WORKING REPORT

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COVID-19 and the Environmental Impact in Indonesia

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Abstract

The environment is an integral component of human security. The emergence of COVID-19 as a global health challenge in the twenty-first century has had polarizing repercussions on the health of the environment. While lockdown measures have helped to reduce air pollution, restrictions on movement have increased the frequency of online shopping, which in turn, has increased the amount of plastic packaging used. The increasing prevalence of disposable personal protective equipment (PPE) made from plastic, such as masks and gloves, has further added to the amount of plastic waste produced during the COVID-19 pandemic. As one of the biggest emitters of plastic pollution, Indonesia has had to deal with an increase in plastic waste during the pandemic. This article will analyze the implications of COVID-19 on environmental security in Indonesia. Following a case study on the increase in plastic pollution and its effects on the environment, the article will provide a brief explanation of the lessons learned during COVID-19 and policy recommendations to address the resulting environmental and human security threats.

Keywords: COVID-19, Environmental Security, Plastic Pollution, PPE.

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1. Introduction

Environmental security is an emerging concept that has its roots in the development of the human security concept during the post-Cold War period. Human security is a concept that extends the referent object of security from nation-states to include individual human beings. The human security concept aims to ensure that the needs of individuals are ensured in relation to the economy, politics, food, health, environment, as well as the community. It sets normative standards of security that guarantee individual persons not only their freedom from fear and want but also their dignity and empowerment in society (Mine, Gómez, and Muto 2019). In formulating solutions to crises such as the COVID-19 pandemic, human security calls for people-centered, comprehensive, and context-specific measures that strengthen the protection and empowerment of all individuals and communities (UNGA 2012).

Human security is also a concept that is formed as a norm-complex, which means that it is comprised of various norms from different aspects of human life, such as those mentioned above, and that these norms and components are all interconnected. Thus, disruption to the security of the environment, for instance, is one aspect that affects human well-being and can consequently threaten the security of individuals. Sources of threats to human security can be derived from the earth's natural systems, the living systems of plants and animals, as well as a social system that is anthropogenic in nature (Mine, Gómez, and Muto 2019). In this sense, threats to human security can be derived from environmental insecurity.

Environmental security regards the natural ecosystem as the main object to be protected (Dermawan et al. 2019). In this context, sustainability of the natural environment is a value that needs to be maintained or achieved. Thus, humankind is perceived to be the main source of threats and our behavior can threaten the security of the environment (Brauch 2005). Despite perceiving humankind as a threat, however, environmental security still sees human anthropology and natural

conditions as having a reciprocal relationship. The threats to humanity resulting from the damage to the natural environment are mostly caused by human actions. This means that humans can be both the victim and the cause of the environmental insecurity.

Natural events such as earthquakes and man-made events such as deforestation can have significant effects on the stability of the natural ecosystem and the overall security of the environment. Like these two challenges, the newly discovered COVID-19 infection among humans, which had become a global pandemic by January 30, 2020, has affected the overall security of the global environment in the 21st century, both positively and negatively.

COVID-19 is the third highly pathogenic coronavirus to have infected the human population in the twenty-first century (El Zowalaty et al. 2020). The virus initially infected humans through animal-to-human transmission. It continues to spread globally through human-to-human transmission, whereby the respiratory droplets of the infected person are the most likely vehicles of transmission. The droplets carry the virus into the air and can linger on various types of solid surfaces. When a person is exposed to the infected droplets or surface, the virus can then enter the human body through the nose or mouth. Once it enters the body, it can cause inflammation in the lungs, causing damage that may lead to death. To date, there have been more than 100 million COVID-19 cases, with more than 2 million deaths worldwide (Worldometer 2021). It has led to one of the largest quarantines in the 21st century after the MERS pandemic. Despite the COVID-19 pandemic being a global health emergency that will have severe consequences for the global economy, it has also created disruptions to the natural environment.

2. Case Study on the Environmental Impact of COVID-19 in Indonesia

There have been very divergent repercussions of COVID-19 on the environment in Indonesia. On the positive side, directives to maintain physical distancing and large-scale quarantines have led

to a substantial reduction in commuter travel and shifted many jobs shift from the office to the home under work-from-home directives. The large-scale travel restrictions imposed by the majority of countries affected during the first months of the global pandemic led to a 25% decrease in air pollution emissions globally from motor vehicles, such as cars, motorbikes and trucks (El Zolawaty 2020; Khan, Shah, and Shah 2021; Rugani and Caro 2020; Zambrano-Monseratte 2020).

