric acid. It forms droplets or solid particles over long distances with other pollutants. Over a long period of time, SO₂ is removed from the atmosphere in the form of acidic rain or dry precipitation. Figure 4 shows daily SO₂ means of 5 stations belonging to Konya city center. As seen in the figure, it is seen that the values are quite high in the winter season and the values decrease depending on the warming weather conditions. Compared to the values before the pandemic period, the decrease in the values in the period when the curfews were taken seems to decrease the industrial-based emissions. In the following period, the values increased due to both the removal of the measures and the decrease in air temperatures.

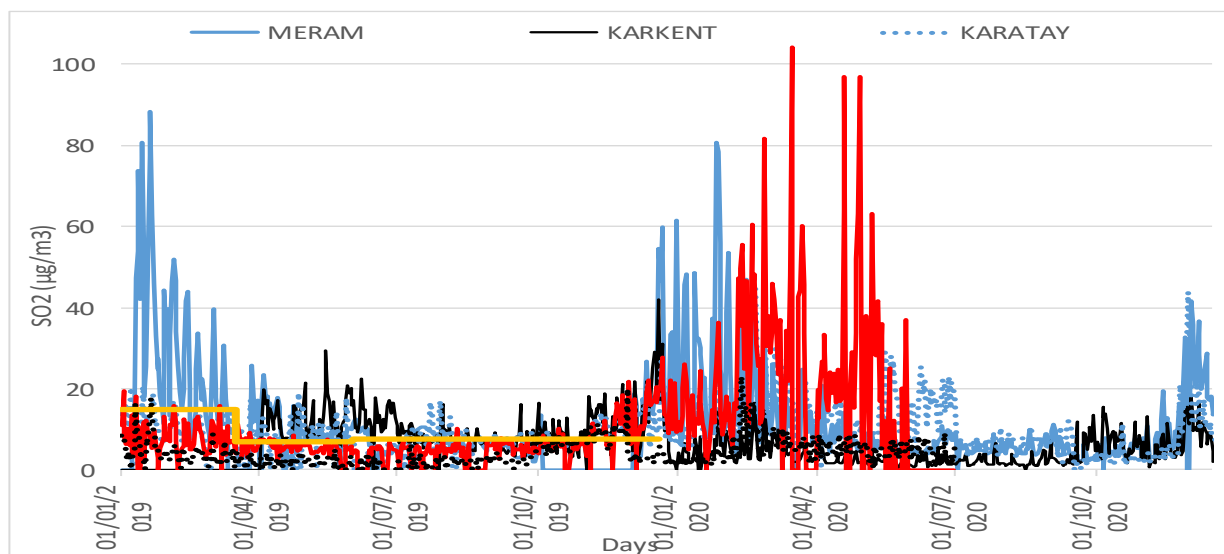


Figure 4. Daily SO₂ volume of 5 stations belonging to Konya city center

Carbon monoxide), colorless and comprehensive (CO is an odorless gas. It consists of the process of incomplete combustion of the carbon/hydrocarbon in the structure of the fuels. The CO tracks are reached by journeys at their highest altitudes in winter. One of the reasons for the high values in cold seasons is the inversion situation. site. The exhaust emissions of CO in the driver's system.

The health impact of CO is chemically sensed to hemoglobin instead of reaching the blood via the respiratory tract. This discourages the frenzy in the blood. This increased CO leads to organs and tissues that go illuminating. Healthy, exposed to higher levels of CO stay, perception of the eye and predictable. People with mild and newer heart and respiratory system diseases to be born with or their babies born in the newest classes of CO preparation. Elevation values in 2020 are seen as an average of CO to 3 stations in 2020. Values in winter compared to summer. My other app can be used in the field.

Particulate Matter (PM_{2.5}) has a diameter of less than 2.5 μm . The largest naturally occurring source for the PM_{2.5} parameter is dust lifted off the ground and into the air. Other important sources are the exhaust emissions of vehicles in traffic, mines, construction sites and quarries. In terms of health effects, PM_{2.5} may enter the respiratory tract and accumulate and cause serious health problems depending on its chemical properties. It can increase respiratory diseases. People with heart or lung diseases such as asthma, chronic obstructive pulmonary and heart disease may have serious health conditions when exposed to PM_{2.5}. The elderly and children are extremely sensitive to PM_{2.5} exposure. PM_{2.5} daily average values of 2 stations with measurements in Konya province are given in Figure 6. It is seen that PM_{2.5} values are lower during the pandemic period compared to the previous period. It is thought that the exhaust gas emissions have also decreased due to the decrease in human activities during the period when the measures were taken.

