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Conference Paper

How to Optimize Local Government Supervision of Medical Waste Management in Healthcare Facilities?

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Abstract.

Medical waste is classified as hazardous and toxic that causes environmental pollution and impacts public health. The management of this medical waste in healthcare facilities is under the supervision of multiple government bodies. However, the approach is not effective due to the overlapping regulations. This research proposes an effective solution for the supervision of medical waste in Indonesia. This is prescriptive qualitative research, and documentation studies are carried out by tracing relevant library sources. Field studies were conducted through online interviews equipped with focus group discussions (FGDs) to obtain complete data from the speakers, which were further analyzed using a qualitative approach. Regulations have existed, but the implementation has not been optimal, so there is still a lot of pollution due to medical waste that endangers public health. Optimization of local government supervision of medical waste needs to be carried out by enforcing regulations on medical waste. Local governments carry out preventive supervision through facilitation by providing infrastructure and guidance on medical waste management technology. The provision of sanctions for those who continue to violate the regulations is a form of repressive supervision so that public health is protected.

Keywords: Surveillance; Local government; Medical waste; Health care facilities

1. INTRODUCTION

The positive impact of development in the industrial sector producing products that are beneficial to the community, will also bring negative impacts to the surrounding environment. One of these impacts is the production of various types of waste that do not meet quality standards and contain Hazardous and Toxic Materials (B3). Waste is a source of environmental pollution. This is also one of the factors inhibiting sustainable development [Liao et al., 2018]. Environmental pollution is an important issue within the framework of the Sustainable Development Strategy. This action is especially relevant for securing, in the long run, the basic needs of society and the economy [Liao et al., 2018]. Environmental pollution is a problem faced by all nations of the world.

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Environmental pollution due to B3 waste will impact the sustainability of development. Its control relies on basic regulations and their implementation that will determine the measure of its success [Lee & Bi, 2019].

Major cases related to environmental pollution due to B3 occur in various parts of the world, such as in Minamata Bay (Japan), Love Canal (United States), Wabigon River (Canada), and Bhopal (India). B3 is one of the seven major environmental problems at the global level, so it requires cooperation among countries to address them. For example, a case in Africa where a very large amount of hazardous waste is sent to African countries by developed countries due to the high cost of disposal of this waste in the country. It happened due to the less stringent of environmental protection laws and regulations in Africa [Akpan & Olukanni, 2020].

At the beginning B3 waste was considered a problem in developed countries. However, in its later development, when B3 waste became one of the objects or commodities that could be traded, many developed countries made poor developing countries the target of B3 waste disposal sites, both legally (legally) and illegally (illegally). As a result, B3 waste was no longer considered a national and regional problem but a global problem.

In third-world countries, the environment is often sacrificed for short-term economic interests. This is referred to as the exploitation of emerging countries by developed countries. For example, at USD 50 per ton, China received containers transporting waste materials in the early 1990s [Akpan & Olukanni, 2020].

To anticipate the issue, *the United Nations Environment Program* (UNEP) initiated the drafting of a global convention on the control and cross-border transport and disposal of B3 waste. On March 22, 1989, ¹² *the Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal* - also called *the Basel Convention* - was signed by the participating countries of the Conflagration. On July 12, 1993, Indonesia ratified the Basel Convention by Presidential Decree of the Republic of Indonesia Number 61 of 1993 concerning ratifying the ¹¹ *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal*. One of the provisions in the convention is that the amount of B3 waste must be reduced to the smallest possible from the upstream stage in the industrial process through clean *technology*.

B3 waste is any waste containing ⁹ hazardous and toxic materials that, due to their nature and concentration and/or quantity, either directly or indirectly, can damage or pollute the environment and endanger human health. Therefore, the management of Hazardous and Toxic Materials (B3) waste must be planned and implemented as well as

possible because the potential for environmental pollution and threats to human health due to unmanaged waste is very dangerous.

The complex problem and challenge for developing countries, including Indonesia, are hazardous and medical waste [Rohajawati et al., 2021]. Hazardous and toxic waste occurs everywhere. Dangers to public health include birth deficiencies, cancer, and even infectious diseases such as human immunodeficiency virus (HIV) are resulted from improper waste materials management [Akpan & Olukanni, 2020].

Many types of waste fall into the B3 waste category. There are two types of hazardous waste, namely dredged sediment contamination (after this referred to as sediment) and MIFA using LCA techniques following ISO guidelines [Hossain et al., 2020]. Medical Waste is included from one of the B3 wastes, which is directly generated from the act of diagnosis and medical action against the patient. The study included medical activities in polyclinic rooms, treatment, surgery, obstetrics, autopsy, and laboratory rooms. Medical waste is often also called biological waste.

