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## Environmental Cost Accounting: Behind the Major Project for the Construction of a Covid-19 Hazardous Waste Management Facility

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Submitted: 2022-08-08 | Accepted: 2022-08-30 | Published: 31<sup>th</sup> August 2022

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### ***Abstract***

After focusing on handling Covid-19, all countries face Covid-19 medical waste. Covid-19 medical waste in Indonesia reached 18,460 tons as of 27 July 2021. The number of waste management facilities did not follow the increased volume of hazardous medical waste. The government has compiled the construction of hazardous medical waste management facilities from health facilities into the Government Work Plan (RKP) for 2022. The budget allocated for the construction facility is quite large. An analysis is needed from the budget management perspective to achieve the right goals and objectives of the program. This research used literature studies from various relevant sources. Data analysis uses an environmental cost accounting perspective consisting of prevention, detection, and internal and external failure costs. The results show that from all aspects of these costs, the government has fulfilled them through the main program and supporting programs. Each program has a budget but no details of every need. The government has not budgeted for technology development, human resource development, collaboration with the private sector, and other impacts that have the potential to hinder the management of hazardous medical waste from health facilities.

**Keywords:** hazardous waste management; environmental cost accounting; waste management facilities; Covid-19.

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## I. Introduction

The Covid-19 pandemic has not entirely disappeared. Regulations in several countries have open health protocols, but there is still the potential for an increase in Covid-19 cases. Even so, the declining trend in the number of Covid-19 has had a positive impact in several sectors. After focusing on handling Covid-19, now all countries are faced with the problem of Covid-19 medical waste. The waste is categorized as hazardous because it affects public health conditions and has the potential to damage the environment.

Yogiswari *et al.* (2021, p. 267) explain that medical waste is hospital waste which is categorized as hazardous because of its unstable, reactive, explosive, flammable, and toxic nature. Medical waste ranks as the second most dangerous waste in the world. This medical waste arises as a result of hospital activities generated during diagnosis, treatment, and research, and if not handled properly, it will harm human health and the environment (Das *et al.*, 2021).

Data from WHO shows that from March 2020 - November 2021, 87,000 tons of Personal Protective Equipment (PPE) could become medical waste due to their single-use (Katadata.co.id, 2022). This number does not include other medical waste such as masks, gloves, vaccine bottles, swab equipment, etc. Covid-19 medical waste in Indonesia reached 18,460 tons as of 27 July 2021. According to Ministry of Environment and Forestry data, most waste comes from health care facilities (Intan, 2021). Several waste disposal sites experienced an increase in the volume of waste. DKI Jakarta, for example, experienced an increase of 500 percent during the pandemic.

On the other hand, the high number of hazardous medical waste from health facilities is also exacerbated by the findings of imported medical waste. Until now, there is no information regarding the government's follow-up to overcome this problem (Beritasatu.com, 2021).

The number of waste treatment facilities did not follow this volume increase. Data from the Coordinating Ministry for Human Development and Culture shows that out of 2,880 government hospitals in Indonesia, only 120 hospitals have legal waste treatment facilities, and only five hospitals have autoclaves (Kementerian Koordinator Bidang Pembangunan Manusia dan Kebudayaan, 2021).

There are 17 hazardous medical waste treatment services with a processing capacity of 252.48 tons per day. In addition, private waste treatment services also carry out the hazardous waste treatment. This waste treatment service is only available in several places such as the Riau Islands, East Kalimantan, Banten, West Java, Central Java, East Java, and South Sulawesi. It can be seen that the location of the waste processing service is not evenly distributed (Litha, 2020).

Based on these problems, the Government of Indonesia has prepared a Government Work Plan (RKP) for 2022, which is formulated in the Presidential Regulation of the Republic of Indonesia Number 85 of 2021. The aim is to formulate the direction of national development policies in a planned, systematic, and adaptive manner. The RKP contains 13 powerful projects, one of which is the construction of hazardous waste treatment facilities. This major project consists of two sub-sectors, hazardous medical waste treatment facilities from health facilities and integrated waste treatment facilities for industry (Rencana Kerja Pemerintah Tahun 2022, 2021). This paper focuses on medical B3 waste treatment facilities

from health facilities because it is more urgent with a *budget allocation* reaching 90% of the total budget for the construction program of hazardous waste treatment facilities.