Moreover, international air travel was substantially reduced by between 60% and 95% due to travel restrictions. This resulted in a big decline in CO2 concentration in the Earth's atmosphere (UNCTAD 2020). The reduction in air pollution during quarantine can be seen in the clear skies over cities previously affected by emissions from intensive industrial activities. The lockdown policy that still continues in some parts of the world demonstrates the direct relation between air pollution levels and economic activities that come from the energy consumption of industrial factories and transportation.

Other than reduced air pollution, there has been improvement in the water quality of rivers around the world that had been heavily polluted before the pandemic. The closure of factories and commercial establishments, such as those comprising tourism industries, has led to reductions in water pollution from chemicals and waste produced as a result of such activities. It is perceived that reductions in water pollution will have positive effects on aquatic life in the sea and rivers across the globe. Scientists, however, are still conducting research on the detailed effects of lockdowns on marine life (Khan, Shah, and Shah 2021). These positive impacts of COVID-19 lockdown policies on the environment have provided opportunities for countries to undertake reforms of how they conduct their economic activities so that they will be able to maintain the improved quality of the environment that has resulted from reduced economic activities, even after the pandemic has been resolved.

Table 2.1 Positive and Negative Consequences of COVID-19 Pandemic and Lockdown Measures on The Environment

Positive impacts	Negative impacts
• Increased outdoor air quality	• Decreased indoor air quality
• Decreased pollution noise	• Increased medical waste
• Decreased household food waste	• Decline in waste recycling with increase in incineration and landfilling
• Decreased energy consumption and GHG emissions	• Increased disinfection routines with hazardous chemical substances in household and outdoor environments
• Global decrease in wildlife trade	• Increased ecological risk to natural ecosystems due to the use of disinfectants
• Reduction in deforestation	
• Increase in surface water quality	

Source: Patrício et al. 2020.

As demonstrated above, the environmental security context perceives humans as the main source of environmental threats, mainly as a result of human industrial activities that exploit natural resources and generate pollution output. Therefore, reductions in the intensity of anthropogenic activities are seen as a necessary means of preventing environmental stress from pollution and natural resource extraction. The lockdown imposed during COVID-19 has slowed industrial activities and reduced worker commutes, giving the natural environment a break from the exploitation and pollution generated by human economic activities. In this sense, COVID-19 has created a positive disruption in the form of carbon footprint reductions, thereby emphasizing the direct linkages between human activities and sustainability of the natural environment. Table 2.1 indicates the positive and negative impacts of COVID-19 on the environment.

Contrary to the positive impacts of lockdown on the environment, there are several negative impacts that have occurred as a result of shifts in consumption patterns due to the restrictions on movement. The most prevalent and observable negative impact of the lockdown emerged from the increased waste from single-use medical equipment and plastic packaging for online shopping

or take-away consumption. This has exacerbated the existing problem of waste mismanagement, creating negative impacts on the environment (Dwinantoaji, and Sumarni 2020). During the COVID-19 lockdown, the prevalent use of plastics for packaging of online deliveries and personal protective equipment (PPE), including facemasks, has resulted in a huge increase in the amount of plastic waste produced globally (Praveena, and Aris 2021; Klemeš et al. 2020). In Indonesia alone, there has been a 30% increase in medical waste generation comprised of plastic PPE during the first wave of the COVID-19 lockdown (Sutrisno, and Meilasari 2020). This surge in plastic medical waste is accompanied by an underprepared plastic medical waste management system, increasing the effects of waste mismanagement and microplastic contamination from the estimated 159 million medical facemasks that have been produced since the first COVID-19 patient was identified in Indonesia (Sangkham 2020; Aragaw 2020). The mismanagement of plastic waste from PPE adds to the burden of the existing national and global plastic pollution problem that persists in the environment (Turner, Arnold, and Williams 2020). This additional problem poses more threats not only to the environment but also to the health, social and economic well-being of the global public, as plastic can be carriers of toxic and carcinogenic pollutants (Graca et al. 2014; Thaysen et al. 2018).

In addition, despite the claim that the lockdown measures have helped in decreasing the amount of the illegal trade in wildlife and deforestation, a prolonged absence of environmental protection workers in national parks and conservation zones following stay-home orders may have increased opportunities for illegal fishing, deforestation and the hunting of wildlife (UNCTAD 2020). With the stoppage or massive reduction of ecotourism activity, people who economically rely on the income from tourism may seek alternative means to provide their households with food and an income. This may further increase the risk of fragile ecosystems being exploited, which could in turn also contribute to the increase in illegal activities that disrupt the environment and the well-being of the natural ecosystem.