Meanwhile, infectious waste is waste that can be a source of disease spread both to officers, patients, visitors, or the community around the hospital environment [Sinha et al., 2020]. Furthermore, it is stated that medical waste is also in the form of Bio-Medical Waste is any waste generated in the process of diagnosis, treatment, immunization, and research with human and animal subjects. If the management of this waste is poor or not, it will pose a great risk to the health of the public, patients, and professionals and also cause environmental disturbances [Sinha et al., 2020].

This medical activity comes from activities in health service facilities, such as Hospitals, Community Health Centers, Clinics, Independent Practice Places, and Pharmacies. Medical wastes can be in the form of solid waste or liquid waste. They can be categorized into sharp objects, glass, plastic rubber, paper, contaminated pads, swabs, and bandages [Khan et al., 2019]. The waste can also be generated from immunization services and patient diagnosis. Generally, health care facility waste is divided into two categories: general waste and infectious waste [Khan, Khan, et al., 2019]. Medical waste poses a risk to public health as well as environmental health. Previous studies have reported that the great risk of medical waste is spreading harmful compounds and pathogens similar to toxic, nuclear, and radioactive chemicals to the risky environment [Rohajawati et al., 2021].

The condition of B3 waste management originating from health care facilities in Indonesia in recent years is quite worrying. For example uncontrolled dumping and controlled embedded stockpiling. Untreated waste is disposed of at the city and other external disposal sites. Other cases include special arrangements for dealing with

cytotoxic waste, ⁴⁵ prevention and control of blood exposure and immunization against hepatitis B, safe handling operations to handle spills, used protective equipment, and reported accidents and incidents [Aung et al., 2019].

The management of medical waste in health service facilities cannot be done properly due to the limited availability of waste processing equipment and the limited capabilities of Human Resources and Funding Resources. As is known, waste processing tools are quite expensive and require considerable management costs. As a result, the medical waste of health service facilities cannot be managed properly. Many diseases still arise due to the pollution of medical waste produced by health service facilities. Therefore, it is necessary to make arrangements to overcome and prevent the impacts arising from medical waste.

As is the case in Indonesia, one of the Asian developing countries, have a very different view from developed countries regarding waste management of health care facilities. Some countries face constraints in terms of resources. Some have only ⁴¹ laws and limited regulatory bodies to enforce the waste management of health care facilities [Khan et al., 2019].

Given the great risk of medical waste generated by health care facilities to environmental health (including human health), it is necessary to regulate and supervise to protect environmental health. When there is a crisis, the government is responsible for addressing the problem so that it does not become bigger and bigger. In planning and implementing a policy, the government must base the principle of balance of two conflicting interests between the will of the people and the actions that the state must take [Askim & Bergström, 2022].

Following its authority, the Government and Local Governments can regulate and supervise waste management to protect public and environmental health. However, the implementation of the Government's authority, especially local government, has not been optimal, and supervision of medical waste management has not been effective. As already mentioned above, regulatory and statutory issues are still not well implemented. One of the problems is that there are several types of health service facilities with different types of services and regulations. Different types of services will produce and manage medical waste [Rohajawati et al., 2021]. Therefore, ² health care facilities inevitably produce medical waste that has the potential to endanger public health and the environment. However, supervision of medical waste management is still lacking, so it is necessary to create a comprehensive evaluation framework [Aung et al., 2019].

From a legal aspect, in Indonesia, legislation regulating waste management, especially medical waste, has been promulgated. However, the implementation of the regulations has not been optimal. This is evidenced by much medical waste dumping, and many diseases are still due to medical waste. Therefore, it is necessary to optimize the supervision of medical waste management with strict enforcement of regulations. This study aims to determine local governments' authority in supervising medical waste management in health service facilities, to realize public health protection.

2. METHODOLOGY/ MATERIALS

This research is prescriptive qualitative research that produces a theory about local government supervision of medical waste management at health facilities that will synergize with environmental health efforts. The data collected is in the form of a set of norms that apply in international and national law. Other data that will be collected are facts about the practice/implementation of local government supervision on managing the medical waste of health service facilities. The sampling method is carried out by purposive sampling, producing samples from two hospitals, two health centers, three clinics, and two practices for doctors and dentists. Documentation studies and field studies carried out the method of data collection. Documentation studies are carried out by tracing relevant library sources. Meanwhile, field studies were conducted through online interviews and focus group discussions (FGDs) to obtain complete data from the speakers. Data analysis is carried out qualitatively.

3. RESULTS AND DISCUSSIONS

Based on the study's results, it is known that part of the health service facilities that are the object of the study have managed the medical waste they produce (especially liquid waste). As for solid waste, the management is in collaboration with partners. However, most health care facilities are still constrained due to not having a Temporary Shelter (TPS) for B3 waste, not having a TPS permit, or not carrying out B3 waste management procedures correctly (such as identification, recording, waste balance, and reporting). In addition, some third-party B3 waste processing service providers do not have complete permits.