The goals of the development program for hazardous medical waste treatment facilities from health facilities are: (1) To improve the quality of the environment and improve the monitoring of hazardous waste regularly; (2) To reduce and overcome the burden of pollution to increase the carrying capacity of the environment, particularly by handling hazardous medical waste after a pandemic; (3) Improving the quality of water, air, seawater, and land that functions as a buffer for the community's life system.

This program is expected to increase the emergency handling of hazardous medical waste to 100% within five years, starting from 80% in 2020, 90% in 2021, and 100% in 2022 to 2024. The target group is an area with health care facilities that do not yet have a hazardous medical waste treatment facility. The government's steps to achieve this target are carried out by building 1 unit of hazardous waste treatment facilities in each province.

The *budget allocated* for the sub-sector of hazardous waste treatment facilities from health facilities is quite dominating. Of the total budget of 87.6 billion, 79.3 billion was allocated for hazardous medical waste treatment facilities from health facilities, and the rest for the sub-sector of integrated waste treatment facilities. The largest *budget allocation* is used for development costs, and the other is for supporting programs such as policy impact analysis, training, monitoring and mentoring, and program socialization. The agencies responsible for implementing this program consist of various stakeholders. However, the Ministry of Environment and Forestry and the Ministry of Health are the key actors that determine the program's success. Following are the details of the *budget allocation*:

Prioritas Nasional / Major Project	Alokasi (Rp Juta)	Instansi Pelaksana
<b>42) MP : Pembangunan Fasilitas Pengolahan Limbah B3</b>	<b>87.614,8</b>	
<b>Dukungan Belanja K/L, KPBU dan DAK</b>	<b>87.614,8</b>	
<b>Sub:</b> Fasilitas Pengolahan Limbah B3 Medis dari Fasyankes		
<b>Aspek:</b> Pembangunan Fasilitas Pengolahan Limbah B3 Medis		
Pembangunan Fasilitas Pengolahan Limbah B3 dari Fasyankes	55.550,0	KEMENTERIAN LINGKUNGAN HIDUP DAN KEHUTANAN
Instalasi Pengolahan Limbah ( <i>Autoclave, Microovawe, TPS, IPAL LB3, Insinerator, dan Cold Storage Limbah Medis Infeksius</i> )	Data belum tersedia	PEMDA (DAK)
<b>Aspek: Enablers</b>		
Kebijakan Analisa Dampak Program Kesehatan Lingkungan	3.000,0	KEMENTERIAN KESEHATAN
Konferensi dan <i>Event</i> Pelaksanaan Peningkatan Lingkungan Sehat	6.099,8	KEMENTERIAN KESEHATAN
Koordinasi Advokasi Program Kesehatan Lingkungan	7.895,3	KEMENTERIAN KESEHATAN
Pelatihan Limbah Medis di Fasyankes	390,7	KEMENTERIAN KESEHATAN
Pemantauan, Pendampingan, Fasilitasi Implementasi Kesehatan Lingkungan	907,0	KEMENTERIAN KESEHATAN
Sosialisasi dan Diseminasi Program Kesehatan Lingkungan	5.472,1	KEMENTERIAN KESEHATAN

**Figure 1.** Budget allocation for Construction of Hazardous Waste Treatment Facilities

Source: RKP 2022

The *budget allocation* is not tiny, so all stakeholders involved must carry out their respective roles to achieve the program goals. The Indonesian government issued a Circular Letter from the Minister of Environment and Forestry Number Se.2/menlhk/pslb3/plb.3/3/2020 concerning Management of Infectious Waste and Household Waste from Handling Covid-19. This circular is a guideline for city, district, and

provincial governments in managing hazardous medical waste from health facilities (Surat Edaran Menteri Lingkungan Hidup Tentang Pengelolaan Limbah Infeksius (Limbah B3) Dan Sampah Rumah Tangga Dari Penanganan Coronavirus Disease (Covid-19), 2021). Besides, the Law of the Republic of Indonesia, Number 32 of 2009 concerning Environmental Protection and Management, also strengthens the government's steps in dealing with Covid-19 hazardous waste (Undang-Undang Republik Indonesia Nomor 32 Tahun 2009 Tentang Perlindungan Dan Pengelolaan Lingkungan Hidup, 2009).

