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THE EFFECTS OF COVID-19 PANDEMIC ON ENVIRONMENTAL CONDITIONS IN THE SPECIAL CAPITAL REGION OF JAKARTA, INDONESIA

Dampak Pandemi Covid-19 pada Kondisi Lingkungan di Daerah Khusus Ibukota Jakarta, Indonesia

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Abstract

The Covid-19 pandemic that is getting worse, the Government responded by issuing PSBB and WFH policies with positive and negative effects in DKI Jakarta as national economic growth. The study aimed to analysis environmental effects. This qualitative research used literature review sourced from articles, government reports, institutional reports, and validated popular media. The policies have some significant effects on people's lives and environmental stability. The positive effects included the decline in $PM_{2,5}$ with the highest value of 31,31% in West Jakarta, 27.80% in East Jakarta, and 25.74% in Central Jakarta. There was an improvement in air quality; the decline in electricity consumption was 7.24% in the industrial sector, 8.70% in business centers, 2.43% in government buildings, and 620 tons/day reduced waste. The adverse effects included: the closure of 3,570 companies and 1,225,725 workers doing WFH; increased household electricity consumption by 4.76%; decreased Commuter Line passengers by 82.10%; a decrease in Transjakarta passengers by 87.60%; and increased household waste by 36%. The pandemic harmed the socio-economic and had a positive effect on the environment. Pandemics provide an opportunity for humans to reflect on their behaviour and how they should interact with nature in post-pandemic encourage pro-environmental behaviour to support sustainable development.

Keywords: DKI Jakarta; electricity; environmental effects; the Covid-19 pandemic; transportation

INTRODUCTION

Coronavirus disease, first discovered at the end of 2019 (Covid-19), spread quickly (Cheng *et al*., 2020). The spread of Covid-19 crossed administrative and geographical boundaries very massively (The Lancet, 2020; Trilla, 2020). Within weeks since the first case was discovered in Wuhan, China, similar cases were detected in Europe, America, and Africa (Cordes & Heim, 2020; Moss *et al*., 2020; Nkengasong & Mankoula, 2020). The World Health Organization (WHO) responded quickly and measurably to the widespread spread of Covid-19 by establishing Covid-19 as a global pandemic on March 11, 2020 (World Health Organization, 2020b).

The establishment of Covid-19 as a global pandemic has had a vast influence on people's lives (Ebrahim & Memish, 2020; Wang *et al*., 2020). The Covid-19 pandemic is considered dangerous because it is very easily transmitted from one person to another through droplets and physical interaction (Bwire & Paulo, 2020; Lin *et al*., 2020). In addition, it was found that there were variants of Covid-19 taken from

samples in several countries, it is possible to trigger genetic mutations in the future (Phan, 2020). The frequency of the spread and transmission of Covid-19 is increasingly challenging to control in various parts of the world, prompting the establishment of a health emergency status (Albarello *et al*., 2020; World Health Organization, 2020a).

At first, the Indonesian government responded quite calmly and calmly to the pandemic and global health emergency status until March 2020 (Djalante *et al*., 2020). The first case of Covid-19 in Indonesia was confirmed in Depok, West Java, on March 2, 2020. Since the first case was found in March 2020, the number of positive cases of Covid-19 in Indonesia has increased at a not too fast rate, thus giving rise to various responses among workers. Media and academia. However, the condition has worsened since April 2020, resulting in the Regulation of the Minister of Health of the Republic of Indonesia Number 9 of 2020 concerning Large-Scale Social Restrictions in the Context of Accelerating Handling of Corona Virus Disease 2019 (COVID-19).

The implementation of Large-Scale Social Restrictions or known in Indonesia as "*Pembatasan Sosial Berskala Besar*" (PSBB) is valid for 14 days from April 10-23, 2020, and this is followed up by the issuance of work from home (WFH) policy for non-essential sector workers and reducing the capacity of virtual sector workspaces to up to 50-75%. The implementation of PSBB and WFH has a significant impact on people's lives because they have to limit physical and social activities (McKibbin & Fernando, 2020). The Covid-19 pandemic has both positive and negative impacts on life, so humans need to adapt to survive and through these challenging conditions, especially with the PSBB and WFH policies.

Work from home is implemented as a national policy by the government that must be obeyed by both the state civil apparatus or known in Indonesia as "*Aparatur Sipil Negara*" (ASN) and private workers to prevent the spread and transmission of Covid-19. The WFH policy significantly influences community socio-economic activities, especially in urban areas (Nasruddin & Haq, 2020). Office workers dominate urban communities, both government and private, and workers in business and industrial centers in normal conditions spend more than 8 hours per day on average for activities in the office and travel (Abadini & Wuryaningsih, 2018). This activity pattern has entirely changed since the emergence of the Covid-19 pandemic and the implementation of the PSBB and WFH policies.