The inability of health care facilities to manage B3 waste can be understood because their main business is health service providers. Hence, they are difficult to expect to manage B3 waste independently. Other obstacles for health service facilities to process

B3 waste are the non-fulfillment of the technical requirements of incinerators, and the location of health facilities that are close to residential areas, so that they are not free to operate their B3 waste processing equipment.

Various laws and regulations have been made to regulate the management of B3 waste. For example, law Number 32 of 2009 concerning Environmental Protection and Management (UUPPLH) provides a definition of B3 Waste in Article 1 item 21 and point 22 define B3 as follows: Items 21, dangerous and toxic substances, after this abbreviated as B3, are substances, energy, and/or other components that due to their nature, concentration, and/or quantity, either directly or indirectly, can pollute and/or damage the environment, and/or damage the environment, and/or endanger the environment, health, and survival of humans and other living things". Whereas in point 22, it is stated that hazardous and toxic materials after this, referred to as B3 Waste, are the remains of a business and/or activity containing B3". Furthermore, various laws and regulations for the management of B3 waste have been prepared since the issuance of Government Regulation 19 of 1994 concerning Management of Hazardous and Toxic Waste, which was later updated with Government Regulation Number 101 of 2014) In its development, B3 waste management has become increasingly complex and requires better planning.

Government Regulation Number 101 of 2014, concerning B3 Waste Management, is an implementer of Law No.32 of 2009 on Environmental Protection and Management (UUPPLH). The definition of B3 Waste is formulated in Article 1, number 3: "Hazardous and Toxic Waste, after this referred to as B3 Waste, is the remains of a business and activity containing B3." Furthermore, in this Government regulation, it is determined that waste from the activities of hospitals and clinical laboratories is included in the list of B3 waste. The types of waste include clinical waste, expired pharmaceutical products, contaminated laboratory equipment, pharmaceutical product packaging, laboratory waste, and residues from the incineration process. Roadmap for B3 Waste Management from Health Service Facilities prepared by the Directorate of Performance Assessment of B3 Waste and Non-B3 Waste Management, Ministry of Environment and Forestry is determined to be the following waste categories in Table1.

According to the Regulation of the Minister of Environment and Forestry Number P.56 / Menlhk-Setjen / 2015, Article 1 number 3 states: "B3 Waste is Hazardous and Toxic Material Waste, after this referred to as B3 Waste, is the rest of a business and activity containing B3." The regulation on the management of medical waste is based on the provisions of Article 28 H paragraph (1) of the 1945 Constitution, "Everyone has the right to live a prosperous life born and mentally, to live, and to have a good and

Industry / Activity Code	Type of Industry/ Activity	Waste sources	Waste Code	Waste description	Hazard Categories
37	Hospitals and health care facilities	1. Entire hospitals and clinical laboratories 2. Incinerator facilities 3. WWTP that processes effluent from hospital and laboratory activities	A337-1	Clinical waste has infectious characteristics	1
			A337-2	Expired pharmaceutical products	1
			A337-3	Expired chemicals	1
			A337-4	B3 contaminated laboratory equipment	1
			A337-5	Medical equipment contains heavy metals, including mercury (Hg), cadmium (Cd), and the like	1
			B337-1	Pharmaceutical product packaging	2
			B337-2	Sludge WWTP	2
47	Operation of waste incinerators	Waste incineration process Pollution control facilities WWTP that processes effluent pollution control process	A347-1	Fly ash incinerator	1
			A347-2	Slag or bottom ash incinerator	1
			B347-1	Gas flue processing residues	2
			B347-2	Used filters & used asbestos	2
			B347-3	Sludge WWTP	2

Figure 1: Categorization of B3 Waste from Health Facilities in Government Regulation 101/2014.

healthy living environment and the right to obtain health services.” Furthermore, as an implementation of the mandate of the Constitution’45, Article 65 (UUPLH) states, “Everyone has the right to a good and healthy living environment as part of human rights.”

Law Number 36 of 2009 concerning Health, relating to the regulation of the right to a healthy environment formulated there is a provision of Article 6 it stated that “Everyone has the right to a healthy environment for the achievement of a degree of health.” Furthermore, Article 162 states, “Environmental health efforts are aimed at realizing a healthy environmental quality, both physical, chemical, biological, and social, that allows everyone to achieve the highest level of health”. Meanwhile, Article 163 (1) states that the government, local governments, and communities ensure the availability of a healthy environment and do not have a bad risk to health.

Based on the provisions above, it can be seen that the regulation on medical waste management in health service facilities aims to realize the community’s right to health.

The government, local governments, and communities must create a healthy environment and be free from waste contamination.