Making a Covid-19 hazardous medical waste treatment program with a large enough budget does not necessarily solve the problem. Several challenges were found that could potentially hinder program implementation. First, the construction of hazardous waste treatment facilities takes a long time. If hazardous medical waste is not treated immediately, it can trigger other diseases that threaten public health. Second, the construction of hazardous medical waste treatment facilities from health facilities requires a large land area far from residential areas.

Meanwhile, not all regions meet these criteria. Third, the lack of publications regarding the progress of program implementation makes it difficult for the community to carry out the supervisory function. Fourth, suppose the number of Covid-19 decreases and no longer produces much hazardous medical waste. In that case, the government must manage every medical treatment facility so it can operate properly.

The construction of hazardous medical waste treatment facilities also requires qualified human resources. Human resources should be provided with training that focuses on waste management, waste risks, responsibilities, and technical instruction for each task (Bandaso & Ayuningtyas, 2019). Seung-Whee Rhee (2020) argues that rules or policies are essential to support the management of hazardous medical waste because policies can encourage all stakeholders to collaborate and work together to achieve program goals and objectives. In addition, with this policy, the function of the budget as a program control tool will also run optimally (Abidah *et al.*, 2021)

Based on this explanation, the government has not yet carried out the preparation of policies at the district, city, and provincial levels that include waste management, the collaboration between stakeholders, and human resource developers. Therefore, this paper tries to explain the construction of waste treatment facilities from the perspective of budget management to achieve the right goals and objectives of the program. With the achievement of goals and objectives, the community will benefit from various sectors such as health, economy, education, etc.

## II. Methodology

This paper uses qualitative research methods to explain the construction of hazardous medical waste management facilities from health facilities. This research method was chosen because it can present data from a more objective perspective but remains specific because it is described in detail. Data were collected through literature studies from various relevant sources. The theory used to analyze the data was also carried out with literature studies from various sources. Several perspectives in previous research regarding hazardous medical waste treatment are finance, waste policy and management, public perception, and stakeholder collaboration.

## **2.1. Financial Perspective**

Research that uses a financial perspective is from Yogiswari *et al.* (2021) entitled Implementation of Environmental Cost Accounting during the Covid-19 Pandemic in Medical Waste Management. The author chooses this perspective because it is rare for research to analyze hazardous waste treatment from a budget perspective. When compared to other perspectives, this perspective can present solution-specific specific data, as well as a more profound understanding following the realities of society. This study combines environmental and budgeting perspectives, namely the environmental cost accounting model from Hansen and Mowen (2007). This model was chosen because it is considered capable of helping reduce environmental management costs by providing accurate information about the framework, environmental impacts, and appropriate management strategies to produce maximum productivity and profitability (Yogiswari *et al.*, 2021, p. 267)

The environmental cost accounting approach consists of four categories. First, prevention costs are costs incurred for activities to prevent producing hazardous and toxic waste. Second, detection costs are incurred to determine environmental standards of products, processes, and activities. Third, internal failure costs are incurred during waste disposal and treatment activities. Fourth, external failure costs are incurred for activities after the hazardous waste management process is carried out (Yogiswari *et al.*, 2021).

The results showed that the Wangaya general hospital, where the research was conducted, had implemented environmental cost accounting well. However, the hospital needs to make some improvements in budget planning so that the costs incurred can be used for more significant hazardous medical waste management. Thus, improvements in the economic, social, and environmental fields can be carried out in a sustainable manner (Yogiswari *et al.*, 2021, p. 271).