The government predicts that large-scale social restrictions will effectively suppress the spread and transmission of Covid-19 in Indonesia, especially DKI Jakarta. The implementation of PSBB since it was first rolled out until now with continuously adjusted terms still reaps the pros and cons but is still being carried out even though it has experienced easing. In general, PSBB encourages changes in the behavior of urban communities, which require them to carry out activities at home. Various activities originally carried out at work have shifted to their respective homes, such as work, meetings, eating, and even worship, including reduced transportation activities for work purposes. Almost all activities are carried out at home and are only allowed to go out for very urgent purposes. This condition raises various questions among environmentalists about whether the PSBB positively affects the environment or vice versa. Therefore, this study aims to identify and analyze the positive and negative impacts of the Covid-19 pandemic on environmental conditions in DKI Jakarta.

METHODS

Research Time and Location

The study was conducted in July-September 2020 using primary data for

January-June 2019 and January-June 2020. Data for January-June 2019 represent environmental conditions (social, economic, and ecological) in normal conditions, while data for January-February 2020 represents the initial conditions for the emergence of information regarding Covid-19 at the global level and data from March-June 2020 represents the pandemic condition in Indonesia, especially area of DKI Jakarta, Bogor, Depok, Tangerang, Bekasi (Jabodetabek) as the epicenter of the spread of Covid-19 in Indonesia. The high transmission of Covid-19 in Jabodetabek greatly influences environmental aspects, both ecosystems, and socio-systems. The research location chosen is DKI Jakarta (see Figure 1) because this area has three types of integrated environments: the natural environment, the built environment, and the social environment. The three types of the environment provide a continuous reciprocal influence, and the dynamics of the condition can be known based on the input and output produced.

Research procedure

This study uses a qualitative approach with literature review and desk study methods. Literature is inventoried from various sources, including (1) national and international scientific journals; (2) working papers; (3) government and institutional reports; (4) articles in popular media; and (5) the Indonesian government's official Covid-19 website. Relevant data from these sources is still quite limited, especially concerning environmental impacts. However, researchers still use the primary references from scientific articles published in reputable international journals such as Thomson Reuters-Web of Science, Scopus, Science Direct, and Google Scholar. Other supporting data are obtained from official government reports and reports from expert organizations in related fields through documents or reports and official websites. Next, complementary data is obtained from print and online media sourced from verified and validated statements, analyses, and experts' calculations. Anyone can access all sources used in this research at any time.

A variety of complete information and data obtained by researchers sourced from electronic media and the data presented complement each other to support the results of others research analytically based on a phenomenon. However, the data and information from the print and online media users have been confirmed using verification on at least three other credible and reputable sources. The information and data displayed can be verified and validated.

Data analysis

An exploratory, descriptive method carried out data analysis. All documents that have passed the screening are carefully studied regarding the methods, results, discussions, and conclusions. The data obtained from each source is then compiled into a scientific argument that is coherent and in sync with the research objectives to be answered. Furthermore, the researcher provides a scientific explanation of the data and information by the scientific expertise possessed, namely environmental science. The analyzed data is explored to explain a phenomenon that occurs and reflect on achieving a better condition.

RESULTS AND DISCUSSION

Electricity Usage Behavior

The survey results show that the behavior of urban communities has changed during the Covid-19 pandemic. The majority of urban communities in normal conditions record much time to work and travel to work, according to research results by Abadini & Wuryaningsih (2018). However, the situation has changed since the Covid-19 pandemic, with the majority spending their time at home due to the imposition of physical activity restrictions.

This change in activity patterns has consequences for behavioral changes in daily life during the pandemic. According to research by Ulhaq *et al*. (2020) that the pandemic affects patterns of human activity regardless of gender, religion, age, and educational background, all of which are affected and affected. The most prominent thing is the increase in household electricity consumption during the pandemic (Figure 2).

Figure 1 shows that there was an increase in household electricity consumption during the Covid-19 pandemic. The growth of household electricity consumption peaked in May 2020 at 10,029 GWh, or an increase of 4.76% from April 2020. The rapid growth in household electricity consumption in May 2020 occurred due to the first Large-Scale Social Restrictions (PSBB) implementation. During the pandemic period, namely April 15, 2020, as stated in the Regulation of the Minister of Health of the Republic of Indonesia Number 9 of 2020 concerning Large-Scale Social Restrictions in the Context of Accelerating Handling of Corona Virus Disease 2019 (COVID-19). The PSBB was implemented in DKI Jakarta, Depok City, Bogor City, Bogor Regency, Bekasi City, and Bekasi Regency. The enactment of the PSBB forced most people to work from home and reduce outdoor activities. The strict PSBB regulations that have been set have encouraged community activity patterns in the Jabodetabek area. The pattern of work activities carried out from home or known as WFH, increases the intensity of the community in using electricity. This information follows Hakim *et al*. (2021) research that most people experienced an increase in electricity bills during the pandemic, and some even reached 90.5%. Electricity is one of the essential needs during the PSBB period because all office work equipment must be done with laptops, cellphones, tablets, and computers which are directly proportional to the electricity needs to charge these devices (Trimanto & Rakhmawan, 2021).

