





Domestic Facemask Waste Policy Based on Environmental Ethics in the Covid-19 Pandemic: Urgency and Challenges

Absori ¹, Kiara Hanna Quinnilla ¹, Heru Santoso Wahito Nugroho ², Arief Budiono ¹

¹Department of Law, Universitas Muhammadiyah Surakarta, Surakarta, Indonesia; ²Department of Midwifery, Poltekkes Kemenkes Surabaya, Surabaya, Indonesia

Correspondence: Arief Budiono, Universitas Muhammadiyah Surakarta, Surakarta, A Yani Street, Pabelan, Surakarta, 57102, Indonesia, Email ab368@ums.ac.id

Introduction: The Covid-19 pandemic greatly affected various aspects of life. To prevent and control its spread, people are morally and legally obliged to wear face facemasks. The use of facemasks brings many waste problems. However, the Indonesian policy on facemask waste management does not regard the massive environmental consequences, as the amount of domestic facemask waste reaches hundreds of tons daily with limited management capacity application. Hence, this study aims to assess current issues and policies on facemask waste from the perspective of environmental ethics.

Methods: This research used the juridical-normative method, where legal rules and principles were processed to address current issues, supported by literature sources. This research employed qualitative approach to collect and analyze data.

Results: Results showed that there was a legal void which caused terrible facemask waste management in Indonesia. There was confusion in categorizing facemask waste, whether it is domestic or infectious waste, causing hazards in its management. From a deep ecology perspective, the applied facemask waste management was only beneficial for humans while completely neglecting biotic and abiotic components. To overcome this, several suggestions were: 1) categorizing domestic disposable facemask waste as hazardous waste, 2) applying sanctions for the violation of norms and tight social control on first-level management of facemask waste, and 3) using reusable facemask.

Conclusion: The obligation of wearing facemasks that were protective for humans during the Covid-19 pandemic must be followed with policies regulating facemask waste management that consider the environment and its biotic and abiotic components.

Keywords: policy, facemask, waste, covid 19, environment, health

Introduction

The spread of the coronavirus disease 2019 (Covid-19) caused global health and environmental impact. Covid-19 is a highly infectious disease that is transmitted through droplets that infect the respiratory system. The symptoms that occur vary, starting from light symptoms such as flu, lung inflammation, and even systemic symptoms.¹ This disease emerged from Wuhan City, China, and originated from an animal host (zoonotic). Then, it mutated into a disease that may be transmitted between humans.² In a matter of weeks, the Covid-19 spread to various countries worldwide. On April 17th, 2021, the World Health Organization (WHO) stated that there were 139,501,934 confirmed Covid-19 cases worldwide, with 2,992,193 deaths.³

The Covid-19 pandemic greatly affected various sectors, including economic, political, environmental, and even legal ones. The government made various efforts to control this disease as a health emergency response, including by issuing governmental policies, namely the Governmental Decree No. 21/2020 on the Large-Scale Social Restrictions to Accelerate the Handling of the Coronavirus Disease 2019 (Covid-19) and Decree of the Ministry of Health No. 9 of 2020 on the Guidelines of the Large-Scale Social Restriction to Accelerate the Handling of the Coronavirus Disease 2019

(Covid-19).⁴ The Large-Scale Social Restrictions caused a great loss to the economic and tourism sectors. Various activities then used the online system, including court trials (e-court).⁵

Apart from Large-Scale Social Restrictions, the use of facemasks has become a legal and moral obligation. It was based on the Decision of the Ministry of Health No. HK.01.07/MENKES/382/2020 of 2020 on Health Protocols for the Society at Public Places and Facilities to Prevent and Control the Coronavirus Disease 2019 (Covid-19). This Ministerial Decision states that health protocols must generally contain stipulations on the use of self-protecting instruments in the form of facemasks that cover the nose and mouth, up to the chin, when leaving the house or when interacting with other people whose health statuses are unknown. Violators may even be imposed with legal sanctions according to Law No. 6 of 2018 on Health Quarantine Article 9. This law states that "Every person who does not comply with the establishment of health quarantine as stated in Article 9 clause (1) and/or inhibiting health quarantine that causes health emergencies will be imposed with imprisonment for 1 (one) year and/or fines with the maximum amount of Rp 100,000,000 (a hundred million rupiahs).

In Indonesia, around 80% of society complied with the obligation to wear facemasks. They used either disposable or reusable (fabric) facemasks, to maintain their health and the health of their surroundings. But facemask usage caused great environmental consequences due to the highly increasing amount of facemask waste. Up to July 31st, 2020, Indonesia produced 420.03 tons of facemask waste daily, consisting of 159,214,791 pieces of disposable facemasks.⁶ Similar conditions were found around Asia, including in the Philippines, Bangladesh, and India.^{7,8}

Not stopping at the quantitative aspect, domestic facemasks may also potentially be an infectious waste. The domestic facemask waste is in a grey zone – it is between medical and domestic waste. These facemasks were used by society in general which was regarded as uninfected by Covid-19. Thus, the waste did not require special management and it was collected with other domestic wastes. At the same time, the government cannot screen all citizens; thus, there was no guarantee that a person who did not show symptoms was free from Covid-19. This meant that the disposable facemask waste may potentially become a medium that causes the infection and the spread of Covid-19.

The domestic waste of disposable facemasks may also cause long-term impacts. The greatest factor that contributes to the facemask waste issue during the Covid-19 pandemic is the grey-zone categorization of the facemask waste, causing policy confusion in managing that waste. However, there has not been any research analyzing the existing policies in Indonesia regarding facemask waste management. Hence, this study aims to give a solution for managing the facemask waste to prevent the worsening condition of the present system.