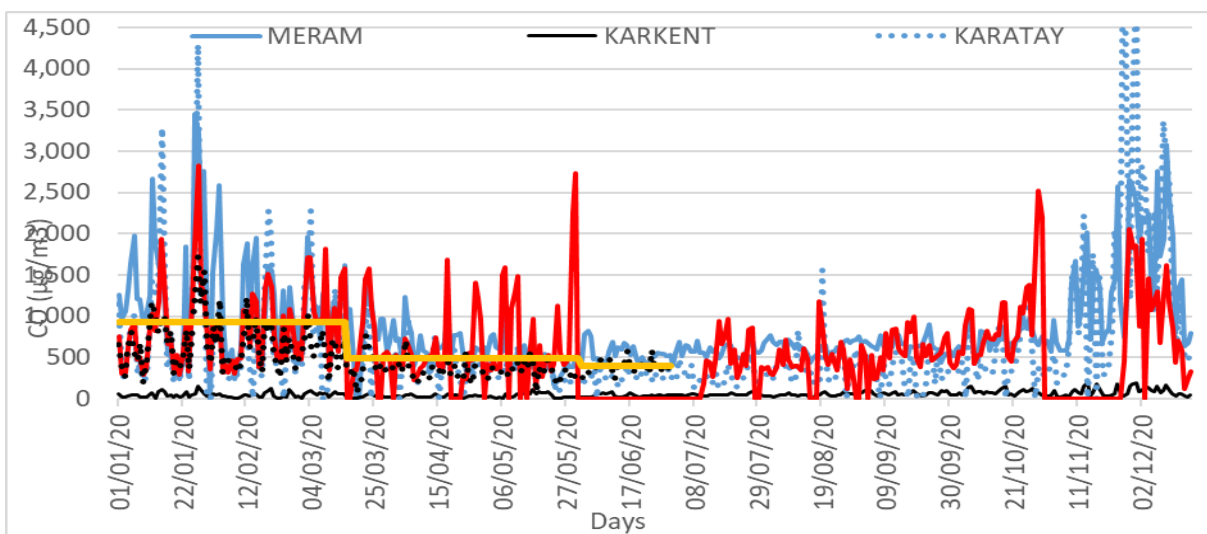


Figure 5. Daily average CO data of 5 stations of Konya city center

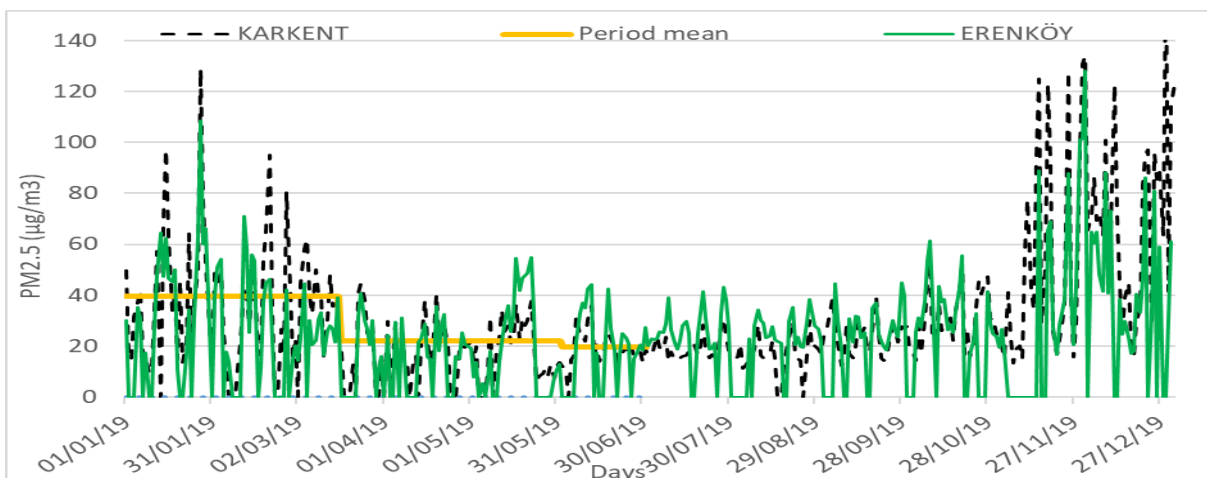


Figure 6. Daily average PM_{2.5} data of 2 stations and different period means of Konya city center

Discussion and Comment

- ✓ As in many of the world's countries, it is thought that there are deaths due to air pollution in Turkey. It is thought that these deaths are more than those who lost their lives in traffic accidents. It has been reported that 6.5 million people worldwide die each year due to air pollution. Unhealthy air is breathed in 92 percent of the world in general (World Nature Conservation Foundation, 2017-2019).
- ✓ Monitoring air quality is of great importance in determining the causes and sources of pollution. Measurements should be spread over larger areas with more regular, systematic and faster measurement methods.
- ✓ With the measures to be taken to improve the air quality, it is possible to bring the parameters to the desired appropriate and unhealthy level. Between 01.01.2019-31.12.2020, graphs were created with the daily average data obtained from 5 air quality measurement stations in Konya province. It has been observed with graphs that pollutant parameters change during periods when fossil fuel consumption for heating purposes is high, industrial activities or human activities increase according to seasonal conditions.
- ✓ In the graphs given above, it is seen that air quality decreases and pollution increases in parallel with the consumption of fossil fuels for heating purposes in winter.
- ✓ The works to be carried out in order to increase the air quality and reduce the pollution in Konya can be listed as follows; Inspecting the activities of industrial enterprises due to excessive industrial area, reducing the use of fossil fuels, encouraging people to use public transportation due to exhaust gases, investing in or increasing nature, making legal regulations and making changes that will reduce the quality of human activity resources.
- ✓ The current public should be informed about developing more effective projects, that is, taking measures to protect the life cycle of the whole world, especially human health.

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