3. COVID-19 and Plastic Pollution in Indonesia

The issue of plastic pollution had become one of humanity's greatest challenges even before the COVID-19 pandemic. The greatest issue of plastic waste during the pandemic has been the massive amount of waste from plastic personal protective equipment, such as masks and gloves, being mixed in with normal household waste (Ouhsine et al. 2020) and littering of the natural environment as well as residential areas. Recently, images of plastic PPE waste piling up in rivers and dumpsites, particularly in areas of Indonesia where the number of COVID-19 cases are high, have been circulating on the media. From this phenomenon, a clear link between inequality and vulnerability can be identified. Those who are the most affected by pollution are at the same time at the greatest risk of having severe symptoms of COVID-19. Therefore, their pre-pandemic environmental vulnerability caused by existing inequality continues to undermine their health and resilience even in times of the COVID-19 spread.

Indonesia is the second biggest polluter of plastic waste in the world after China (Jambeck et al., 2015; Lebreton et al. 2017). With a population of more than 270 million people and rapid urbanization, Indonesia generates more than 63 million tons of plastic waste per year and between 552 thousand–1.29 million tons of this leaks into the ocean, creating problems for the marine ecosystem (Ministry of the Environment and Forestry RI 2020; World Bank 2020). Plastic waste mismanagement and leakage into the ocean have occurred as a result of the absence of sufficient waste management infrastructure with the capacity to manage the increasing waste generation in Indonesia. The plastic waste problem has led to economic losses for Indonesia that amounted to US$138 million in tourism in 2018 alone and has posed a threat to the sustainability of both land and marine ecosystems.

The risk posed by COVID-19 to achieving such targets in waste reduction has become apparent from the huge increase in waste from PPE and food packaging. The large-scale lockdown imposed

through Government Regulation No.21/2020 during the pandemic has caused a paradigm shift in the form of waste generated, whereby single-use plastic waste from medical equipment such as masks, plastic face shields and hazmat suits, as well as single-use packaging from online shopping, have comprised a large portion of plastic waste generation. Plastic PPE waste has been found in rivers that flow past the Jakarta, Bogor, Depok, Tangerang, and Bekasi (JABODETABEK) areas, such as the rivers Cilincing and Marunda that lead toward the Jakarta Strait. A 5% increase of waste in the this river system occurred over the course of the two months at the beginning of the pandemic, March to April 2020 and 46% of the waste consist of plastic PPE (Cordova and Nurhati 2020). As can be seen from Table 3.1, during the first two months of lockdown measures in Indonesia, the largest contributor of plastic PPE to waste generation in the Cilincing and Marunda Rivers was comprised of medical masks, followed by plastic raincoats likely used as replacements for hazmat suits.

Table 3.1 The Percentage of Total Waste and Composition of PPE Waste Found at the Mouth of Cilincing and Marunda Rivers in March – April 2020

Types of PPE Waste	Marunda				Cilincing		
	Amount (%)		Weight (%)		Amount (%)		Weight (%)
	March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	March 2020
Cloth Masks	0.89	0.86	0.97	1.96	1.09	1.05	0.84
Scuba/Sponge Masks	2.68	3.43	1.36	2.03	2.73	3.14	1.28
Medical Masks	5.36	6.87	1.94	2.16	4.92	6.28	2.29
Gloves	2.68	1.72	1.4	0.7	2.73	3.14	1.28
Hazard Suit Materials	0.89	0.86	4.01	3.7	1.09	1.05	4.63
Raincoats (replacement for Hazmat suits)	1.79	2.58	5.55	6.48	1.64	2.62	3.13
Face Shields	0	0.86	0	0.56	0	1.05	1.49

Source: Cordova et al. 2020.

The waste generated from single-use PPE, especially waste that comes directly from hospitals, can be very hazardous due to its high virus transmissivity. The existing waste management infrastructure that is currently being developed will need to address the added burden from the increases in plastic waste in a timely manner, so as to reduce waste mismanagement. As of 2019, 1220 hospitals out of 2861 hospitals in Indonesia had installed a hazardous waste management system that complies with government standards. This only amounts to 42.64% of hospitals in Indonesia that complying with government standards. Areas such as Aceh, Maluku, Jambi, Riau Islands, West Java, North and South Sumatra, East and West Nusa Tenggara, Papua, West and South Kalimantan, as well as Southeast, West and North Sulawesi report lower percentages (below 28%) of compliance compared to other parts of Indonesia (Sutrisno et al. 2020). The low rate of hospitals complying with a standardized waste management system represents an added challenge to a health system that has proved insufficient to handle the rapid increase of infected patients (Shidiq 2020). If mismanaged, plastic waste from PPE can pose a risk to public health, as waste can be a carrier of COVID-19, which can survive for up to 3 to 21 days on plastic surfaces depending on the type of plastic (Tripathi et al. 2020).

