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ANALYSIS OF CARBONMONICIDE (CO) AIR QUALITY IN DKI JAKARTA DUE TO LARGE-SCALE SOCIAL RESTRICTIONS (PSBB) POLICIES FIRST VOLUME USING CLOUD- BASED COMPUTING ON GOOGLE EARTH ENGINE

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ABSTRACT
The corona virus first appeared in Wuhan, China and spread to Indonesia in 2020, causing the Indonesian government to implement Large-Scale Social Restrictions (PSBB) in several cities, one of which is DKI Jakarta. The government is implementing Large-Scale Social Restrictions (PSBB) which aims to stop the spread of the corona virus. During the Large-Scale Social Restrictions (PSBB) period, all community activities were mostly carried out at home, many public facilities were closed. With the implementation of the Large-Scale Social Restrictions (PSBB) policy which limits community activities in DKI Jakarta, it turns out it also has an impact on the concentration of carbon monoxide (CO) gas emissions in the air . This research uses a statistical analysis method for CO gas emissions from Sentinel-5P imagery which is extracted using cloud-based computing on Google Earth Engine. V isualization of the spatial distribution of CO gas emission content was carried out by interpolating CO data extracted using the kriging interpolation method. The results of the research show that in the first volume of the PSBB on April 10 - June 4 2020 , an unstable CO concentration pattern was seen and the average CO was obtained, namely, 0.03187 mol/m 2 . In the period a year after the first volume of PSBB 10 A April-4 June 2021, there was an increase in CO concentration by 10% to 0.0352 mol/m 2 , so this shows that the implementation of the first volume of PSBB in DKI Jakarta affected the concentration of carbon monoxide (CO) in the air.

INTRODUCTION

The corona virus is a virus that can cause disease ranging from mild to severe symptoms (Susanto, 2020). The corona virus can spread to humans quickly and has spread to almost all countries in the past few months (Irwan, et al, 2021). In humans, the corona virus causes respiratory tract infections, such as colds. On the other hand, it can also cause deadly

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diseases such as SARS, MERS, and COVID-19 (Nasruddin and Haq, 2020). COVID-19 first appeared in Wuhan, China in December 2019. COVID-19 is transmitted through droplets that come out of the human respiratory tract .

To prevent the increasing spread of this virus, WHO urges the world community to implement social restrictions (Yunita, et al, 2021). The government is implementing Large-Scale Social Restrictions (PSBB) which aims to stop the spread of the corona virus. The PSBB policy is certainly an effective strategy to stop the spread of the virus. This of course must be balanced with public awareness of continuing to comply with health protocols when carrying out activities outside the home.

PSBB steps are considered more appropriate than a lockdown , because a lockdown is the same as stopping all people's mobility outside the home, people are not allowed to leave the house, all types of transportation cannot operate, and office activities are also stopped. The PSBB policy can only be implemented by the government by first conducting an inspection in an area, considering the economic and social consequences of PSBB.

From the PSBB policy, the community is expected to be able to contribute and comply with the health protocols set by the government so that the spread of COVID-19 can stop. Many public facilities are closed but important facilities such as health, markets and minimarkets remain open. The public supports the PSBB policy because it is considered to be able to reduce the spread of the virus but still maintain people's purchasing power (Nasruddin and Haq, 2020). The implementation of WFH (Work From Home) is a form of PSBB. This causes a lack of transportation volume, especially land transportation. The direct impact is a reduction in sources of air pollution due to reduced exhaust emissions from motorized vehicles (Irawan, et al, 2021).

The capital city of DKI, namely Central Jakarta, has a high level of mobility, causing a high density of motorized vehicle traffic (Permatasari, et al, 2021). Jakarta was declared a city with high levels of air pollution tall one. During the work from home and PSBB period, many people's activities were carried out at home. School activities and office work are carried out remotely. The decrease in activities outside the home has a positive impact, namely by improving air quality along with the reduction in motorized vehicles. Improvements in air quality can occur due to reduced emissions from motor vehicles and industry which produce pollutant gases in the atmosphere .