Methods

This research was conducted from June 2020 to July 2021 in Central Java Province, Indonesia. This study used the juridical-normative method where legal rules and principles were processed to address current issues. Normative legal research is a scientific research procedure to determine facts based on scientific logic from the normative aspect. The normative aspect in this case was not limited to mere legal regulations. As stated by Marzuki (2005), research with the normative juridical method did not only study positivist laws.⁹ Norms were not merely defined as the positive law, ie, the regulation made by politicians that have a higher position or regulations enacted by the authorities as stated by Hans Kelsen.¹⁰ Based on this opinion, normative juridical legal research strives to find facts on legal norms and policies which contain obligations and sanctions related to the issue of the policies on facemask waste.

This research, which concerns the facemask waste issue during the Covid-19 pandemic, was supported with high-quality literature regarding facemask waste in Indonesia and its management. It was crucial to utilize research from international researchers as sources. Many studies on different aspects of solid waste management amid the Covid-19 pandemic were available, especially to answer the following questions: What has been done? What is left to be done and why?

The data were taken from laws, policy releases, as well as data from existing reports on the handling of facemask waste which steeply increased due to the pandemic. The writers also obtained data from previous research on the handling of facemasks and plastic waste from various countries. Then, the researchers conducted a descriptive analysis of the available data to discover facts and the ideal concept of policies in handling this case.

Results

The Reality of Facemask Waste During the Covid-19 Pandemic

The public use of facemasks during the Covid-19 pandemic was a preventive effort against the spread of the disease. There were generally two types of facemasks that society wore: disposable and reusable facemasks (with fabric material that can easily be disinfected and washed). An environmental problem occurred due to this pandemic, caused by disposable facemask waste.

There has not been any concrete data on the percentage of the public that chose to use disposable facemasks. But in Asia, 2,228,170,832 disposable facemasks have been used, where Indonesia stood at the third rank of the country that used the most facemasks (after China and India).⁶ Even, in the first 60 days of the pandemic in Indonesia, 12,740 tons of medical waste was produced in Jakarta.¹¹

Based on other findings from previous research, for comparison, in the city of Baguio, the Philippines, most respondents (48.7%) used two facemasks per day. Thus, an estimated 417,834 facemasks were disposed of daily, generating 3,585 kg of additional waste every day. The average medical waste of Covid-infected individuals was 3.29 kg per day per capita.⁸ The increase in facemask waste was in essence due to the change of the people's demand for facemasks. Instead of the continuing policy of fighting unknown viruses during the pandemic, it shifted to preventing known threats, controlling the spread of the pandemic, and meeting people's daily needs. This showed that the position of masks changed, originally from disposable medical appliances to the commonly used items in life.¹²

The extensive usage of masks, sanitizers, and synthetic-based personal protective equipment (PPE) kits by healthcare professionals and the overall community has resulted in massive amounts of plastic trash, with no effective measures or policies in place to reduce its severity. It is commonplace to wear face masks as a way of protecting oneself against Covid-19. However, because mask disposal techniques (ie, burning and reclamation) produced dangerous chemicals, the huge production of contaminated facemask waste posed environmental challenges. Furthermore, disposable masks were prepared using a variety of materials that were either non-recyclable or difficult to recycle. Therefore, it was crucial to comprehend the scope of the problem and it was equally essential to devise a viable solution to contribute to the creation of a sustainable environment.¹³

Some regional governments, especially the Jakarta Special Capital Region Province, were aware of that issue. The facemask waste was manually taken from home to home. They were then sorted by Environmental Service workers. Then, the Environmental Service worked together with hazardous waste managers to eradicate the thousands of tons of facemask waste through incineration.^{14,15} Unfortunately, this caused new problems. The increasing amount of disposable facemask waste also increased the need for incineration. Incineration will increase the production of particulates, as hundreds of tons of gases (CO₂, S₂O, etc.) are emitted to the sky, polluting it. Also, the ashes of the incinerator pollute the waters.¹⁶

Some other regions in Indonesia have trouble handling the steep increase in facemask waste. People of Tulungagung Regency, East Java Province dumped hundreds of kilograms of facemask waste at the Segawe Landfill.¹⁷ Then, many people from Cirebon and Bogor, West Java Province, littered the facemask waste. The people's lack of waste sorting and also the lack of waste management (due to limited funds, shipping services, human resources, permits, and depot search of hazardous waste) were obstacles that occurred in various areas in Java.^{18,19}

The Ministry of Health issued guidelines to manage people's facemask waste at the domestic level. It stated that the facemasks used by the public were not categorized as medical waste that was treated in health service facilities. Thus, they were categorized as domestic waste. The recommendation on the domestic facemask waste management was as follows:

- a. Collect the used disposable facemasks.
- b. Disinfect the used facemasks by soaking them in disinfectant/chlorine/bleach solutions.
- c. Change the form of the facemask waste by collecting it in safe plastic pouches, then rip the string and the middle part so that they cannot be reused.
- d. Dispose of the used facemasks into a domestic waste bin.
- e. Wash hands using soap and water, or use hand sanitizers if the two are unavailable.

Aside from the government-issued suggestions, for a long time, society did not comply with the protocol for disposing of used facemasks. Domestic and facemask waste were mixed. Later on, the rubbish cleaners manually sort out the waste. On top of that, much facemask waste was accumulated in the environment due to society's littering behavior. There was a significant accumulation of facemasks waste at Jakarta Bay and the riverbank of the Ciliwung River.²⁰ Hence, not only did society need to be educated on facemask waste sorting and sterilization, but also the basic education on disposing of waste at the right places.