Furthermore, based on a survey conducted by LIPI, plastic waste generation in the JABODETABEK area during lockdown measures increased twofold compared to the amount before the lockdown was implemented. The surge was mostly caused by the increase in online shopping, which rose from 4.6% to 34.6%. Of the packaging used for delivery, 96% is comprised of plastic (Nurhati 2020).

4. The impacts on river systems

The waste management issues posed by COVID-19 have direct effects on rivers and other major waterways in Indonesia, such as the Citarum River. Citarum River is the largest and longest river in the West Java province of Indonesia. Since the year 2002, Citarum River has been well-known

as one of the world's most polluted rivers due to the high contamination of toxic chemicals and a huge amount of debris. The accumulated plastic waste flowing into the river creates the potential for flooding, since it obstructs river flow. Floods in the upstream level of the Citarum River Basin are an annual problem. These floods have occasionally hit some areas along the Citarum River Basin, which included areas located near the Cikapundung River, a tributary of Citarum, such as the Dayeuhkolot District, Baleendah District and Bojongsoang District (CSEAS 2020). The COVID-19 pandemic has disrupted the rehabilitation of Citarum (Aqil 2020). Citarum River has also suffered from the presence of plastic PPE waste, as the waste flow has not receded with an addition of waste from other waterways (Rizaldi 2020). The massive amount of pollution found in Citarum River will requires strong and concerted effort to resolve.

To further illustrate the impact an increased amount of plastic waste from PPE on the environmental security as well as the livelihoods of the people living within the vicinity of the affected areas, this paper will consider the example of the impact of pollution in the Citarum River in more detail. As Indonesia's most strategic river, the Citarum is the source of water for the Jatiluhur Reservoir, which has 3 billion cubic meters of storage capacity and is Indonesia's largest reservoir. The reservoir not only supplies clean water for the Bandung area but also provides 80 percent of the water supply to the capital city of Jakarta. As people depend on the water from the Citarum River, heavily polluted water more than 27 million people at risk of various skin diseases, ranging from scabies to infections, not to mention respiratory distress from inhaling factory smoke. In addition, poor water quality due to waste and pollution also damages the crops of farmers (CSEAS 2020). The people living in the margins of affected environments from plastic waste pollution such as the residents that rely on Citarum River for their water source, are vulnerable groups likely to feel the negative environmental impacts from the pandemic directly, and they need to be protected. The spread of infectious waste from plastic PPE will also make these groups more prone to the virus and aggravate the occurrence of floods as an increased in the amount of

waste that piled up in waterways would decrease the absorption of water runoffs.

The social groups that are most in danger of the negative effect of plastic pollution on their health and environment often come from middle to lower-income households, as this demographic is more likely to live in polluted slum areas. Such groups may expand and are prone to being pushed further below the poverty line due to the economic effects that COVID-19 brings. The economic shocks that have emerged from COVID-19 started as a negative supply shock resulting from the reduced production capacity due to lockdown and an increase in the number of infected workers (Hausmann 2020). According to research conducted by Atkeson (2020), when 10 percent of the population becomes infected, and key economic infrastructure faces severe staffing shortages. People who are employed in low-wage sectors or informal jobs are likely to be the most vulnerable to cuts in employment. This has implications for the recovery efforts to not only return the pace of plastic pollution reduction, but also to eradicate poverty that is regarded as a factor that could intervene the progress of achieving plastic reduction targets (Lema 2019; Hodal and McVeigh 2019). COVID-19 can lead to economic shocks that affect the incidence of poverty, including a decline in economic growth, which in turn reduces average household expenditures along with its distributional impact.