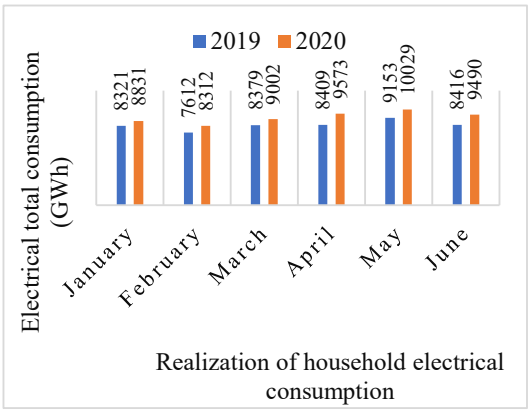

Figure 1. Comparison of Household Electricity Consumption Before and During the Pandemic

Source: Directorate General of Eletricity, 2020 (processed)

Household electricity needs to be increased rapidly during the Covid-19 pandemic, not only contributed by the electronic equipment sector supporting work such as laptops, cellphones, tablets, and computers but also by the increased use of other supporting electronic equipment. Based on the researcher's search, it is known that equipment whose use has increased during the pandemic include: (1) AC; (2) lamps; (3) television; (4) fan; and (5) water pump. The results of the analysis also found that the majority of people when carrying out WFH need support for optimal lighting, comfortable temperatures, or even entertainment on the sidelines of doing work activities and also increasing the intensity of water use, especially for washing hands and toilets, so that the use of the five types of electronic equipment increases. Drastically. This finding strengthens Hakim *et al*. (2021) research where people experience the intensity of using electricity for online WFH and entertainment purposes. This is also in line with Putri & Mulyono's (2018), which states that sufficient lighting is needed to

maintain eye health when working in front of a monitor screen.

The activities that are typically carried out in the office are moved to their respective homes. Therefore, household electricity consumption has increased, and on the other hand, electricity consumption in the industrial sector, business centers, and government office buildings has decreased (see Figure 2). The transfer of electricity usage centers from being centralized to being divided in settlements only occurs when the PSBB is enacted and similar policies, which in the current context continue to experience changes in terms.

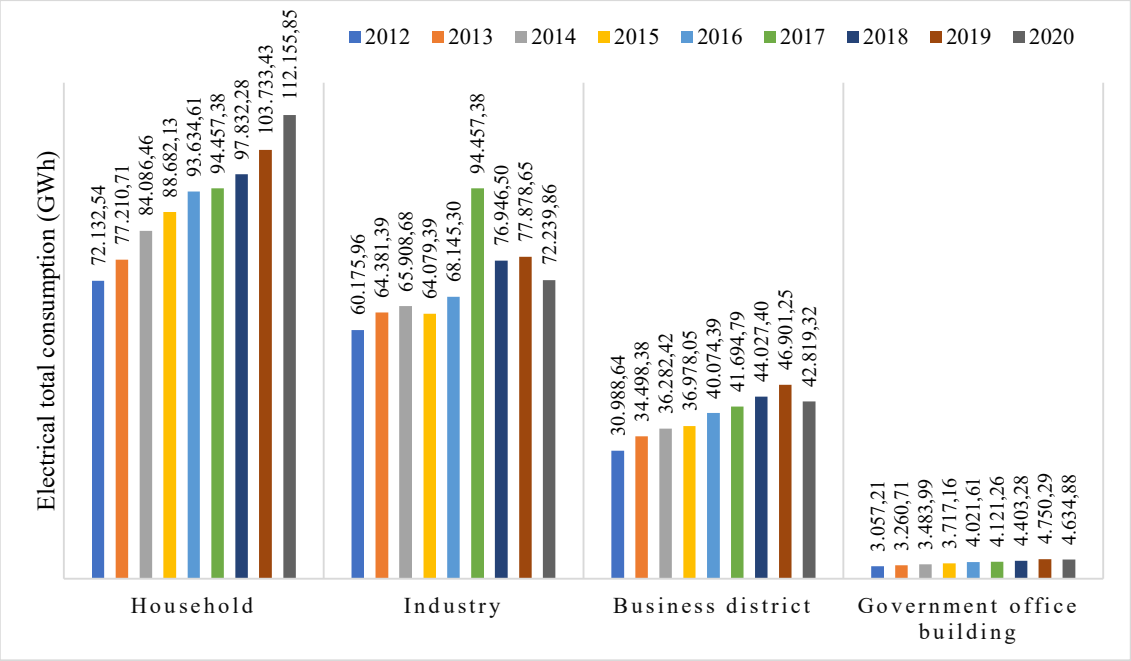

Figure 2. Comparison of Sectoral Electricity Consumption from 2012-2020
Source: State Electricity Company, 2020 (processed)