3.1. Discussion

3.1.1. Local government authority over the management of medical waste by health care facilities.

The Indonesian government has regulated the management of medical waste and protects public and environmental health through outreach. To illustrate the description of the identification and mapping of different parties related to the management of B3 waste from health facilities and to facilitate readability, Figure ?? is shown:

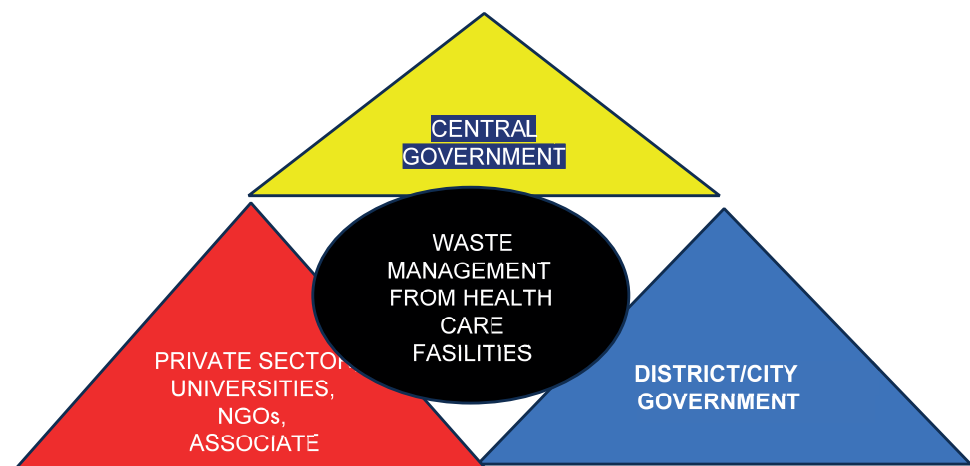


Figure 2: Identification and Mapping of Various Parties Related in B3 Waste Management of Health facilities.

Special arrangements that show the authority of Indonesia local governments in the waste management of health service facilities include: authority in licensing, determination of management requirements and obligations, management activities that must be carried out, and environmental recovery obligations that must be carried out by health service facility managers. The formulation of the regulation can be seen in table 3:

Table 2. above shows that with the promulgation of the Omnibus Law, there is a lack of regulation on the authority of the Government (Local Government) in regulating the waste of health facilities. This causes the B3 waste management rules of health facilities to still be violated.

To discuss the authority of local governments in supervising medical waste management, it begins with a discussion of the authority of local governments according to Law Number 23 of 2014 concerning Regional Government. This law stipulates the grouping

TABLE 1: government regulations base on their authority.

Old Rules	New Rules (Omnibus Law)
<p>Law No.32 of 2009 on Environmental Protection and Management Article 59 paragraph (4) (Issuance of Permits B3 waste management must obtain permission from the Minister, governor, or regent/mayor in accordance with their authority. Article 59 paragraph (5) (Environmental requirements Ministers, governors, or regents/mayors must include environmental requirements that must be met and obligations that B3 waste managers must comply with in permits.</p>	<p>Law 11 of 2020 on Job Creation Environmental Clusters Number 20: The provisions of Article 59 are amended to read as follows: (4) Waste Management 83 shall obtain a Business Permit, or the approval of the Central Government or Local Government (5) The Central Government or Local Government shall include the environmental requirements that must be met and the obligations that waste managers must comply with 83 in the Business Permit, or the approval of the Central Government or the Government Area. Article 529 Government Regulation 101 of 2014 was revoked and ceased</p>
<p>Law Number 23 of 2014 concerning Regional Government Appendix K – Government Affairs for the Environment Central Government B3 Waste Management: Reduction storage Collection Transportation utilization, processing, and/or Hoarding Provincial Government B3 waste collection across districts / cities in 1 (one) Region province. District/City Government Temporary storage of B3 waste. B3 waste collection in 1 (one) regency/city area</p>	<p>Government Regulation PP 22 of 2021 about the Implementation of Environmental Protection and Management. Article 16 [1]. Business Plans and Activities that are required to have an Environmental Impact Analysis (Amdal) as referred to in Article 5 paragraph (21) letter a can be determined to be a Business and/or Activity plan that is not required to have an Amdal by the Minister. [2]. The Business Plan and/or I (activities as referred to in paragraph (1) is proposed in writing to the Minister. by: a. the Minister and/or Head of a Non-Ministerial Government Agency; b. governor; c. regent/mayor; and/or d. community.</p>
<p>Government Regulation Number 101 of 2014, concerning B3 Waste Article 215 paragraph (1) The restoration of environmental functions as referred to in Article 203³³ carried out by the Government, provincial governments, and district/city governments according to their authority if: a. the location of the pollution is not known source of pollution; and/or b. unknown to the party who committed the pollution. Article 203 Restoration of Environmental Functions is carried out by stages: cessation of sources of pollution and cleaning of contaminants; Remediation; Rehabilitation; restoration; and/or other ways according to the development of science and technology.</p>	

or division of government affairs, namely absolute and concurrent government affairs. Concurrent government affairs are divided between the central government, provincial and regional governments, and regencies/cities (Article 9 of Law Number 23 of 2014). Therefore, ¹⁶ Concurrent Government Affairs handed over to the Regions became the basis for implementing regional autonomy

¹⁰ Concurrent Government Affairs that are the regional authority include Compulsory Government Affairs and Elective Government Affairs. Mandatory

Government Affairs consists of Government Affairs relating to Basic Services and Government Affairs unrelated to Basic Services. Compulsory Government Affairs relating to Basic Services are Those whose substance is partly Basic Services. For example, medical waste management matters are mandatory affairs related to basic services.