Vehicle exhaust which emits pollutant gases such as carbon monoxide, if inhaled by humans, will enter the respiratory tract and lungs and then attach to blood hemoglobin. The higher the concentration of CO inhaled by humans, the more deadly the risk, which can cause death. Carbon monoxide is an odorless, colorless and very poisonous gas. CO is usually referred to as the silent killer . CO gas is dangerous for health because CO has a binding capacity of 240 times to HB than the binding capacity of CO to oxygen. Chronic exposure will cause symptoms of neurological disorders, brain infarction, heart infarction and death of the baby in the womb. High levels of CO gas in the blood can be caused by cigarette smoke and vehicles. Indoors, CO gas can also be a gas that causes illnesses such as headaches, nausea and vomiting (Maryanto, et al, 2009).

RESEARCH METHODS

Research sites

This research was conducted in DKI Jakarta Province which is located at 5°19'12"-6°23'54" South Latitude and 106°22'42"-106°58'18" East Longitude. This region has 6 districts. DKI Jakarta has an average height of 7 meters above sea level which is included in the lowland category. DKI Jakarta had a population of 10,557,810 people in 2019 with an area of 662.33 km 2 (BPS, 2020). This province has an average temperature of around 28.7 °C, average humidity of around 74%, and annual rainfall of around 121.65 mm2 (BPS, 2019).

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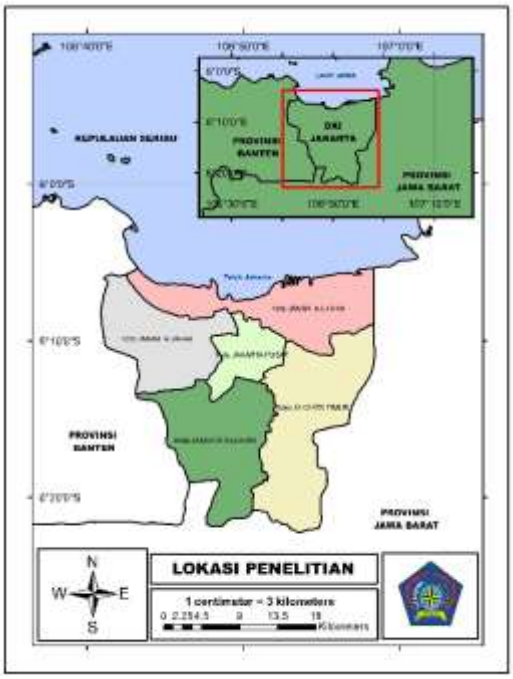

Figure 1. Research location

Data source

This research uses TROPOMI's Sentinel-5P Imagery which aims to monitor air quality using several air quality parameters, one of which is carbon monoxide (CO) (Apituley, 2017). Carbon monoxide (CO) data is processed using cloud -based computing in Google Earth Engine . This research uses NRTI data to obtain fairly detailed time recordings from April 2020 to June 2021.

Carbon monoxide (CO) data extraction was carried out using JavaScript syntax in the Google Earth Engine Code Editor . Raster data visualization and the Javascript syntax used are shown in Figure 2 . This algorithm was developed with the aim of obtaining information on CO column density as a representation of CO concentration in the atmosphere. CO concentration extraction was carried out during the PSBB Volume I period in Table 1 .

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Figure 2 . Javascript syntax on Google Earth Engine

Table 1. Data extraction time period

No	Tanggal	Kategori
1	10 April - 23 April 2020	PSBB Jilid 1
2	24 April - 7 Mei 2020	PSBB Jilid 1
3	8 Mei - 21 Mei 2020	PSBB Jilid 1
4	22 Mei - 4 Juni 2021	PSBB Jilid 1
5	10 April - 23 April 2021	Setelah PSBB Jilid 1
6	24 April - 7 Mei 2021	Setelah PSBB Jilid 1
7	8 Mei - 21 Mei 2021	Setelah PSBB Jilid 1
8	22 Mei - 4 Juni 2021	Setelah PSBB Jilid 1

The spatial distribution of CO content was visualized by interpolating CO data extracted using the kriging interpolation method. The interpolation method was chosen based on the stochastic characteristics of irregularly distributed data, therefore the kriging method is considered more objective for interpolation.