The facemask waste produced during the pandemic was not only a medium of infection, but it was also a great environmental threat. Up to July 31st, 2020, Indonesia produced 420.03 tons of waste in a day, consisting of 159,214,791 pieces of disposable facemasks.⁶ These facemasks were made of polymer material that may be degraded into smaller particles due to environmental conditions (temperature, humidity, etc.). These littered disposable facemask waste may be dragged into the sea, increasing the amount of macroplastic that will then degrade into microplastic in the freshwater and seawater areas. These microplastics contain hazardous chemicals such as phthalates, organotin, triclosan, etc. These compounds will be released in the degradation process, impacting the flora and fauna in the related environments, including fish, that will then be consumed by humans. Apart from that, the microplastic may become the proliferation of microbes, thus they may become a source of Covid-19 transmission.²¹ This problem may also impact the economic sector. The existence of facemask waste in various environments requires special treatment and handling to clean and sort, especially in aquatic areas. This activity certainly required some funds.

Another problem that arose was that facemask waste was at the same time regarded as infectious waste. Thus, it cannot be recycled. Infectious waste is a material that may contain pathogens (bacteria, viruses, parasites, and fungi) in adequate concentration or quantity that may cause diseases in hosts that are prone to infection. It also included waste that was contaminated with blood, body fluids, tissues, sharp parts, and objects for therapy, diagnoses, etc.²² Thus, they posed dangers to the health of the people if they were not handled right. In Indonesia, the facemask waste was disposed of and managed with other domestic waste, though the facemasks contain the respiratory droplets of the users. Because of the government's lack of capability to screen all citizens; thus, there was no guarantee that a person who did not show symptoms was free from Covid-19. Thus, the disposable facemask waste may potentially become a medium that infects and spreads Covid-19. This caused uncertainty in the classification of facemasks used by the public. They were in a grey zone between medical waste, hazardous waste, and domestic waste.

The disposable facemask waste must be given special treatment in the form of sterilization before recycling. The long recycling stages of the disposable facemasks were not a quick solution to managing this waste. Even before the pandemic, with waste that was more easily managed, 52% of the waste was unrecycled each year.²³ From that data, the classification of domestic facemask waste was inconsistent. In the first-level management, the domestic disposable facemask waste was regarded as domestic waste that did not require special handling. Then, at the next stage, the facemask waste was separated and unrecyclable as they were regarded as infectious waste, thus they needed to be recycled before becoming a solution to the management of domestic facemask waste. The disposable facemask waste may cause environmental problems that do not only stay during the pandemic but may cause problems for future generations. Thus, there needs to be legal systems, regulations, and products to handle this phenomenon.

Environmental Ethics

Environmental issues increase in line with the development of the post-modern world and industrialization. In line with these changes, ecologic philosophies also grow. As a form of systemization of reasoning experience, philosophy determines the people's way of thinking, which will then determine the direction of the environmental policies that will be formed. Most environmental disasters happen due to people's wrong way of thinking in perceiving nature and its management. As stated by Albert Schweitzer, "The greatest error of the ethics so far is that they only discuss interhuman relations". Thus, the environmental ethics that will be embraced must be chosen to become guidelines for forming sustainable environmental policies in Indonesia. Thus, it is time to leave the anthropocentric environmental ethics. Anthropocentrism is environmental ethics that emphasize humans and their interests, with nature as objects or instruments to facilitate humans. Nature does not have its own value except to support human quality of life. This way of thinking is so destructive. Then, biocentrism develops.

Biocentrism does not only emphasize the interests of humans but also those of other living creatures on earth, namely flora and fauna. From the perspective of this ethics, creatures other than humans have their own intrinsic values. All creatures are regarded as valuable as opposed to merely regarding humans as valuable. Thus, the environmental perspective is not only exploitative but also reservative.²⁴

This paradigm shifted to become the ecocentrism philosophy. It does not only emphasize biotic aspects but also non-biotic ones. Water, air, and earth also have their own intrinsic values. The ecocentrism theory that is most prominent today is deep ecology which was introduced by Arne Naess in 1973. This concept is a new breakthrough as it brings some new ideas. First, humans are no longer the center of morality, but it encompasses all species and biospheres as a whole. It does not only prioritize short-term interests but also long-term ones. Sustainability becomes the main focus of the deep ecology. Second, deep ecology is practical ethics. Thus, it cannot only be manifested in the realm of ideas or moralities but it must be manifested in life. Third, the world is regarded as a comprehensive thing, in contrast to a set of separated parts. Thus, the deep ecology concept has a special characteristic compared to other theories, namely, it is a holistic ecology.²⁴

Environmental ethics may be manifested in the form of legal products. Principally, environmental issues are inseparable from legal politics. This is because human behaviors are regulated by policies and it is due to human behaviors that environmental problems arise. If humans have good behavior towards the environment, the environment will be in good condition.²⁵ Legal politics have a great role in the environmental condition. According to Chalid Muhammad, most environmental destruction in Indonesia happened due to errors in the state policies compared to the actions of the people.²⁶ There need to be policies that direct towards ecologic ecocentrism. Meanwhile, the anthropocentrism paradigm must be eliminated.