The authority of the Local Government to manage medical waste for health service facilities, in addition to being based on the Local Government Law, is also based on the UUPLH (currently adjusted to the Job Creation Law). Furthermore, according to Law Number 23 of 2014 concerning Regional Government, it is stated that the Regional Government has the authority to manage the national resources available in its territory and is responsible for maintaining its sustainability. Therefore, to carry out the mandate of the Law, the Office of the State Minister of the Environment (Environmental Impact Management Agency) has formulated an interpretation of the authority of environmental management, including: In general, environmental management authorities can be divided into three groups, namely: a. Central Authority b. Provincial Authority c. Regional Authority in environmental management, especially related to waste, can be known as the authority in controlling environmental management, Monitoring and evaluating environmental quality, and enforcing environmental laws. In particular, in Appendix letter K of the Local Government Law, it is regulated regarding government affairs in the environmental sector, it is stated that the Central Government is authorized in matters of B3 Waste Management: 1) reduction, 2) storage, 3) collection, 4) transportation, 5) utilization, 6) processing, and/or 7). Hoarding. The Provincial Government has authorized matters concerning the collection of B3 waste across districts/cities in 1 (one) provincial area. Meanwhile, the Regency/City Government is authorized in matters of The temporary storage of B3 waste; b. Collection of B3 waste in 1 (one) district / city area.

UUPLH regulates the authority of local government through regulations on the issuance of permits and the determination of environmental requirements. For example, article 59, paragraph (4) states, "B3 waste management must obtain permission from the Minister, governor, or regent/mayor following their authority". In addition, article 59, paragraph (5) stipulates, "The minister, governor, or regent/mayor must include the environmental requirements that must be met and the obligations that the B3 waste manager must comply with in the permit", medical waste management is carried out alone or carried out by waste treatment service providers. Based on these provisions, the local government has the authority to grant medical waste management permits and set requirements related to environmental protection from medical waste pollution.

Authority is a right owned by an official or institution that acts to exercise its authority based on applicable laws and regulations. Administrative law deals with public authority,

the ways of testing its authority, and the law regarding control over that authority. The environmental sector and the health sector are concurrent authorities that are mandatory. The local government is obliged to organize the affairs in this field. The problem of B3 waste, especially medical waste for health service facilities, is a major problem that must be faced by local governments and is the authority of local governments to regulate and supervise them.

As outlined above, medical waste is one type of B3 waste that can pose a health risk. Some health risks caused by environmental pollution from medical waste include infectious diseases (hepatitis, diarrhea, measles, AIDS, influenza, etc.). Waste can be categorized as B3 waste with the following criteria: it has already exploded, is already on fire, and has reactive pervasiveness. In addition to those above, if we discuss medical waste, the packaging of expired medicines and medicines is included as garbage containing hazardous and toxic materials. The definition of medical waste has changed since the onset of the covid-19 pandemic. Medical waste, not only from hospitals, but food waste and items touched or thrown away by covid-19 survivors, which were not previously considered infectious medical waste, are treated like an infectious waste (World Health Organization, 2020) [Thakur, 2021].

During the Covid-19 period, disinfectants are also materials that can cause hazardous waste. Disinfectants are one of the ingredients⁴⁸ the World Health Organization recommends to reduce the spread of covid-19 to maintain health. This material can be used⁴³ in outdoor environments. However, many studies have shown that such disinfectants contain toxins, which are dangerous, in particular in fish and surrounding aquatic organisms [Subpiramanyam, 2021]. Hospital wastewater usually contains high doses of medicines. During the Covid-19 pandemic, the waste increased in quantity and type due to high demand [Espejo et al., 2020]. Wastewater coming from hospitals, particularly those associated with infectious diseases, poses a major risk to human health and the environment³⁰ during the covid-19 pandemic [He et al., 2022].

During the Covid-19 pandemic, medical waste has accumulated everywhere. The more human activities increase, the more waste is produced, the denser the intensity of health services and the more medical waste will be produced. At this time, environmental pollution due to industrial activities has not been properly addressed. Similarly, environmental pollution due to medical waste has also not been handled properly.