RESULTS AND DISCUSSIONS

Based on Figure 3 , it can be clearly seen and understood that throughout 2019 DKI Jakarta had an average traffic density of very high, this is in line with the results of DKI Jakarta air quality data from the Environmental Service The majority of people are classified as moderate (ISPU 51-100) to unhealthy (ISPU 101-199). Then the average monthly congestion level in DKI Jakarta has decreased drastically since the COVID-19 related policy was implemented, namely in April, coinciding with the implementation of PSBB Volume I which places restrictions on social activities, which then also results in limited The use of vehicles, both motorbikes and cars, is the largest contributor to carbon monoxide emissions in the air and is also the main factor causing traffic jams.

This indicates a relationship between carbon monoxide (CO) emissions and the PSBB Volume One policy which limits community activities

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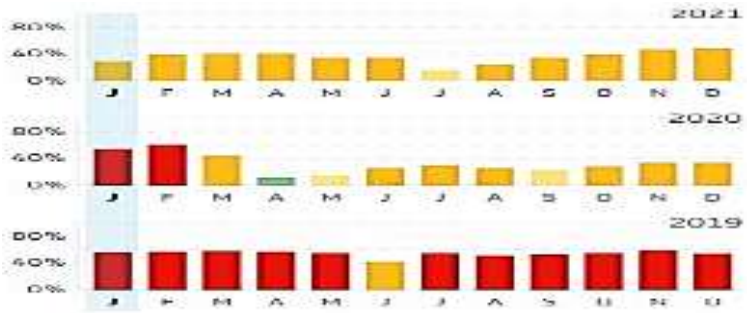

Source: https://www.tomtom.com/traffic-index/jakarta-traffic

Figure 3. Graph level Jakarta's average monthly congestion in 2019-2021

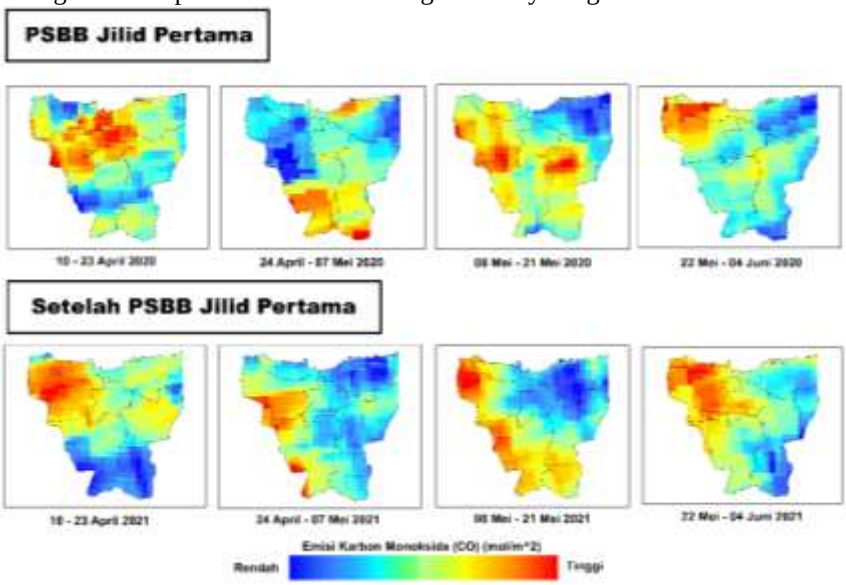

Figure 4. Visualization graphic CO content in DKI Jakarta during And after implementation of PSBB Volume I