Figure 2 shows that sectoral electricity consumption continues to grow consistently from 2012 to 2019, but simultaneously in 2020, it experienced a sharp decline except for the household sector. As discussed in Figure 1, household electricity consumption has increased due to the implementation of the PSBB, which requires workers in the non-essential sector to WFH. Figure 3 that the electricity consumption of the industrial sector, business centers, and government office buildings experienced a sharp decline because the three sectors implemented WFH as a form of commitment to support the implemented PSBB policy. However, the essential sectors consist of: (1) health; (2) security and public order; (3) energy; (4) logistics; (5) food and drink; (6) petrochemicals; (7) infrastructure and construction; (8) essential utilities (water, electricity, and waste management); (9) finance and banking; (10) information and communication technology; and (11) export-oriented industries are still allowed to work from the office or often called work from office (WFO) with reduced room capacity.

The policy's implementation directly impacts electricity consumption, so it can be seen in Figure 3 that the industrial sector experienced a decline in electricity consumption by 7.24%, the business center sector by 8.70%, and government buildings by 2.43%. The business center experienced the sharpest decline compared to the other

two sectors because it was filled with various businesses, and only a few remained WFO with reduced capacity. Meanwhile, the government building sector experienced the lowest reduction in electricity consumption compared to the other two sectors because most government agencies still carried out WFO with a maximum space capacity of 50-75%. This trend of decreasing sectoral electricity consumption is possible only during the implementation of PSBB and similar policies with other terms. This finding confirms Sugiyono *et al*. (2020) research, which models energy needs in Indonesia during the Covid-19 pandemic. The industrial and energy sectors experienced a decrease in energy demand, while households experienced an increase in energy demand.

Behavior of Using Public Transportation

Implementing public physical and social activities due to the spread of the Covid-19 pandemic impacts the number of passengers on public transportation. The number of industrial sectors, business centers, government office buildings, and educational institutions that apply WFH and learning from home directly impacts the decreased mobility of residents in Jabodetabek. It can be seen in Figure 4 that the Commuterline Electric Rail Train or known in Indonesia as "*Kereta Rel Listrik*" (KRL) experienced a sharp decline in the number of passengers in the April-June 2020 period.

Figure 3 shows that there has been a sharp decline in the number of KRL Commuterline Jabodetabek passengers since the Covid-19 pandemic hit. Seen in March, there was a decrease in the number of passengers by 34.61% compared to the same month in 2019, while in April 2020, there was a decrease in the number of passengers by 81.69% compared to the same month in 2019. While in May there was a decrease in the number of passengers. Passengers by 82.10% compared to the same month in 2019, and in June, there was a decrease of 66.72% compared to the same month in 2019 as it is known that the first Covid-19 case was identified in Indonesia on March 2, 2020, located in Depok City. Since discovering the Covid-19 case in Indonesia, people have begun to worry and change their activity patterns, including choosing the type of transportation.

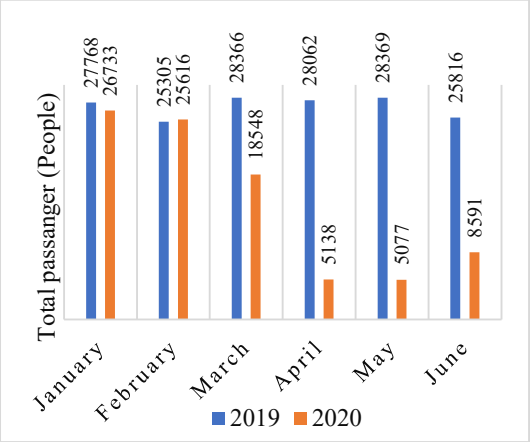

Figure 3. Number of KRL Commuterline Jabodetabek transportation users
Source: Ministry of Transportation, 2020 (processed)