The increase in the number of patients with the novel (COVID-19) also means an increase in the amount of medical waste that can carry the new coronavirus (SARSCoV-2). Therefore,¹ how to safely dispose of medical waste caused by COVID-19 is a huge

challenge that needs to be resolved immediately [Su et al., 2021]. During the COVID-19 pandemic, the daily amount of medical waste increased significantly. The diagnosis and treatment of COVID-19 patients not only produces conventional medical waste but also some waste from contaminated protective clothing, masks, gloves, and other protective equipment. In addition, there is also the patient's household garbage, the surge in the total amount of medical waste and an increase in the load on medical waste disposal. Unlike ordinary waste and garbage, medical waste that is not processed or processed incompletely will cause environmental pollution and directly or indirectly cause infections and endanger public health [Su et al., 2021].

This condition shows how medical waste is very dangerous to human health if it is not managed properly. Medical devices to seek disease cures will become a medium for disease transmission. Inappropriate handling of the infectious medical waste directly endangers human health and the environment. In practice, infectious waste must be properly disposed of [Wajs et al., 2019]. Improper handling of infectious medical waste will endanger human health and the environment. Infectious waste must be properly managed and disposed of. The COVID-19 pandemic has created a global medical emergency. The occurrence of an unexpected pandemic has resulted in exceptional levels of medical waste and raised questions about how waste is managed and disposed of, as well as environmental impacts. Since the outbreak, the amount of medical waste generated from COVID-19 has been estimated at 2.6 million tons/day worldwide. In Australia, piles of personal protective equipment such as disposable gowns, face masks/face shields, aprons, gloves, and goggles. Also, cleaners, sharp objects, and syringes are disposed of daily as a result of the pandemic [Andeobu et al., 2022].

According to the Director of Environment of the Ministry of National Development Planning/Bappenas, Medrilzam said one of the challenges of the prolonged Covid-19 pandemic is the accumulation of medical waste in hazardous and toxic materials (B3). He said throughout the Covid-19 pandemic, and there has been a significant increase in medical waste. Based on data from the Ministry of Environment and Forestry (KLHK), from March 2020 to August 2021, the figure has reached 20,110,585 tons per cubic. Medical waste is accumulated from health care facilities, self-isolation centers, Covid-19 vaccinations, Covid-19 detection test centers, and households.

For example, medical waste during the COVID-19 pandemic is face masks. Face masks are part of a comprehensive package of measures to prevent and control the spread of COVID-19. However, please be aware that, for the most part, face masks are

made of polymers, non-renewable petroleum-based materials that are not biodegradable. Therefore, it harms the environment and can lead to health problems [Dharmaraj, Ashokkumar, Hariharan, et al., 2021]. Therefore, taking precautions and protection measures is necessary to manage medical equipment. Security measures start from its production to the final phase of its service life. Thus, an innovative, robust, and most prominent modeling approach is needed for a sustainable waste production and management policy for COVID-19 medical equipment [Ahmad et al., 2021].

During the COVID-19 pandemic, local governments need to take steps following their authority on the management of medical waste by health care facilities. The implementation of local government authority needs to be optimized to minimize the adverse impact of medical waste on public health and environmental health. The important thing that local governments must do in dealing with crises related to infectious disease pandemics is to go through a crisis management process at the local government level identifying risks that may have more serious security consequences with a wider impact. Risks directly related to infectious disease pandemics can be classified and characterized as systemic risks because their potential impact is related to the integrity of the entire system, whether political, economic, social, technological, or environmental [Karovic et al., 2022].

Indonesia has formulated various regulations for waste management of health care facilities. However, the study results show that these regulations have not been implemented properly. In addition, the local government's authority over managing medical waste by health care facilities has not been optimal.

Local governments currently make it. These provisions have regulated the obligation to manage waste. In addition, sanctions are regulated, but enforcement of the regulations has not been carried out properly and has not even finished [Dharmaraj, Ashokkumar, Chew, et al., 2021] Regulation of hazardous waste can be further developed in two general ways, namely by emphasizing the risk of exposure to hazards or the total content of hazards [Johansson & Krook, 2021].

3.1.2. How to optimize the local government's authority in supervising medical waste management in health care facilities?

The management of B3 waste, especially medical waste in health service facilities, is the responsibility of the Government. The study results show that the regulation of B3 waste, especially medical waste in service facilities, has been carried out in several provisions of laws and regulations. Nevertheless, in reality, medical waste is still an

insurmountable problem. Various regulations and laws have been made to deal with waste, but a large amount of environmental pollution is still caused by dumping and landfills containing hazardous waste [Hao et al., 2020].

According to WHO data, poor medical waste management can trigger the following hazards:

1. Infection

Medical waste usually contains pathogens that cause infections, namely viruses and bacteria.

2. Harmful chemicals,

Medical waste often contains hazardous chemicals. If not properly disposed of, it can provoke poisoning. Chemicals in the medical waste can also increase the risk of respiratory or skin diseases.

3. Genotoxic substances

Research from Finland found that genotoxic substances in the medical waste can increase the risk of miscarriage.