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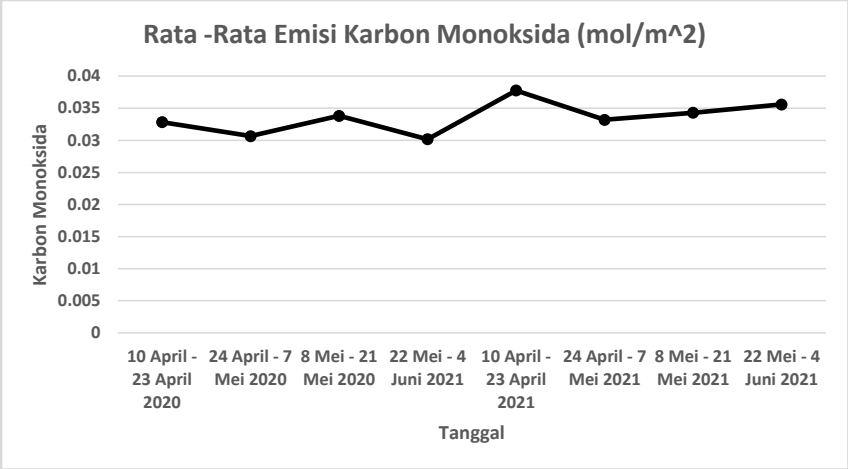

Figure 5. Chart dynamics DKI Jakarta CO concentration

The results of the extraction of carbon monoxide (CO) content in DKI Jakarta Province show a tendency for high CO concentrations in several areas of DKI Jakarta in certain periods of time. Visual spatial distribution analysis was carried out by grouping graphical visualizations of CO content into each period to see the relationship between periods during and after the PSBB Volume d I period . The distribution pattern of CO content during the PSBB Volume I period , the distribution pattern of CO content later varies (see Figure 4). There is no special pattern visible in each time period during the implementation of PSBB Volume I. Graphical visualization of CO concentrations also does not show any significant changes when compared to the previous period. A year after the PSBB Volume I period , the distribution of CO content again focused on certain areas in DKI Jakarta (see Figure 4). Graphic visualization shows the distribution pattern of CO concentrations concentrated in West Jakarta to the western part of South Jakarta. This is in connection with the loosening of policies regarding activity restrictions compared to during the PSBB Volume I period . Based on this, it is known that the graphical visualization of the distribution of CO content in DKI Jakarta Province does not show specific information between one period and another, in this case it is during PSBB Volume I period and the period a year after PSBB Volume I.

Based on data visualized in the form of images (see Figure 5) , in period during implementation PSBB Volume I shows an unstable pattern with the average concentration as big as 0.03187 mol/m 2 . Meanwhile, in the year after PSBB Volume I , the average CO concentration rose by 10% to 0.0352 mol/ m2 . This time period is also the period with the highest CO concentration values during the PSBB period, especially April 10-23 202 1. Observing CO concentrations in the atmosphere can provide an overview of the frequency of human activity especially related with the PSBB policy Volume I applied to stop distribution chain the COVID-19 virus which is felt to have happened walk in a way effective For repair quality air in DKI Jakarta if benchmark on CO concentration data showing a decrease during the PSBB period. However, evaluation is still needed regarding technical implementation, namely public order in complying with the policy.

CLOSING

Based on extraction carbon monoxide (CO) data carried out shows the influence of the implementation of the PSBB Volume I policy on the concentration of carbon monoxide (CO) gas emissions in DKI Jakarta. This is related to human activities during the implementation of the PSBB Volume One policy in DKI Jakarta. Carbon monoxide (CO) concentration levels at two research period viz during application PSBB Volume I , and a year after PSBB

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Volume I were compared with the same date and month period and showed changes in the value of carbon monoxide (CO) emissions in the air.

There is a period for the implementation of the First Volume of the PSBB policy in DKI Jakarta on April 10 - June 4 2020, namely with an average of 0.03187 mol/m 2 . Carbon monoxide concentrations increased again in the period one year after PSBB Volume One was implemented in DKI Jakarta, to be precise from 10 April - 4 June 2021, namely 0.0352 mol/m 2.

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