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MORALITY BEFORE KNOWLEDGE

Managing medical waste in the context of environmental security during COVID-19 in Indonesia

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ABSTRACT
One form of non-military threat that is currently occurring is a disease outbreak, namely the COVID-19 pandemic. Apart from having an impact on the health sector, the COVID-19 pandemic also has an impact on the environmental sector. Some of the negative impacts caused by the COVID-19 pandemic include an increase in medical waste. The aim of this research is to examine and describe Managing Medical Waste in the Context of Environmental Security during COVID-19 in Indonesia. This research used a descriptive method and a qualitative approach. The data sources are secondary data (journals, archives, books, documents). The data collection technique is a literature study, with the data analysis used being bibliographic analysis. The results are there is a 30% - 50% increase in medical waste during the COVID-19 pandemic in Indonesia. Therefore, Understanding related regulations on environmental pollution due to the accumulation of medical waste is still limited. Regulations related to environmental pollution have not been able to reach the wider public. So, The usage of a comprehensive and medical waste management strategy has to be accelerated. Cautious planning and strict usage of standards, methods, and rules on how to dispose of medical waste need to be implemented. In making decisions on that, governments and stakeholders ought to consider both environmental security as much as the human security perspectives of the population.

KEYWORDS: environmental security; medical waste; non-military threat; solid waste

1. Introduction

Threats are any efforts and activities, both domestic and foreign, that conflict with Pancasila and threaten or endanger the sovereignty of the state, the territorial integrity of the Unitary State of the Republic of Indonesia, and the safety of the entire nation. Threats can consist of military, non-military threats, and/or hybrid threats. (Article 1 paragraph 2 of Law No.23 of 2019). The characteristics of threats that are becoming more complex and dynamic and the influence of developments in the world's strategic environment have made the focus of national security studies and policies shift from traditional threats to non-traditional threats.

As many countries pursue securitization, threats beyond the military dimension have become a serious issue (Lutfi, 2020). The securitization of non-military threats can be classified as real threats. Indonesia has adopted a multi-agency approach to respond to threats to its national defense. The government has assigned ministries other than the defense sector as the lead sector or key element in dealing with non-military threats (Act

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No. 3 of the Republic of Indonesia 2002, Article 7, Section 3). This suggests that states recognize that threats to national defense come not only from military threats but also from non-military threats (Octavian et al., 2021).

National security is described as the ability of a state to ensure the protection and defense of its citizens. With the advocacy of the United Nations Office for the Coordination of Humanitarian Affairs (OCHA), the element of human security has evolved beyond military protection to a larger dimension that threatens human dignity. Therefore, it becomes necessary for states to make a conscious effort to build relationships with other countries and consciously participate in global security efforts. OCHA's expanded definition of security includes a wide range of security areas: economic, food, health, environmental, community, personal, and political.

The focus of this research is on environmental security, namely countermeasures against environmental degradation, resource depletion, natural disasters, and environmental pollution. In the 2014 Quadrennial Defense Review (QDR), a national defense white paper, the United States classified the threat of climate change as a threat to national security (Quadrennial Defense Review, 2014). One form of non-military threat that is currently occurring is a disease outbreak, namely the COVID-19 pandemic. Apart from having an impact on the health sector, the COVID-19 pandemic also has an impact on the environmental sector. Its relationship with environmental conditions where residents live and carry out activities in daily life and the safety and maintenance of the physical condition of the country's population (Oswald, 1993) is an important component for state security.

The spread of COVID-19 has forced governments around the world to impose social restrictions. This causes changes in the environmental order, including aspects of health, food security, natural conditions, water quality, and the economy. Social distancing and hygiene rules implemented as standard operating procedures (SOP) for rapid protection against COVID-19 brought several changes to the environment. Some of the negative impacts caused by the COVID-19 pandemic include an increase in medical waste and the use of safety equipment and municipal solid waste. Globally, the accumulation of medical waste resulting from the process of sampling, analyzing, and treating patients has increased due to the spread of COVID-19, posing a risk to public health (Chakraborty & Maity, 2020). In addition, the use of safety equipment by the public to protect against viral infections such as masks, gloves and disposable personal protective equipment (PPE) increases solid waste. This has an impact on air, land, and water pollution, especially aquatic life which is contaminated by microplastic pollution from plastic gloves and masks, causing quite serious problems in the safety of the food chain. Also, the quarantine policy set by the government makes people carry out shopping transactions online which has an impact on increasing domestic waste (Ahmad et al., 2020).