The law must have goals to protect human interests. The law may only be manifested if it is enforced. If there are legal violations, the law must be enforced. There are three elements of law enforcement, namely legal certainty (*rechtssicherheit*), legal benefit (*zweckmassigkeit*), and legal justice (*gerechtigkeit*). Legal certainty means one will obtain the thing he/she hoped in certain conditions, to give justiciable protection against arbitrary actions. The law must also give benefit, as it exists for the benefit of humans. Then, the element of justice must be fulfilled in the legal context. In reality, law enforcement with the proportional application of these three elements is very difficult to implement.²⁷

The main aim of legal certainty is order. With it, human interests are protected. This also applies in the context of environmental law. The people's orderly behaviors towards the environment will create environmental protection and preservation, which will then guarantee human interests, especially in the aspects of health and the economy. In the environmental context, nature must be acknowledged to have its own sovereignty, as the people are regarded as sovereign humans. On that basis, *ecocracy* should be regarded as highly important. According to Purwendah, the preserved condition should strengthen the conceptual basis of the environment and sustainable development. Then, the Republic of Indonesia's 1945 Constitution, which is placed at the highest constitutional hierarchy, contained the basic idea of *ecocracy* that may be equalized with the concepts of democracy and nomocracy.²⁷

Green Constitution and Law on Environmental Protection and Management

In Indonesia, environmental preservation is a governmental obligation. It is stated in the Preamble of the 1945 Constitution. Article 33 of the 1945 Constitution states, "Earth, water, and natural riches contained therein are under the authority of the state and is used maximally for the welfare of the people". This article forms a contract between general rights (of the state) and personal rights (of citizens) in utilizing the environment.²⁸ Thus, the state is obliged to protect the environment so that the people may reach prosperity and welfare. This is then restated in Article 28 H (1) of the 1945 Constitution, which states,

Every person has the right to live with physical and mental welfare, to have shelter, and to live in a good and healthy environment, and they have the right to obtain health services.

From the above clause, it can be concluded that environmental rights are a part of human rights. The articles that support the environment are hereinafter called the 'green constitution'.

Not only the green constitution, but Indonesia also has green legislation that is manifested in Law No. 32 of 2009 on Environmental Protection and Management. Concerning facemask waste during the pandemic, Indonesia has Law No.18 of 2008 on Waste Management. This law classifies wastes, and one of them is the specific waste. Article 2 clause (4) of

this law states some specific wastes, namely hazardous waste, waste that appears due to disasters, building debris, waste that is technologically unmanageable, and waste that does not periodically occur. The government is obliged to manage these specific wastes, as regulated in the Governmental Decree No. 27 of 2020 on Specific Waste Management.

The Governmental Decree No. 27 of 2020 Article 1 explains Hazardous Waste. It describes it as, “Substances, energies, and/or other components that due to its characteristic, concentration, and/or amount, may either directly or indirectly pollute and/or destroy the environment, and/or endanger the environment, health, and survival of humans and other creatures”. Apart from that, the Article also states that hazardous waste may come from domestic areas or areas that contain hazards. Article 14 stipulates the handling of waste that contains hazards. It states, “Waste that contains hazards is handled using the following steps: sorting, collecting, shipping, managing, and finishing process”. Continuing the previous Article, Article 15 clause (1) states, “The sorting of hazardous waste as stated in Article 14 letter a is carried out by every person at the source”. It means that the management of domestic facemask waste must also follow that governmental decree.

The usage of facemasks during the pandemic was a legal and moral obligation carried out by society to anticipate the spread of Covid-19. This obligation was based on the Decree of the Ministry of Health No. HK.01.07/MENKES/382/2020 of 2020 on Health Protocols for the Society at Public Places and Facilities to Prevent and Control the Coronavirus Disease 2019 (Covid-19). This law stated that health protocols must generally contain stipulations on the use of self-protecting instruments in the form of facemasks that cover the nose and mouth, up to the chin, when leaving the house or when interacting with other people whose health statuses were unknown. This was supported by the Governor’s Decree No. 33/ 2020 on the Implementation of Large-Scale Social Restrictions at the Jakarta Special Capital Region Provincial Area in Chapter IV on the general application of Large-Scale Social Restrictions and Chapter V on the citizens’ rights and responsibilities. It stated that those who violate the law may be imposed with sanctions according to the constitutional regulations.

The aforementioned constitutional regulation referred to Law No. 6 of 2018 on Health Quarantine Article 93. It stated,

Every person who does not comply with the establishment of health quarantine as stated in Article 9 clause (1) and/or inhibiting health quarantine that causes health emergencies will be imposed with imprisonment for 1 (one) year and/or fines with the maximum amount of Rp 100,000,000. (a hundred million rupiahs)

A similar thing was regulated by the Decree of the West Borneo Governor No. 110 of 2020 on the Application of Discipline and Law Enforcement on Health Protocol to Prevent and Control the Coronavirus Disease 2019. These regulations may cause severe environmental consequences if they are not equipped with the efforts to manage facemask waste through education and other regulations on facemask usage and management.

The government issued some policies on specific waste management during the Covid-19 pandemic, including the Decree of the Republic of Indonesia’s Ministry of Health No. HK.01.07/Menkes/537/2020 on Health Service and Waste from Independent Isolation or Quarantine of the Society in Handling the Covid-19. Generally, this policy was a substance from the management of solid domestic waste (such as leftover food, cardboard boxes, etc.) as well as special solid domestic waste (such as facemasks, gloves, and tissues) that must be managed as infectious hazardous waste. The wastes that must specially be managed come from health service facilities and independent isolation or quarantine facilities of the society.

Legal instrumentation on facemask waste management during the Covid-19 pandemic in the aspects of health service facilities, isolation facilities, and independent quarantine was issued through the Decree of the Ministry of Health No. HK.01.07/Menkes/537/2020 on Health Service and Waste from Independent Isolation or Quarantine of the Society in Handling the Covid-19. However there was still a legal void on domestic facemask waste management. There were only disposal suggestions through Notification Letter No. SE.2/MenLHK/PSLB3/ PLB.3/3/2020 on the Management of Infectious Waste (Hazardous Waste) and Domestic Waste from the Handling of the Covid-19. According to Law No. 10 of 2004 on the Formation of Constitutional Regulations, Notification Letters were not categorized as constitutional regulations. As a notification, they were not norms, thus orders, prohibitions, or sanctions cannot be given.