It cannot be denied that plastic packaging has become an essential component of household products bought by lower to middle income groups. Concerns over the role of reusable plastics as vectors for COVID-19 transmission have contributed to the reversal, strongly supported by the plastic industry, of complete bans on single-use plastics, (Prata et al. 2020). Assessment of contamination and the impact of plastic waste increase driven by the pandemic, however, needs to be carried out once the pandemic is over to provide a detailed information on the characteristic main drivers of plastic waste contamination during the pandemic, especially those that are derived from PPE (De-la-Torre et al. 2020). Thus far, one major finding on the impact of waste

management on the spread of virus that has been identified is that a 72-hour delay in the collection and disposal of waste from infected households and quarantine facilities is crucial in controlling the spread of the virus (Mofijur et al. 2021).

5. Conclusion and Lessons Learned

The increased potential of mismanaged plastic waste during the pandemic should be seen as a challenge to the current efforts in addressing both the pandemic and plastic pollution. This issue urgently needs to be overcome to reach the target of single-use plastic reductions that each nation has set in order to achieve a holistic environmental as well as human security. As the number of COVID-19 patients has not yet been fully curbed and is predicted to continue increasing, the implementation of a comprehensive and robust waste management strategy for medical and non-medical plastic waste needs to be accelerated. This will help to prevent the spread of contaminated of plastics that can be a potential pathogen-carrier, thereby reducing the spread of the virus (Canning-Clode et al. 2020). Careful planning and strict implementation of standards, procedures, and guidelines on how to dispose of medical waste, such as facemasks, is needed in all stages of waste management, including separation, storage, collection and disposal. In making decisions on containing the surge of plastic pollution from PPE during COVID-19, governments and stakeholders should consider both environmental security as much as the human security aspects the population.

Indonesia's heavy reliance on the informal sector for waste collection and recycling needs to be evaluated, as it can pose further risks and hinderances to the sustainability and resilient growth of recycling facilities during and after the pandemic. One key point that can be addressed by the government is the need to implement measures that ensure everyone's easy access to and participation in conducting proper waste management, especially for medical waste, to curb the spread of the virus as well as the mismanagement of waste. It should be emphasized that the

responsibility to manage waste should not be placed only on the informal sector and waste processors. Instead, efforts should promote behavior change in the society towards plastic consumption and waste disposal, thus avoiding the increase in plastic pollution (Borg 2018; Heidbreder et al. 2019; Paterson 2019). It is necessary for individual consumers and well as plastic producers such as the packaging industry to start using products that are sustainable and friendly for the environment.

In Indonesia, the plastic packaging industry is one of the main contributors of plastic waste, as more than 50% of the plastic waste that circulates, originated from the packaging of food and beverage industry (UNEP 2018). Hence, it is crucial to strengthen policies that push for a more sustainable packaging production, such as the implementation of a circular economy and extended producer responsibility regulation (Bassi et al. 2020). This goal is stated in Ministerial Regulation No. 75/2019, regarding the road map for plastic reduction by producers. Moreover, clear instructions and information accountability, such as the need to "rest" plastic waste from PPE for at least 72-hours and regulations along with reasonable financial aid, if possible, should be consistently applied, supported by proper research, routine evaluation and monitoring (SMERU 2020a).

The government can also create a robust contingency plan to brace for disruptions that may emerge from the pandemic to the waste management system in the future (Tsukiji et al. 2020). The plan should consider both short-term and long-term actions related to the implementation of healthcare or hazardous waste management. Government agencies in charge of COVID-19 mitigation measures need to practice clear and firm oversight, from the national down to the local levels, in managing strategic resources crucial to curbing the virus, such as medical personnel and facilities (SMERU 2020b). A survey across hospitals, waste management stations and social demographics, particularly of those who live in areas vulnerable to waste mismanagement, should

be conducted to map out the shift in sources of waste generation and identify the changes in the waste amount/ flow. The survey result could then help to increase the efficiency of the use of resources by improving or maintaining the existing waste management system. This may assist in preventing health risks from an increased amount of waste should there be any service interruptions of waste collection and treatment in the future. In developing such contingency plans, the government should also include the livelihood protection of both the formal and informal sector workers who are involved in the provision of services related to the waste management system to ensure their holistic inclusion (EEA 2020).

Collaboration between stakeholders from various fields related to environmental management is key throughout all of the stages of addressing the plastic waste problem in Indonesia.

The impacts of COVID-19 and environmental change require the explicit consideration of the exposure of individuals and groups to climate change and variability. The slum dwellers are especially vulnerable. Slum dwellers who live along riverbanks are particularly exposed to the increased risks of flooding and land subsidence risks that will be amplified by COVID-19 and global environmental change. The majority lack access to potable water, while many of those who do have access face inadequate supply. The reliance on local waterways and wells exposes slum dwellers to the health risks associated with decreases in water quality.

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