The aim of this research is to examine and describe Managing Medical Waste in the Context of Environmental Security during COVID-19 in Indonesia. Research related to studying how to manage medical waste in the context of environmental security is still small and not yet detailed, making this research important to discuss.

2. Methods

The research method used in this research is a descriptive method, which focuses on providing accurate and systematic facts (Hardani et al, 2020). Meanwhile, the approach used is a qualitative approach, which is directed at scientific research activities in the form of describing and understanding the social phenomena observed. The data sources used by researchers are secondary data (journals, archives, books, documents). The data collection technique is in the form of a literature study, with the data analysis used being bibliographic analysis. This analysis is carried out to search, analyze and interpret and make general conclusions regarding the facts obtained from experts according to the problem being studied (Purdue University, 2022).

3. Results and Discussion

Medical waste is waste originating from medical services, dental care, pharmacy, research, treatment, care, or education that involves the use of toxic, infectious, hazardous, or potentially harmful materials, unless specific precautions are taken (Depkes RI 2001). According to WHO, medical waste is classified into two fundamental types: hazardous and nonhazardous wastes (Alrawi et al., 2021). Based on Ministry of Environment and Forestry (MoEF) data, for the period of one year, from March 2020 to February 2021, the total amount of medical waste generated by healthcare facilities (Fasyankes) was 6,418 tons. The highest amount of medical waste was generated by healthcare facilities in Jakarta, reaching 4,630 tons. These figures do not include medical waste generated from the COVID-19 vaccination process, which started in January 2021 and aimed to target 180 million people in Indonesia.

Medical waste can take the form of face shields and Personal Protective Equipment (PPE), including mask waste used by both medical and non-medical personnel or the general public. The Ministry of Environment and Forestry notes a 30% - 50% increase in medical waste during the COVID-19 pandemic in Indonesia. 9,884 health centers and 2,820 hospitals across the nation provided the data (UNDP, 2022). The Indonesian Institute of Sciences (LIPI) also reports that between March and September 2020, the accumulated amount of medical waste is estimated to be 1,662.75 tons (Putra, 2021). The continuous generation of waste, especially mask waste commonly used by the public, results in accumulation, causing environmental pollution and damage. Through this data, an increase in the following years is possible, and if these wastes are not managed and handled properly, it will have worse consequences for the environment and public health.

Therefore, Identification of the Potential of Solid Medical Waste during the Covid 19 pandemic can be seen in Table 1 that mentions health activities, potential of solid medical waste and hazardous waste characteristics.

Table 1. Identification of the potential of solid medical waste during the covid 19 pandemic

Health Activities	The Potential of Solid Medical Waste	Hazardous Waste Characteristics
All activities where there is no direct contact with patients who have or have no symptoms of respiratory tract infections	Disposable head protectors Disposable surgical masks Disposable gloves	Infectious waste
Physical examinations in patients with symptoms of respiratory tract infections	Disposable surgical masks Disposable medical gowns Disposable gloves Eye protection (goggles) whose conditions are damaged, opaque, and loose Disposable face shield Disposable shoe cover	Infectious waste

Imaging examination in COVID-19 patients or patients who are indicated to be infected with COVID-19	N-95 mask whose condition is damaged Disposable medical gowns Disposable gloves Eye protection (goggles) whose conditions are damaged, opaque, and loose Disposable face shield Disposable shoe cover	Infectious waste
Medical actions that trigger exposure to airborne COVID-19 transmission such as bronchoscopy, intubation, extubation, tracheotomy, gastrointestinal endoscopy, non-invasive ventilation, pulmonary resuscitation, manual ventilation before intubation, nebulation, dental examination such as ultrasonic scaler and high-speed-air-driven, nose and throat examination, eye examination in COVID-19 patients or patients indicated to be infected with COVID-19	N-95 mask Disposable medical gowns Disposable gloves Eye protection (goggles) Disposable face shield (face shield) Disposable head protectors Disposable shoe cover Disposable Apron Coverall jumpsuits Intubation hose	Infectious waste
COVID-19 patients care	Disposable surgical masks or N-95 masks that are damaged Disposable medical gowns Disposable gloves Eye protection (goggles) whose conditions are damaged, opaque, and loose Disposable face shield Disposable head protectors Disposable shoe cover IV line Plabot/Infusion needles Vials/ampoules Oxygen relief hose Infusion needle Syringes Contaminated tissue	Infectious waste Sharps Waste