Apart from that, the Notification Letter No. SE.2/MenLHK/PSLB3/ PLB.3/3/2020 was issued on the Management of Infectious Waste (Hazardous Waste) and Domestic Waste from the Handling of the Covid-19. It explained the three types of domestic waste, namely infectious waste from health service facilities, probable cases at residences, and domestic waste/types of domestic waste. Disposable facemasks were part of the last category. To dispose of them, it was suggested to rip and cut them, then package them neatly before disposal.

Discussion

Up to July 31st, 2020, Indonesia produced 420.03 tons of facemask waste daily, consisting of 159,214,791 pieces of disposable facemasks.⁶ This was not a small amount, and its management was also difficult. People's behaviors on facemask waste during the Covid-19 pandemic showed the paradigm of anthropocentrism environmental ethics, that placed humans at the core of interests. Meanwhile, nature and all of its components were objects that support these interests. This was also reflected in fulfilling the obligation to use facemasks in the effort to save oneself and others against Covid-19, without thinking about the environmental impacts that may happen. People littered the facemask waste; hundreds of tons of facemasks were dumped every day. Facemask waste was also incinerated. These things may be prevented with ecocentrism-based domestic facemask waste management policies. Ecocentrism means considering biotic (humans, flora, and fauna) as well as abiotic (air, water, and earth) interests.

The urgency of environmental protection has led to the need for environmental ethics in the philosophy of environmental studies across the physical and social sciences and humanities.²⁹ The holistic philosophy of the field of biology deals with the study of mutual relations between a man, other living organisms and their environment, called the deep ecology.³⁰

The name "deep ecology" was first used by Arne Naess (1973), a Norwegian analytical philosopher. It was about fundamentally revolutionizing anthropocentric ethics and politics. Devall advocated the term "deep ecology" (*Tiefenoekologie*) because it was relatively short.³¹

In deep ecology, there is a continuous process of forming coalitions between reformist groups, which extends to the establishment of rights and policy in the area of public interest, for example, the rights governing the maintenance of cleanliness of water and air and the rights relating to the use of land. They struggle within certain governmental bodies dealing with environmental protection. There is a tendency to establish influences over government for ecological interests.³²

There needs to be a holistic policy on the management of domestic waste. This "holistic" context may be found in the ecocentrism theory, deep ecology, where policies must consider all environmental components, namely the interests of humans, as well as biotic and abiotic components.³³ There needs to be consideration of the harmonization between mask waste management policies and the interests of humans, nature, and biotic components.

With consideration for human interests, regulations that manage domestic facemask waste at its source – namely at the domestic level – must be planned. The latest research showed that 20% of Covid-19 infections did not show symptoms.²⁵ Thus, disposable facemask waste used by the public must specially be managed as there is no guarantee that they were a non-infectious waste. At least, society must be obliged to separate facemask waste correctly to minimize transmissions. It was also to ease waste sorting at the advanced processing level.³⁴

The main issue of domestic disposable facemask waste was the confusion in categorizing that waste. At the domestic level, facemask waste was regarded as domestic waste that required no special treatment. Thus, the domestic facemask waste had a legal basis, namely the Governmental Decree No. 81 of 2012 on the Management of Domestic Waste and the Similar. But, at the advanced level, the waste cannot be recycled as they were regarded as infectious. In this perspective, the domestic facemask waste was classified as hazardous waste with the legal basis of the Governmental Decree No. 27 of 2020 on Specific Waste Management. The inconsistency in the categorization of domestic facemasks based on the existing documents greatly contributed to the terrible facemask waste management.

Therefore, there need to be policies on waste management through its different phases (that is, pre-treatment, segregation, storage, delivery, collection, transportation and disposal). This can prevent Covid-19 from spreading, as it can spread through contact with contaminated surfaces and objects without harming the environment and the biotic life. Hence, all necessary precautions must be taken to prevent the potential spread of infectious viruses. Apart from that, feasible guidelines for the environment should be put forward. The guidelines should also consider socio-economic conditions and technologies available in specific environments.³⁵ However, healthcare waste must be treated by incineration and secure landfill. Thus, priority was given to high-temperature incineration to dispose of medical waste related to Covid-19. This was the most common, biologically safe,³⁶ and suitable method to destroy traces of the virus with high furnace temperature. The incineration temperature and duration were set to 1100 °C for 3 minutes. In these facilities, combustion efficiency was ensured by using specific equipment capable of maintaining a minimum temperature of more than 850°C and a residence time of waste in the furnace of more than 1 hour.

The classification of disposable facemask waste as domestic waste that was regarded as un Hazardous may increase the rate of Covid-19 transmission. Due to the limited governmental screening and the public vaccination that was not holistic, disposable facemask waste may bring risks of infection. The domestic facemask waste should be categorized as hazardous waste. This perspective opens the chance for the application of the Governmental Decree No. 27 of 2020 on Hazardous Waste or Dangerous and Poisonous Substances Article 15 clause (1), that waste management must be carried out by sorting them at their source.

Facemask waste causes issues to the environment, flora, fauna, and abiotic components. Not only that, but the plastic wrappers of facemasks may also increase the plastic waste accumulation in natural environments. The littered facemask waste accumulates at river banks and will then end up in the sea environment – causing new problems. This accumulation also happens due to the controversies in recycling facemask waste. As they are regarded as infectious, the facemask waste cannot directly be recycled, as it needs to be preceded by sterilization stages. Incineration should not become a solution; due to the hundreds of tons of ash and pollutants it produces.