4. Radioactive substances

Radioactive substances can cause headaches, dizziness, nausea, and vomiting.

Poor management of medical waste is very dangerous for human health. Very detrimental to human beings. Hospital medical waste can be a source of the spread of infectious diseases. Waste disposal is usually a place for pathogenic organisms that become nests for insects and rodents, putting disease transmission at risk. In addition, the waste also contains various toxic chemicals and sharp objects that can cause health problems and injuries [Al-Fikri et al., 2021]. Widespread outbreaks of infectious diseases are often caused by piles of solid waste that are not managed properly. Such solid waste management conditions are exacerbated by public health emergencies such as the Covid-19 pandemic [Nzeadibe & Ejike-Alieji, 2020]. Many cases report how dangerous medical waste is. Around the world, there are concerns over the risks of the negative impact of hazardous waste generated by hospitals. It is reported that the big risk of medical waste is spreading harmful compounds and pathogens, including toxic chemicals and nuclear and radioactive materials, to the environment [Rohajawati et al., 2021]. The impact of exposure to hazardous waste on human health, especially the effect of biomarkers and morbidity for those exposed [Ahirwar & Tripathi, 2021].

To overcome and prevent the adverse consequences of poor medical waste management, local governments need to carry out measures both technically and juridically.

According to *WHO* in medical waste management, technical arrangements on the actions officers must take are very necessary, starting from waste storage to waste destruction with incinerators. For example, when storing waste bags that should not be full, the waste collection officer must ensure that bags of the same color have been made together and sent to the appropriate place. This is intended to prevent negative impacts of waste management both on officers, the environment, and the surrounding community.

Based on the provisions of waste management, health service facilities must be able to minimize waste, namely, efforts made to reduce the amount of waste produced by *reducing materials (reduce)*, reuse waste (*reuse*), and recycling waste (*recycle*). Meanwhile, the next stage is carried out in collaboration with waste management from health service facilities.²⁴ According to the Regulation of the Minister of Environment Number P.56 / Menlhk-Setjen of 2015, Article 6 states, "The reduction and sorting of B3 Waste as referred to in Article 5 letter B3 Waste Producers must carry out a."

The juridical steps are carried out through supervision and enforcement of regulations related to waste management of health service facilities. Law and law enforcement are often faced with problems when implementing them. It can even be a barrier. Law is a design and construction tool for government organizations. Law is a means of carrying out the duties of government.²² Their powers and duties, organizational structure, limitations, and decision-making procedures are all established by law [Burris & Lin, 2021].

The study results showed that supervision of B3 waste management in health facilities did not follow standards. This includes⁷ the storage of infectious waste that is collected out of place, the accumulation of medical waste, temporary storage areas that do not meet the standards, and the use of incinerators that are not up to standard and incomplete combustion as the B3 waste feeding system.

Some health risks caused by environmental pollution from medical waste include infectious diseases (hepatitis, diarrhea, measles, AIDS, influenza, etc.). In addition to those mentioned above, if we discuss medical waste, the packaging of expired medicines and medicines is included as³⁹ garbage containing hazardous and toxic materials and hazardous and toxic waste materials.⁴ During the Covid-19 pandemic, the amount of medical waste has accumulated in all health care facilities with increasingly diverse types of waste. During the covid-19 pandemic, the use of materials made of plastic increased sharply, such as gloves, face masks, hand sanitizer bottles, and syringes. These products can potentially become hazardous waste because they can still carry pathogens or contaminants [Dharmaraj, Ashokkumar, Chew, et al., 2021].

Given the huge risk of medical waste generated by healthcare facilities to public health and environmental health, it is necessary to supervise and supervise the management of medical waste by healthcare facilities. The Government's obligations related to waste management are based on the provisions of Government Regulation No. 101 of 2014, which stipulates the government's obligation to carry out environmental recovery as referred to in Article 215 paragraph (1); "Restoration of Environmental Functions as referred to in Article 203 is carried out by the Government, provincial governments, and district/city local governments according to their authority if: a). the location of pollution is unknown and the source of its pollution; and/or; b) it is not known to the party who committed the defamation." Article 203 regulates the Restoration of Environmental Functions carried out by the following stages:

1. cessation of sources of pollution and cleaning of contaminants;
2. remediation;
3. rehabilitation;
4. restoration; and/or
5. other ways correspond to the development of science and technology.

Strategies to optimize government supervision of the waste management of health facilities can be carried out preventively and repressively by providing technical guidance to medical waste management officers of health service facilities. Repressively, it is carried out through enforcing regulations as a government obligation that must be optimized. This is intended so those responsible for waste management can comply with regulations and the government firmly and consistently enforces regulations, namely by providing sanctions for violators. Furthermore, laws and regulations can positively impact waste management through a mechanism for providing fair rewards and punishments [Hao et al., 2020].