Taking swab	N-95 mask whose condition is damaged Disposable medical gowns Coverall jumpsuits Disposable gloves Eye protection (goggles) whose conditions are damaged, opaque, and loose Disposable face shield Disposable head protectors Disposable shoe cover Disposable Apron Swab tools	Infectious waste
COVID-19 sample testing	N-95 mask whose conditions damaged Disposable medical gowns Disposable gloves Eye protection (goggles) whose conditions are damaged, opaque, and loose Disposable face shield Disposable head protectors Disposable shoe cover Sample specimen Specimen used bag	Infectious waste
Displacement of the suspected patients that infected coronavirus disease	Disposable surgical masks Disposable medical gowns Disposable gloves Eye protection (goggles) whose conditions are damaged, opaque, and loose Disposable face shield Disposable head protectors Disposable shoe cover	Infectious waste
Patient registration and payment of health administration (Cashier)	Disposable surgical masks	Infectious waste
Washing surgical instruments	Disposable surgical masks Disposable medical gowns Disposable gloves Eye protection (goggles) whose conditions are damaged, opaque, and loose Disposable face shield Disposable head protectors Disposable shoe cover Disposable Apron	Infectious waste

Clean the COVID-19 patient room	Disposable surgical masks Disposable medical gowns Thick disposable gloves Eye protection (goggles) whose conditions are damaged, opaque, and loose Disposable face shield Disposable head protectors Disposable shoe cover	Infectious waste
Clean the insulation room	Disposable surgical masks Disposable medical gowns Thick disposable gloves Eye protection (goggles) whose conditions are damaged, opaque, and loose Disposable face shield Disposable head protectors Disposable shoe cover	Infectious waste
Clean the consultation room	Disposable surgical masks Disposable medical gowns Thick disposable gloves Eye protection (goggles) whose conditions are damaged, opaque, and loose Disposable face shield Disposable head protectors Disposable shoe cover	Infectious waste
Clean the ambulance after removal of the suspected patients that infected coronavirus disease	Disposable surgical masks Disposable medical gowns Thick disposable gloves Eye protection (goggles) whose conditions are damaged, opaque, and loose Disposable face shield Disposable head protectors Disposable shoe cover	Infectious waste
Handling the infectious linen	Disposable surgical masks Disposable medical gowns Thick disposable gloves Eye protection (goggles) whose conditions are damaged, opaque, and loose Disposable face shield Disposable head protectors Disposable shoe cover Disposable Apron	Infectious waste

The Rapid Test	Disposable surgical masks Disposable medical gowns Thick disposable gloves Eye protection (goggles) whose conditions are damaged, opaque, and loose Disposable face shield Disposable head protectors Disposable shoe cover Disposable Apron Syringes Contaminated gauze/cotton Alcohol bottles Rapid Test Tools	Infectious waste, Sharps infectious waste, Chemical waste
The pharmacy	Medication is broken and has expired Disposable surgical masks Disposable gloves	Pharmaceutical waste, Infectious Waste

(The Minister of Environmental and Forestry of the Republic of Indonesia No: P.56/Menlhk-Setjen/2015 Regarding Technical Procedures and Require-ments for the Management of Hazardous and Toxic Waste Material from Health-care Facilities)

Generally, medical waste includes around 85% of not infectious waste, 10% of infectious, hazardous waste, and 5% of radioactive and/or chemical waste (Datta et al., 2018). Therefore, specific procedures are necessary for its disposal (Indonesian Hospital Sanitation Guidelines). Medical waste management involves a series of activities, including segregation, collection, transportation, storage, treatment, and disposal of medical waste (Minister of Health Regulation 2004). According to the Republic of Indonesia Law No. 18 of 2008, systematic, comprehensive, and sustainable waste management includes waste reduction and handling. Several essential components of hospital waste management include waste reduction, labeling and packaging, transportation, storage, treatment, and disposal of waste. This waste management process must be carried out using proper methods while considering health, economic, and environmental preservation aspects (WHO, 2005).

The handling of hazardous medical waste has become an emergency issue that requires attention because improperly managed medical waste can have environmental impacts, including environmental pollution, as well as health risks such as injuries from sharp objects and the spread of viruses. Therefore, hazardous medical waste cannot be treated like domestic waste that can be disposed of in Final Disposal Sites (TPA). Regulations regarding hazardous waste (B3 waste) are governed by Law No. 32 of 2009 concerning Environmental Protection and Management. There are four principles for the treatment of hazardous waste. First, all waste generators are legally and financially responsible for using safe and environmentally friendly waste management methods. Second, a high level of caution is emphasised. The third and fourth principles specifically address COVID-19 waste, regulating health and safety principles, as well as proximity principles in handling hazardous waste to minimise risks during transportation.