Some things must be considered in filling the legal void on domestic facemask waste and in developing eco-centric policies that focus on deep ecology. First, categorizing domestic disposable facemask waste as hazardous waste. Apart from minimizing the transmission of Covid-19 through facemask waste, this categorization makes the facemask waste treated as hazardous waste, where the first-level management is carried out tightly – namely by separating and sterilizing them according to the procedures. The sterilization at the domestic level also opens doors to facemask waste recycling, to decrease the pollution rate due to incineration.

Second, there needs to be sanctions on the violation of norms and tight social control on first-level management of facemask waste. The case of facemask waste is a national-scale problem that is unresolvable through mere suggestion or education.¹⁶ Deep ecology is practical ethics. Thus, it is not only in the realm of ideas and morals, but it must be manifested in reality, for instance through legal products. Departing from that, there need to be regulations that strictly regulate domestic disposable facemask waste and even sanction imposition to violators. Educating society on the related policy is also crucial in increasing their awareness, which will increase social control. The surrounding environment must supervise and prevent law violations.³⁷

Then, deep ecology is ethics that focuses on sustainability. In handling facemask waste to the root causes, the government must plan the policy of reusable facemasks that are usually made of fabric (fabric facemasks). In a day, Indonesia produced 420.03 tons of facemask waste, consisting of 159,214,791 pieces of disposable facemasks.⁶ By enforcing the use of fabric facemasks, it is hoped to decrease the amount of domestic disposable facemask waste. This regulation must also be followed by the standard fabric facemasks that society may use.³⁸ This standardization is to substitute the use of disposable facemasks (which are usually three-ply) with fabric facemasks, without compromising the safety of the public against Covid-19 transmissions. This will decrease the rate of infection and in the end, decrease the use of facemasks.

Regulations and policies according to previous studies are also needed to handle the inadequacies and inefficiencies of our current waste management system. It is also to deal with the increased dependence on plastic, as its mismanagement and leakage into the environment may trigger a new environmental crisis. Mandating scientific sterilization and the use of sealed bags for the safe disposal of contaminated plastic waste should be an immediate priority to reduce the risk of transmission to sanitation workers. A policy is needed to ensure development of circular technologies like feedstock recycling, improving the infrastructure and environmental viability of existing techniques could be the key to dealing with the facemask and plastic waste fluxes during such a crisis.³⁹

The environmental issues that arise due to domestic disposable facemask waste will not only affect the current generation but will also affect future generations.⁴⁰ In line with the deep ecology principle that prioritizes long-term interests, curative steps on the existing situation as well as preventive steps against worsening conditions must be created, through the formation and the realization of policies that are based on eco-centric environmental ethics.⁴¹

Conclusion

The Covid-19 pandemic resulted in significant global impacts in various sectors, including environmental and legal ones. This pandemic also encouraged changes in lifestyle, where facemasks (both disposable and reusable ones) were used daily. Some areas experienced difficulties in handling facemask waste due to its significant amount. In a day, Indonesians

produced 420.03 tons of facemask waste, consisting of 159,214,791 pieces of disposable facemasks. This was worsened by the Indonesian people's lack of awareness and behavior on facemask waste management. Many wastes were disposed of in aquatic areas, namely rivers and seas. These disposable facemasks were generally made of plastic; thus, they will be degraded into microplastics in the future. Thus, the disposal of facemask waste in water ecosystems will pollute the food chain, which will then endanger human life.

In discourses on environmental issues, policies and environmental ethics may become the benchmark of resolutions. Without the support of a strong policy, Indonesia would not be able to handle facemask waste as a result of the pandemic. Policymakers need to enforce their policies to protect the citizens' lives. They must act by applying biocentrism. Biocentrism does not only prioritize human interests but also those of other living creatures, namely flora and fauna. Biocentrism then develops into eco-centric environmental ethics, where the interests of abiotic components (water, earth, and air) are also involved. A prominent theory in eco-centrism is deep ecology.

There needs to be a solution with an eco-centric approach – especially deep ecology – in developing a solution for the issue of domestic facemask waste. The main problem with domestic disposable facemask waste is the classification of that waste. The domestic facemask waste is in a grey zone between medical waste (hazardous waste) and domestic waste. At its source, facemask waste is regarded as domestic waste. Thus, there are no regulations that require them to specially be managed at the domestic level. But, at the advanced level, the facemask waste is separated from the rest of the waste, and they are incinerated as they are deemed infectious. There have not been any other solutions for managing the facemask waste. Recycling is a controversial solution as facemasks may potentially be infectious media. The inconsistency in the classification may confuse the legal bases of the domestic facemask waste – is it based on the Governmental Decree No. 27 of 2020 on Hazardous Waste or should it be based on the Governmental Decree No. 27 of 2020 on Specific Waste Management? With a clear classification, a clear system will also be formed for managing that waste. There will be the sorting of the types of waste and the sterilization of the facemask waste from its source at the domestic level. This will ease the recycling process.

Then, the deep ecology concept needs to be implemented. One of them is through legal products. Not only that, there need to be sanctions on the facemask waste management that are not according to the regulation in various levels, as well as social control. Lastly, the government needs to implement the sustainability principle by promoting the use of standardized reusable facemasks, to significantly decrease the number of domestic facemask waste.

Ethical Consideration

This research did not involve humans and it received ethical approval before the research process was carried out. Ethical approval was obtained from the Legal Research Ethics, Universitas Muhammadiyah Surakarta, number: 55/KEPHK/III/2020, based on the results of a review conducted by a team of evaluators, which showed that this research had applied the ethical principles of health law research, as stated in the Declaration of Helsinki, namely: upholding autonomy, not harming any parties, maintaining justice, and providing benefits.