The choice of the type of transportation is based on many factors; Setyodhono (2017) details these factors, including: (1) age; (2) gender; (3) educational background and level; (4) type and status of work; (5) income; (6) distance between residence and work location; (7) travel time; and (8) travel expenses. Therefore, most Jabodetabek people choose Commuterline KRL as the primary mode of transportation, especially for workers who live in supporting areas of Jakarta such as Bekasi City, Bekasi Regency, Bogor City, and Bogor Regency. The safety and comfort of the Commuterline KRL are also factors driving the Jabodetabek community to choose this mode of transportation. Wijayanto's (2019) shows that urban communities widely choose Commuterline KRL because of the ease of access, the convenience of service, and affordable rates. However, due to the Covid-19

pandemic, the number of Jabodetabek KRL users continues to decline. This condition was exacerbated by the implementation of the PSBB so that many workers had to carry out WFH and no longer needed a mode of transportation to go to the office. This factor is the most influential on the decrease in the number of passengers. This finding confirms the research of Lois *et al*. (2021) that passengers on the Jakarta-Bogor KRL Commuterline route have decreased since the Covid-19 pandemic. Currently, those who are still using this mode of transportation are very careful with health protocols.

The decline in the number of passengers also occurred in the Transjakarta public transportation mode. It is generally known that Transjakarta is the second favorite mode of public transportation for Jabodetabek residents after the Commuterline KRL. Transjakarta passengers are also Commuterline KRL passengers because they use Transjakarta to connect the Commuterline KRL stations to the office (Arifin *et al*., 2015). In Figure 4, there is a sharp decline in the number of Transjakarta passengers in March - June 2020.

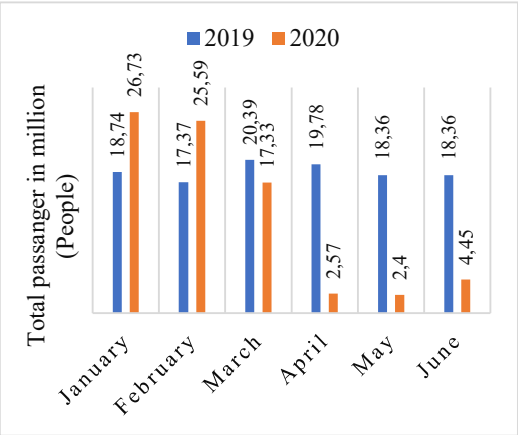

Figure 4. Number of Transjakarta Users
Source: DKI Jakarta Transportation Agencies, 2020 (processed)

Figure 4 shows a very sharp decline in the number of Transjakarta users during the Covid-19 pandemic. The decrease in the number of Transjakarta users has the same pattern as the decrease in the number of Commuter line KRl users. The number of Transjakarta users began to show a decline in February 2021 when the news of Covid-19 began to be widely published in various media, both print and electronic. However, a very sharp decline occurred in April-June 2021. It was recorded that in April 2021, the number of Transjakarta users decreased by 87.01% compared to the same month in 2019, while in May, there was a decrease in the number of users by 87.60% to the month before. In the same month in 2019, and in June, there was a decrease in users of 75.76% compared to the same month in 2019. A very sharp decline occurred due to the implementation of the PSBB, which required all workers in the non-essential sector to carry out WFH and a reduction in space capacity. as much as 25-50% for essential sector workers shown by the research of Kusumawardani *et al*. (2020) during the Covid-19 pandemic Transjakarta experienced a drastic decrease in the number of passengers and provided an opportunity for management evaluation in order to improve service quality in the post-pandemic period.

Implementing the WFH policy from all non-essential agencies and room restrictions for essential sector workers has significantly reduced the number of Transjakarta users. Based on Figure 4 and Figure 5, it can be seen that the Covid-19 pandemic was able to change the pattern of people's activities from initially working centered in industry, offices, business centers, and the list goes on, having to work from their respective homes in order to prevent and control the spread and transmission of Covid-19. The policy is indeed complicated to decide. The impact is enormous because it risks reducing the income of companies/offices/other industries and can have implications for termination of employment or known in Indonesia as "*Pemutusan Hubungan Kerja*" (PHK). However, the government has taken

firm and measured steps and puts the safety of people's lives as a top priority. This is in line with Hadiwardoyo (2020) which states that the implementation of the PSBB impacts enormous economic losses, reduces the intensity of traffic flows for the distribution of goods and services. It puts pressure on all elements of society.

Waste Management Behavior

Waste management is one of the individual obligations to maintain environmental health and stability. Like the rest of daily activities from human activities and natural processes in solid form, Garbage harms the environment if it is not appropriately managed (Ariyanti, 2013). Waste management during the pandemic needs attention because it is concentrated in households as a result of WFH. Meanwhile, based on various reports and studies, it is stated that the majority of household waste has not been appropriately managed so that the burden of waste management is concentrated in the final dumping site or known in Indonesia as "*Tempat Pengelolaan Akhir*" (TPA) (Adipraja & Islamiyah, 2016; Nizar *et al*., 2016; Sulistiyorini *et al*., 2016). This is the basis so that waste management during the Covid-19 pandemic gets attention to be appropriately managed.