As mentioned, the welfare of the community to obtain a healthy environment depends on the legal regulations of healthy environmental management and the role of government agencies in supervising activities that have the potential to pollute the environment. One of them is supervising medical waste management in health care facilities. Furthermore, supervision is carried out by creating regulatory enforcement mechanisms and implementing standards in the field of waste management [Kidalov et al., 2020].

Enforcement of regulations is important in optimizing local government supervision of waste management of health service facilities as it is known that, like efforts to

protect environmental health, it is regulated by the prohibition of dumping. Natural provisions of Article 1 point 24 UUPPLH stated that what is meant by *dumping* (disposal) is: “The activity of disposing of, placing, and/or inserting waste and/or materials in a certain amount, concentration, time, and location with certain requirements into certain environmental media.” Furthermore, the Origin 60 UUPPLH states, “Everyone is prohibited from *dumping* (dumping) waste and/or materials into environmental media without permission.” So that if there is a violation of this, sanctions can be applied as regulated in Article 104 of the UUPPLH, which stipulates that: “Everyone who dumps waste and/or materials into environmental media without a permit as referred to in Article 60, shall be punished with a maximum imprisonment of 3 (three) years and a maximum fine of Rp3,000,000,000.00 (three billion rupiahs)”. Therefore, if the provisions of this sanction are enforced, then health service facilities that carry out the dumping of medical waste, as occurred in Indonesia recently, can also be sentenced to these sanctions.

A case of sanctions due to poor waste management occurred in Sidoarjo, East Java, in 2015. Where the head of the environmental health installation at Sidoarjo Regional Hospital was sentenced to sanctions in the case of transporting medical waste without a permit with a prison sentence of 1 year and a fine of 1 billion rupiahs based on Article 103 and Article 116 of Law Number 32 of 2009 concerning Protection of Environmental Management, **article 103** of the UUPPLH states: “Everyone who produces B3 waste and does not manage as referred to in **Article 59**, shall be sentenced to a minimum imprisonment of 1 (one) year and a maximum of 3 (three) years and a fine of at least Rp1,000,000,000.00 (one billion rupiahs) and a maximum of Rp3,000,000,000 (three billion)”. Meanwhile, Article 116 paragraph (1) states, “If an environmental crime is committed by, for, or on behalf of a business entity, criminal charges and criminal sanctions are imposed on: a. business entity; and b. the person who gave the order to commit the crime or the person who acted as the leader of the activity in the criminal act. Subsection (2) If the environmental crime as referred to in paragraph (1) is committed by a person”.

The verdict of the case interprets poor waste management as a corporate crime. Article 116 of the UUPLH regulates the criminal liability of corporations. ³ talking about corporate criminal liability cannot be separated from the crime of the corporation itself, where there is a causal relationship between corporate crimes and their penalties [Satria, 2018]. John Braithwaite describes corporate crimes as corporate conduct, or ³ employees acting on behalf of the corporation, which is determined and punished by law. In contrast, Marshall B. Clinard and Peter C. Yeagar say that a corporate crime is any act committed by a corporation that is punished by the state, regardless of whether it is punished

under administrative, civil, or criminal law [Satria, 2018]. A corporate crime in the case of medical waste is when a corporate agent uses the company's infrastructure or assets to commit a crime resulting in environmental pollution due to medical waste.

We still find many cases⁴ of medical waste from health care facilities these days, especially during the Covid-19 pandemic, where the type and volume of waste in almost all health facilities increased sharply. The government is faced with a difficult situation between the prevention of covid mitigation itself and the side effects of using equipment and medical measures to deal with covid-19. The government must still be consistent in enforcing regulations. Local governments can implement good governance and laws to influence community behavior to improve health. Law enforcement must be done well to foster healthy environmental conditions and practices [Burris & Lin, 2021]. Through optimal supervision, both preventively and repressively, the protection of public health and environmental health due to medical waste will be realized.

4. CONCLUSION AND RECOMMENDATION

Medical waste is one of the B3 wastes that risks causing environmental pollution and risks disturbing public health and the health of the surrounding environment. Health care facilities are producers of medical waste. Waste management of health service facilities is carried out alone or through partners. As a result,⁵⁰ medical waste management has not been in accordance with the rules. Obstacles, in general, are caused by the limited capacity of waste management tools owned by partners. Weak supervision is also a factor that hinders the implementation of B3 waste management in health care facilities.

The local government has the authority to regulate and supervise the medical waste management of health care facilities. The authority of local governments is carried out by stipulating that the management of medical waste must be with the local government's permission. In addition, local governments establish various obligations related to medical waste management. Optimization of government supervision of medical waste management is carried out preventively in the form of technical guidance on waste management and repressively by prohibiting dumping. The application of sanctions for those who carry out dumping. Health care facilities risk criminal sanctions if they dump medical waste. By enforcing regulations, it will improve the compliance of healthcare facilities in the management of medical waste.

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