Acknowledgments

The authors express their gratitude and highest appreciation to Universitas Muhammadiyah Surakarta, who supported and funded this research with Professors Competency Research.

Disclosure

All authors declare that there is no conflicts of interest associated with this research and publication.

References

1. Mohapatra RK, Pintilie L, Kandi V, et al. The recent challenges of highly contagious COVID-19, causing respiratory infections: symptoms, diagnosis, transmission, possible vaccines, animal models, and immunotherapy. *Chem Biol Drug Des.* 2020;96(5):1187–1208. doi:10.1111/cbdd.13761
2. Dhama K, Khan S, Tiwari R, et al. Coronavirus Disease 2019-COVID-19. *Clin Microbiol Rev.* 2020;33(4). doi:10.1128/CMR.00028-20
3. WHO. Global Situation. WHO Coronavirus (Covid-19) Dashboard; 2021. Available from: <https://covid19.who.int/>. Accessed May 03, 2024.
4. Saraswati PS. Kebijakan hukum terhadap penanganan pandemi covid-19 di Indonesia (Legal Policies in Handling the Covid-19 Pandemic in Indonesia). *KERTHA WICAKSANA Sarana Komun Dosen Dan Mhs.* 2020;14(2):147–152. doi:10.22225/kw.14.2.1923.147-152