Based on a report from the DKI Jakarta Environmental Agency published by Kata Data (9/4/2020), the average waste from Jakarta transported to the Bantargebang TPA was 620 tons/day. This value was collected on March 16-31, 2020, with primary data from March 1-15, 2020. The decrease in waste generation in Jakarta was caused by the WFH policy as reported by the Jakarta Manpower and Transmigration Office or known in Indonesia as Disnakertrans published in the same media that 3,570 companies apply WFH with a total of 1,225,725 workers doing work activities from their respective homes. Changes in work patterns and activities from office to home impact the efficiency of the use of eating and drinking utensils. Suppose under normal circumstances the majority of companies, business centers, and offices provide catering consumption for workers with disposable wrappers or workers have to buy their food with disposable wrappers, then in WFH conditions. In that case, workers are more efficient because they can use cutlery at home, and personal drinks that are reusable, such as plates, spoons, and glasses. This is following the research of Fadhila *et al*. (2015) that consumption behavior at home is based on a belief in the hygiene of eating utensils so that a person tends to prefer eating and drinking utensils that can be used repeatedly and then clean them.

The efficiency of eating and drinking utensils is very personal by their respective habits, so it cannot be evenly distributed for all workers who carry out WFH. Thus, on the other hand, WFH is also at risk of increasing household waste generation. This problem was confirmed by the Director of Performance Assessment of Hazardous Waste and Non-Hazardous Waste Management Sinta Saptarina in an online National Seminar published by the Harian Republika (15/2/2021) that household waste during the Covid-19 pandemic increased 36%, which was dominated by an increase in waste. Single-use packaging, masks, and other waste, while waste from offices, business centers, and industries has decreased. The implementation of PSBB followed by WFH policies for non-essential sectors and space capacity limitation of 50-75% for essential sectors can reduce the waste generation in the industrial sector, business centers, and government office buildings but is followed by an increase in household waste generation. However, in general, it has succeeded in reducing cumulative waste generation.

Implications of PSBB and WFH on Air Quality

Implementing the PSBB and the WFH policy has a significant impact on the flow of community mobility in Jabodetabek. Initially, the activities of the working community were concentrated in industrial areas, business centers, and government office buildings. However, with the PSBB, the workers carried out all their activities from their homes. This encourages a change in the pattern of worker activity, which directly influences the flow of transportation in DKI Jakarta. Based on the Central Statistics Agency or known in Indonesia as *"Badan Pusat Statistik"* (BPS) (2019) data, it is reported that DKI Jakarta has 4.5% of recent migrant workers and 95.6% of recent non-migrant workers. Based on the same data, as many as 82.6% of workers in Jakarta are in the service sector, 16.6% in the manufacturing sector, and 0.8% in the agricultural sector. As many as 12.1% of workers in DKI Jakarta are commuter workers who make routine trips back and forth every day and between their residences and places of work in different districts/cities.

Commuter workers need a mode of transportation to connect between their homes and places of work; there are two significant groups of transportation modes used, namely private vehicles and public transportation. As shown in Figures 3 and 4, there has been a decrease in the number of users of the KRL Commuterline and Transjakarta public transportation modes due to the implementation of the PSBB. Large-scale social restrictions that require workers in the non-essential sector to WFH and a reduction in the capacity of essential sector workers also impact reducing pollution in various areas of Jakarta. Several road sections around industrial areas, business centers, and government office buildings experienced a decrease in Particulate Matter (PM2.5) pollutants (Table 1).

Table 1. The Drop Percentage of $PM_{2.5}$ in DKI Jakarta during the Covid-19 Pandemic

Drop Percentage	Monitoring station				
	Bundaran HI (%)	**Kelapa Gading (%)**	**Jagakarsa (%)**	**Lubang Buaya (%)**	**Kebon Jeruk (%)**
Week 1 WFH	4,44	19,87	15,62	27,80	9,44
Week 2 WFH	2,58	-1,38	-2,76	10,21	-10,86
Week 3 WFH	25,74	20,57	5,38	25,17	31,31
Week 4 WFH	3,05	3,89	5,18	27,30	20,41