The incidence of medical increased by around 30% during the COVID-19. Therefore the medical waste management needs to be improved. Reduce medical waste is one management effort that can be made. The reduction of medical waste can be in several ways, such as sorting medical waste from sources, reuse of medical equipment, minimize the use of dangerous and toxic substances, wise in the procurement af chemicals and pharmaceutical ingredients, and recycling of medical waste. The reduction of medical waste

must be carried out by hazardous waste producers. The reduction of medical waste aims to reduce the amount of medical waste generated from health care activities (Purwanti, 2018).

In the treatment of medical waste, attention must be given to the principles of hospital hazardous waste management because improperly managed medical waste can lead to environmental pollution. The treatment of hazardous medical waste can involve the use of incinerators, autoclaves, and microwave technology. In emergency situations such as COVID-19, the use of such equipment allows healthcare facilities to operate incinerators without permission during the finalisation stage of the permit acquisition process.

The processing of COVID-19 B3 medical waste must be carried out in accordance with the Circular Letter of the Minister of Environment and Forestry Number SE.02/PSLB3/PLB.3/3/2020, which mandates the use of B3 waste incinerators with a minimum combustion temperature of 800 degrees Celsius, along with strict procedures for management, operation, and monitoring.

The Ministry of Health classifies waste management for handling COVID-19 patients into three groups: liquid waste management, domestic solid waste management, and solid medical hazardous waste (B3) management. Domestic solid waste refers to waste originating from household activities or similar waste such as food leftovers, cardboard, paper, and others, both organic and inorganic. Meanwhile, special solid waste includes single-use masks, used gloves, tissues/cloths containing nasal and oral fluids/droplets, and is treated as infectious B3 waste. The management of solid waste should be done separately according to the waste category. Personnel involved in waste collection also use personal protective equipment such as gloves, masks, boots, etc. The waste is then collected in a temporary storage facility for waste and B3 waste, with treatment as infectious B3 waste.

The management of solid medical hazardous waste (B3) includes items or materials resulting from activities that are not reusable and have the potential for contamination by infectious substances or contact with COVID-19 patients and/or healthcare workers in facilities handling COVID-19 patients. This includes used masks, gloves, bandages, used tissues, used plastic food and drink containers, used paper for food and drink, used syringes, used infusion sets, protective equipment in the Emergency Room (UGD), isolation rooms, ICU, care rooms, and other service rooms. B3 waste must be placed in containers with biohazard symbols. Liquid waste should be disposed of in a wastewater treatment plant (IPAL). Solid waste collection uses special infectious waste transportation and personal protective equipment. B3 waste treatment can involve incineration, autoclaving, or microwave technology. Healthcare facilities without such equipment can follow burial procedures according to the Ministry of Environment and Forestry Regulation No. P.56 of 2015. It can be seen in Figure 1. Construction of COVID-19 Hazardous Waste Burial.

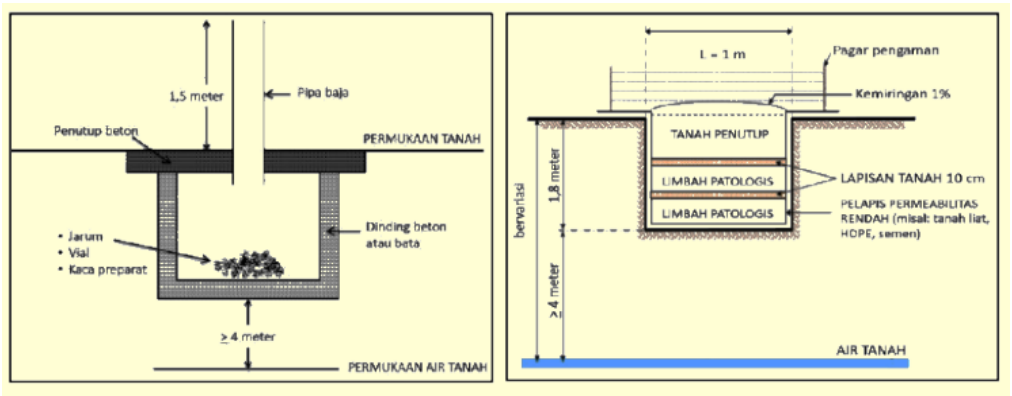

Figure 1. Construction of COVID-19 Hazardous Waste Burial

Understanding related regulations on environmental pollution due to the accumulation of medical waste is still limited. Regulations related to environmental pollution have not been able to reach the wider public. This condition is related to the perspective of green criminology, which focuses on crimes conceptualized in the relationship between the environment, humans, and living beings in an ecosystem. The concept of Green Criminology