5. Anggraeni RD. Wabah pandemi covid-19, Urgensi Pelaksanaan Sidang Secara Elektronik (Covid-19 Pandemic, The Urgency of e-Courts). *Adalah Bul Huk Keadilan*. 2020;4(1):22.
6. Sangkham S. Face facemask and medical waste disposal during the novel COVID-19 pandemic in Asia. *Case Stud Chem Environ Eng*. 2020;2020:2. doi:10.1016/j.cscee.2020.100052
7. Torres FG, De-la-Torre GE. Face mask waste generation and management during the COVID-19 pandemic: an overview and the Peruvian case. *Sci Total Environ*. 2021;786. doi:10.1016/j.scitotenv.2021.147628
8. Lunag MN, Abana AS, Agcaoili JP, et al. Face mask and medical waste generation in the City of Baguio, Philippines: its current management and GHG footprint. *J Mater Cycles Waste Manag Vol*. 2023;25:s1216–1226. doi:10.1007/s10163-023-01601-2
9. Dimiyati K, Wardiono K. *Metode Penelitian Hukum (Legal Research Method)*. Universitas Muhammadiyah Surakarta; 2004.
10. Kelsen H. *Teori Hukum Murni: Dasar-Dasar Ilmu Hukum Normatif (Pure Law Theory: Fundamentals of Normative Law)*. Nusa Media Publisher; 2008.
11. Mihai FC. Assessment of COVID-19 waste flows during the emergency State in Romania and related public health and environmental concerns. *Int J Environ Res Publ Heal*. 2020;17:5439. doi:10.3390/ijerph17155439
12. Wu Y, Zhang H, Zhang M. Research on design strategy of mask recycling service based on behavior environment. *Sustainability*. 2023;15(2):1065. doi:10.3390/su15021065
13. Shrotriya A, Tiwari PK, Jain T, Gupta R, Sinha A. Face mask waste generation and its management during covid-19. at next generation of internet of things. In: Proceedings of ICNGIoT; 2022:481–488.
14. Haryanti R. Pemprov DKI Musnahkan 1,2 Ton Limbah Facemasker Bekas Selama Pandemi (The Provincial Government of Jakarta Special Capital Region Eliminated 1,2 Tons of Used Facemasks During the Pandemic). Kompas Megapolitan; 2020. Available from: <https://megapolitan.kompas.com/read/2020/12/16/10111581/pemprov-dki-musnahkan-12-ton-limbah-facemasker-bekas-selama-pandemi?page=all>. Accessed May 03, 2024.
15. Haryanti R. Selama Pandemi, Dinas LH DKI Musnahkan 1,5 Ton Limbah Facemasker (During the Pandemic, the Environmental Service of the Capital City Eradicated 1,5 Tons of Facemask Waste). Kompas Megapolitan; 2021. Available from: <https://megapolitan.kompas.com/read/2021/01/27/16011911/selama-pandemi-dinas-lh-dki-musnahkan-15-ton-limbah-facemasker?page=all>. Accessed May 03, 2024.
16. Hamdani AH, Haryanto AD. The Facemask Recycling Generated During Covid-19 Pandemic in Indonesia. *J Geosci Appl Geol*. 2021;5(2):1.
17. Yohanis D. Limbah facemasker menumpuk di TPA tulungagung, begini perlakuan sebelum dibuang agar tidak berbahaya (The facemask waste pile up in tulungagung landfill, this is how to treat it so they are not dangerous). Tribunnews; 2021. Available from: <https://surabaya.tribunnews.com/2021/01/22/limbah-facemasker-menumpuk-di-tpa-tulungagung-begini-perlakuan-sebelum-dibuang-agar-tak-berbahaya?page=2>. Accessed May 03, 2024.
18. Siswadi A Jawa Barat Kesulitan Atasi Limbah Medis Covid-19 1,7 Ton Sehari (Wes Java Has Difficulties Handling Covid-19 Medical Waste, 1,7 Tons a Day). Tempo; 2021. Available from: <https://teknوtempo.co/read/1433756/jawa-barat-kesulitan-atasi-limbah-medis-covid-19-17-ton-sehari/full&view=ok>. Accessed May 03, 2024.
19. Zakaria S. Sampah Facemasker Medis Menumpuk di Bantaran Sungai Ciliwung (Medical Facemask Waste Pile Up at the Ciliwung Riverbank). Republika; 2021. Available from: <https://www.republika.co.id/berita/qny534384/sampah-facemasker-medis-menumpuk-di-bantaran-sungai-ciliwung>. Accessed May 03, 2024.
20. Masker, Sarung Tangan, dan Limbah Medis Cemari Lingkungan (Facemasks, Gloves, and Medical Waste Pollute the Environment). Metrum; 2021. Available from: <https://metrum.co.id/facemasker-sarung-tangan-dan-limbah-medis-cemari-lingkungan/>. Accessed May 03, 2024.
21. Aragaw TA. Surgical face facemasks as a potential source of microplastic pollution in the COVID-19 scenario. *Mar Pollut Bull*. 2020;159. doi:10.1016/j.marpolbul.2020.111517
22. Yong Z, Gang X, Guanxing W, Tao Z, Dawei J. Medical waste management in China: a case study of Nanjing. *Waste Manag*. 2009;29(4):1376–1382. doi:10.1016/j.wasman.2008.10.023
23. Aditya IGNAK. Pergub Bali nomor 97 tahun 2018 dalam paradigma ekosentrisme (Bali governor's decree no. 97 of 2018 in the eco-centric paradigm). *J Ilm Widya Sosiopolitika*. 2019;1(2). doi:10.24843/JIWSWP.2019.v01.i02.p05
24. Nurmadiansyah E. Eco-philosophy dan implikasinya dalam politik hukum lingkungan di Indonesia (Eco-philosophy and its implications to the environmental legal politics in Indonesia). *J Melintas*. 2014;30(1):88.
25. Pollock AM, Lancaster J. Asymptomatic transmission of covid-19. *BMJ*. 2020;m4851. doi:10.1136/bmj.m4851
26. Satmaidi E. Konsep deep ecology dalam pengaturan hukum lingkungan (The concept of deep ecology in the legal regulation on the environment). *Penelit Huk dan Supremasi Huk*. 2015;24(2):1.
27. Purwendah EK. Konstitusionalisasi keadilan lingkungan di Indonesia sebagai keadilan eko-sosial berciri ekosentrisme (Consolidation on the environmental justice in Indonesia as eco-social justice with eco-centric character). *Proseding Senahis*. 2018;2018:44–45.
28. Saleh INS, Spaltani BG. Environmental judge certification in an effort to realize the green legislation concept in Indonesia. *Law and Justice*. 2021;6(1):1–18. doi:10.23917/laj.v6i1.13695
29. Rees WE. Sustainable development: economic myths and ecological realities. In: *Environmental Ethics: Readings in Theory and Application*. Cengage Learning; 1994:437–443.
30. Bombik M. The bases and methodology of deep ecology. *Stud Ecol Bioethicae*. 2020;18(5):67–85. doi:10.21697/seb.2020.18.5.06
31. Devall B. Die tiefenoekologische Bewegung (Deep Ecology Movement). In: *Ecophilosophy, Hrsg. Birnbacher*. Reclam; 1997:17–59.
32. Session G. The deep ecology movement: a review. *Environ Rev*. 1987;11(2):105–125. doi:10.2307/3984023
33. Satmiadi E. Konsep deep ecology dalam pengaturan hukum lingkungan. *Supremasi J Penelit Huk*. 2015;24(2):192. doi:10.33369/jsh.24.2.192-105
34. Aminah R, Aminah A. Pengaruh covid-19 terhadap hukum lingkungan di indonesia ditinjau dari aspek perilaku sosial. *Lex Libr J Ilmu Huk*. 2021;7(2):139–150. doi:10.46839/lljih.v7i2.268
35. Maria FD, Beccaloni E, Bonadonna L, et al. Minimization of spreading of SARS-CoV-2 via household waste produced by subjects affected by COVID-19 or in quarantine. *Sci Total Environ*. 2020;2020:743.
36. Kanemitsu K, Inden K, Kunishima H, et al. Does incineration turn infectious waste aseptic? *J Hosp Infect*. 2005;60(4):304–306. doi:10.1016/j.jhin.2005.01.016
37. Nugroho S, Ahadiati A, Mutmainah, M. Judge considerations of the corruption decision of social aid for covid-19 disaster mitigation from the perspective of anti-corruption principles. *J Jurisprud*. 2022;12(1):30–45. doi:10.23917/jurisprudence.v12i1.771
38. Selvaranjan K, Navaratnam S, Rajeev P, Ravintherakumaran N. Environmental challenges induced by extensive use of face masks during COVID-19: a review and potential solutions. *Environ Challenges*. 2021;3. doi:10.1016/j.envc.2021.100039

39. Vanapalli KR, Sharma HB, Ranjan VP, et al. Challenges and strategies for effective plastic waste management during and post-Covid-19 pandemic. *Sci Total Environ.* 2021;750. doi:10.1016/j.scitotenv.2020.141514
40. Naess A. The Place of Joy in a World of Fact. *North Am Rev.* 1973;258(2):53–57.
41. Marzuki PM. *Penelitian Hukum.* Kencana Prenada Media Group; 2005.

Risk Management and Healthcare Policy

Dovepress

Publish your work in this journal

Risk Management and Healthcare Policy is an international, peer-reviewed, open access journal focusing on all aspects of public health, policy, and preventative measures to promote good health and improve morbidity and mortality in the population. The journal welcomes submitted papers covering original research, basic science, clinical & epidemiological studies, reviews and evaluations, guidelines, expert opinion and commentary, case reports and extended reports. The manuscript management system is completely online and includes a very quick and fair peer-review system, which is all easy to use. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <https://www.dovepress.com/risk-management-and-healthcare-policy-journal>