Source: Inaku, 2020

Table 1 shows that the implementation of PSBB has a direct impact on reducing $PM_{2.5}$ in DKI Jakarta. A total of 5 pollutant monitoring locations in Jakarta provide information in real-time to be compared between conditions before and during the Covid-19 pandemic. The implementation of the PSBB for four weeks resulted in a change in ambient air conditions to be much better than before the PSBB. It was recorded that for four weeks, the PSBB was able to reduce $PM_{2.5}$ in various ways. The highest decrease occurred in the Kebon Jeruk monitoring station area in the 3rd week of PSBB by 31.31%, followed by the Crocodile Hole monitoring station area in the first week of PSBB implementation by 27.80%, and the HI Roundabout monitoring station area in the third week of PSBB by 25. 74. Meanwhile, in the second week of the PSBB implementation, anomaly conditions occurred where the Kelapa Gading monitoring station recorded an increase in $PM_{2.5}$ of 1.38%, the Jagakarsa monitoring station of 2.76%, and the Kebon Jeruk monitoring station of 10.86%.

In general, there has been an improvement in air quality during the implementation of PSBB and non-essential sector WFH policies, and this is indicated by a cumulative decline in $PM_{2.5}$ at five locations of air quality monitoring stations spread across West Jakarta, North Jakarta, Central Jakarta, East Jakarta, and South Jakarta. Thus, it can be said that there is an improvement in air quality in the DKI Jakarta area as a positive impact of the implementation of PSBB and WFH. Following Agus *et al*. (2019) research, the WFH policy has succeeded in reducing $PM_{2.5}$ pollutants in DKI Jakarta. The most significant factor causing the decline in pollutants in all areas of DKI Jakarta is the decrease in community mobility which has implications for the decreased intensity of private and public transportation modes on protocol roads. Suryani's research (2020), citing BBC News, stated that 43% of global emission reductions during the pandemic came from the transportation sector. This condition considers the government and the public that reducing pollutants in DKI Jakarta can be done by limiting the mobility of transportation modes. Therefore, it is necessary to transition to environmentally friendly transportation modes and mobilize people to switch from private transportation to public transportation.

Transitioning environmentally friendly transportation modes and mobilizing people to use public transportation is the best option to reduce air pollution in DKI Jakarta. If implemented optimally, public health can be improved because air pollution is one of the factors causing health problems, especially respiratory function. Improving air quality also encourages the creation of environmental stability and increases the carrying capacity of the environment to provide a more suitable living space for humans and other organisms. The stability and carrying capacity of the environment has a significant influence on the social and economic life of the community because the ecosystem is a space for all social activities. This finding is in line with Ismiyati *et al*. (2014) research that motor vehicle emissions have a significant impact on public health, so their existence needs to be limited through government policies. At the same time, there is a need for a transition to transportation modes that are more friendly to health and the environment.

In principle, social activities can run well if the ecosystem as space has resilience and stability. Ecosystem resilience can be represented by its role in overcoming the occurrence of a disaster, both natural and artificial. Ecosystem resilience is a critical variable in order to support environmental health and urban public health. A disturbed ecosystem is prone to experiencing natural phenomena that appear to signal the community to provide rebalancing efforts. Phenomena that arise include pollution of water bodies, mass death of a community of organisms, declining air quality marked by short visibility, not fresh air, and flooding. This confirms Objantoro (2016) statement that nature always gives signs of imbalances that occur, so humans should reflect on and improve the balance of nature.

One phenomenon that is directly related to the Covid-19 pandemic and the implementation of PSBB, as well as WFH, is air quality. During the Covid-19 pandemic, many people were reluctant to leave their homes even though the PSBB and WFH policies had not been implemented. Massive coverage in the media, both print and electronic, which reports on the situation and conditions in various parts of the world, puts psychological pressure on the public. The impact of this is that they prefer to reduce outdoor activities. This condition was also confirmed by Mulyadi (2020), in his research, there was found a tendency that people prefer to stay at home during the Covid-19 pandemic in order to maintain health and safety. This reached its peak when the government imposed PSBB and WFH. The implementation of the policy forced at least 1,225,725 workers to do WFH so that the protocol road was opened,

and the central business district, industry, and government office buildings were empty and even very quiet. The implication of this condition is the improvement of air quality in DKI Jakarta (see Figure 5).