is an ecological approach that focuses on environmental sustainability and environmental damage arising from the interaction between humans and the environment, applying ideas about environmental ethics, ecology, and human rights (White, 2013).

The connection between the concept of green criminology and the behavior of disposing medical waste is that such actions fall into the category of environmental crimes as they can be linked to the impact of behaviors causing pollution to the environment. This behavior elicits fear reactions in the community towards potential dangers when medical waste is not managed properly. The impact of improperly managed medical waste can cause environmental damage, as this waste is classified as biologically, chemically, and physically hazardous. Additionally, medical waste can be reactive, easily flammable, and infectious (radioactive), necessitating proper management in a safe location before being disposed of in a final waste processing facility.

The increasing volume of medical waste generated due to the COVID-19 pandemic has prompted ministries and institutions to prepare instruments for waste management to address the issue promptly. Support is provided by the Ministry of Environment and Forestry (MoEF), involving three main steps. Firstly, there is support for policy relaxation, especially for healthcare facilities (fasyankes) without permits. This initiative, whichcontinue until 2024 (WHO,2020). They are granted operational dispensation on the condition of using an incinerator with a temperature of 800 degrees Celsius and are subject to supervision. Secondly, MoEF provides support in terms of facilities because the capacity to dispose of medical waste is highly limited. Medical waste management is still centralized on the island of Java, accounting for 78%. The third step involves supervision activities, focusing on guidance during the monitoring phase, with the primary goal of preventing the disposal of medical waste in landfill sites. However, during the COVID-19 epidemic, WHO has been assisting Indonesia's Ministry of Health in organizing webinars on medical waste management.

The increased possibility of mismanaged of medical waste during the epidemic poses a challenge to the ongoing attempts to address environmental insecurity and the pandemic. In order to attain comprehensive environmental and human security, this issue must be resolved immediately in order to reduce medical waste to the target. The usage of a comprehensive and medical waste management strategy has to be accelerated. Cautious planning and strict usage of standards, methods, and rules on how to dispose medical waste need to be implemented. In making decisions on that, governments and stakeholders ought to consider both environmental security as much as the human security perspectives the population (Arisman, 2022).

4. Conclusions

This study focused on providing accurate and systematic facts to examine and describe Managing Medical Waste in the Context of Environmental Security during COVID-19 in Indonesia. The data sources used by researchers are secondary data, in the form of journals, archives, books, documents.

Based on literature and MoEFss results, it is found that a 30% - 50% increase in medical waste during the COVID-19 pandemic in Indonesia. The handling of hazardous medical waste has become an emergency issue that requires attention because improperly managed medical waste can have environmental impacts. There are four principles for the treatment of hazardous waste. First, all waste generators are legally and financially responsible for using safe and environmentally friendly waste management methods. Second, a high level of caution is emphasised. The third and fourth principles specifically address COVID-19 waste, regulating health and safety principles, as well as proximity principles in handling hazardous waste to minimise risks during transportation. In the treatment of medical waste, attention must be given to the principles of hospital hazardous waste management because improperly managed medical waste can lead to environmental pollution.

Based on the result, it is found that understanding related regulations on environmental pollution due to the accumulation of medical waste is still limited. Regulations related to environmental pollution have not been able to reach the wider public. Therefore, the increasing volume of medical waste generated due to the COVID-19 pandemic has prompted ministries and institutions to prepare instruments for waste management to address the issue promptly. Support is provided by the Ministry of Environment and Forestry (MoEF).

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Author Contribution

Conceptualization, N.D. Agustin and D.N. Fadilah; Methodology, N.D. Agustin; Results, D.N. Fadilah; Discussion, N.D. Agustin and D.N. Fadilah; Writing – Original Draft Preparation, N.D. Agustin and D.N. Fadilah; Writing – Review & Editing, N.D. Agustin.

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Data Availability Statement

The data is available upon request.

Conflicts of Interest

The authors declare no conflict of interest.

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