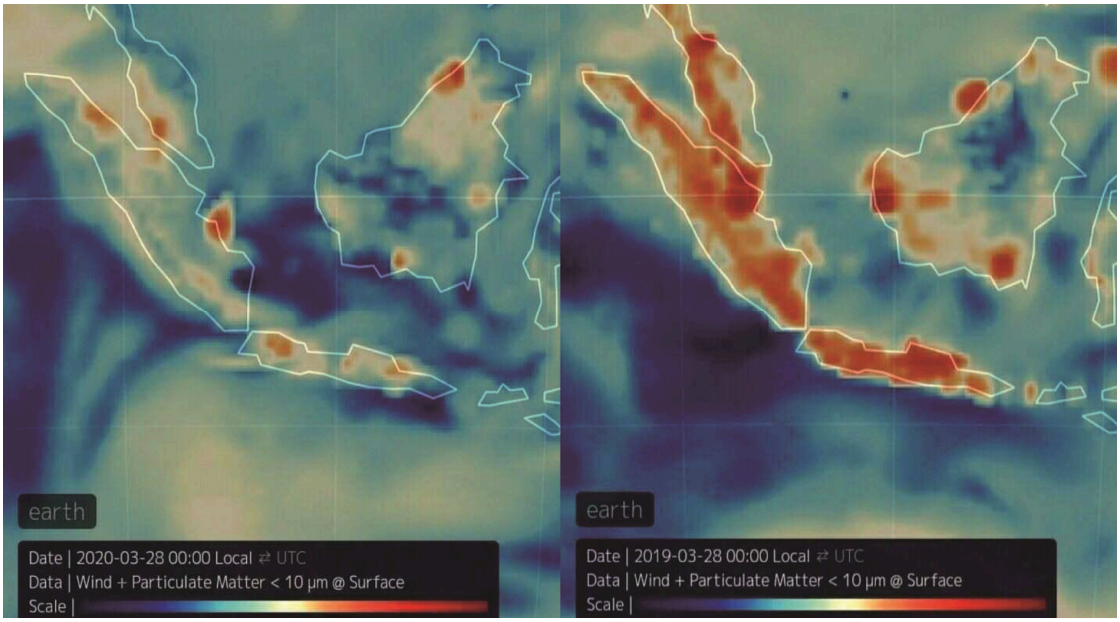

Figure 5. Comparison of Satellite Images based on PM_{10} Parameters before and during the Covid-19 Pandemic on 28 March 2019 and 28 March 2020
Source: National Institute of Aeronautics and Space, 2020 (processed)

Figure 5 shows that $PM_{2.5}$ in the atmosphere above the islands of Java, Sumatra, and Kalimantan has decreased. On March 28, 2019 (right image), Sumatra, Java, and Kalimantan were covered by $PM_{2.5}$ with a reasonably high scale indicated by a dark brownish-orange color. Meanwhile, on March 28, 2020 (left image), it can be seen that the three islands have very much better conditions, marked by a clean atmosphere above them. $PM_{2.5}$ pollutants during the Covid-19 pandemic have decreased sharply, so the air becomes much cleaner and looks clearer through LAPAN's satellite. The drop in $PM_{2.5}$ indicates that the Covid-19 pandemic provides an opportunity for nature to improve its condition after continuously receiving pollutant loads from anthropogenic activities. These conditions can be leverage for humans to make a more environmentally-friendly policy and improve air quality continuously.

Continuous improvement of air quality can be made, but it is impossible to achieve this through the continuous implementation of PSBB and WFH. More tactical efforts are needed to encourage people to use public transportation and reduce unnecessary travel. Environmentally friendly behavior in urban communities needs to be started as soon as possible because the rate of environmental degradation is moving much faster than nature's ability to repair itself and faster than human improvement efforts. Suppose repairs are not carried out correctly and effectively. In that case, the urban environment will be increasingly degraded, and it’s carrying capacity will continue to decline, and its capacity will exceed its maximum limit.

CONCLUSION

The Covid-19 pandemic is becoming increasingly difficult because the spread and transmission are still happening and are getting wider. The continuous spread has prompted the issuance of PSBB and WFH policies that directly influence people's lives and environmental stability in DKI Jakarta. Environmental conditions have a positive impact due to a decrease in electricity consumption in the industrial sector, business centers, government buildings, a decrease in waste generation, a decrease in air pollution, and improved air quality. This is very important for the balance and stability of the environment because so far, the environment's carrying capacity has been exceeded due to high human activities.

Human activities that have undergone drastic changes have had a negative impact caused by the Covid-19 pandemic. The decline in transportation users, industrial closures, business centers, and government office buildings due to WFH accompanied by a surge in household electricity consumption, increased household waste generation, and uncertainty in socio-economic conditions are negative impacts that are very difficult to deal with. The uncertainty of conditions during the pandemic provides an opportunity for humans to reflect on the behaviour that has been done and reflect on what and how they should interact with the environment in the future to encourage the realization of sustainable development. Improvements in environmental conditions during the pandemic may only be temporary if humans fail to reflect on the transition to an environmentally friendly lifestyle after the Covid-19 pandemic. It requires commitment, cooperation, and support between parties so that the pandemic period can be passed by minimizing negative socio-economic impacts and optimizing positive environmental impacts to realize sustainable development.

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