## **2.2. Policy and Waste Management Perspective**

One of the Covid-19 hazardous medical waste treatment studies that use a policy and waste management perspective is Maalouf & Maalouf (2021). This study focuses on the impact of Covid-19 medical waste management in Lebanon. This research was conducted because research on treating hazardous medical waste in developing countries is scarce. It is hoped that the research results can be helpful for other developing countries in processing waste data, measuring waste potential, increasing the efficiency of medical waste treatment systems, and being useful for policymakers in making decisions in reducing hazardous medical waste (Maalouf & Maalouf, 2021, p. 46)

The study was conducted using a hazardous waste comparison technique before and after the Covid-19 pandemic. The analysis was carried out using two approach models in terms of policies and procedures for managing hazardous medical waste and waste management to obtain information about the impact on the community (Maalouf & Maalouf, 2021, p. 47).

From a policy perspective, Lebanon has regulated the hazardous medical waste management policy through decree 8006 dated 11 June 2002 and decree 13389 on 18 October 2004. One of these policies explains that medical waste must be grouped by category for further processing properly. Every hospital or other health care facility must be responsible for the hazardous medical waste they produce. However, implementing this policy does not immediately make the management of hazardous medical waste in Lebanon run well. Several problems, such as economic, political, and health crises, have delayed some

hospital budgets so that they have an impact on waste management (Maalouf & Maalouf, 2021, pp. 49–50).

Meanwhile, in terms of hazardous medical waste management, the private sector in Lebanon has a significant role, especially in urban areas, which are the center of medical facilities. Cooperation with the private sector can reduce costs and improve the quality of hazardous medical waste treatment services. In 2010, Lebanon had 33% private hospitals and 20% public hospitals. Of this amount, only 2% can manage hazardous medical waste independently. At the same time, others utilize hazardous waste treatment services from the private sector. In contrast to conditions when the Covid-19 pandemic hit, the amount of hazardous medical waste has increased rapidly since February 2020. In a period of 1 month, from March to April 2020, B3 waste has increased by 71% and continues to increase in the following months (Maalouf & Maalouf, 2021, pp. 49–51).

This condition raises several problems. The amount of mixed waste has increased due to the absence of a sorting process, increased littering, increased risk of death for informal workers who are in direct contact with hazardous medical waste, and the lack of facilities for handling Covid-19. The author provides several recommendations regarding the policy and management of the Covid-19 hazardous medical waste treatment in Lebanon. First, carry out further research related to the amount of data on Covid-19 medical B3 waste because previously, there was no classification. Second, routine monitoring and evaluation of medical B3 waste treatment facilities. Third, emphasizing the prevention and reduction of medical waste and sorting it directly from the source. Fourth, develop a policy for treating Covid-19 hazardous medical waste. Fifth, providing data on Covid-19 hazardous medical waste that can be accessed by the public so that transparency is created in running the program, making it easier for the public to supervise (Maalouf & Maalouf, 2021, pp. 51–53).

Previous research that also uses a waste management perspective is the research of Das *et al.* (2021) entitled Covid-19 pandemic and healthcare solid waste management strategy – A mini-review. The research conducted with this literature study outlines the most widely used strategies by various countries in managing Covid-19 hazardous medical waste.

One of the countries that have good hazardous medical waste management is the Philippines. The country has unique laws governing the transportation of Covid-19 medical waste carriers. Transportation of waste carriers must be specifically registered, divided into several points such as treatment facilities, storage areas, and waste disposal. This is regulated so that the government can easily supervise waste management. Meanwhile, in Jordan, the strategy adopted in managing hazardous medical waste from Covid-19 is slightly different. Jordan has three principles in waste treatment, which are reducing unnecessary health care waste, separating ordinary waste and hazardous medical waste, and providing proper treatment for health workers and the public (Das *et al.*, 2021, p. 5).

From several strategies implemented by various countries, it can be concluded that there is no most appropriate strategy in dealing with Covid-19 hazardous medical waste. A unique strategy adapted to the economic, social, and cultural conditions of the community is the most appropriate to be applied. Even so, it is crucial for each country to develop a management of hazardous medical waste.

Even so, the author explained that regardless of the strategy implemented in managing hazardous medical waste, it must contain essential points. Some of these crucial

points are compliance with regulations, worker responsibilities, waste classification, proper waste handling procedures, and worker training related to hazardous medical waste management. If this strategy is carried out correctly, it will realize sustainable development, which will later add value to the national economy (Das *et al.*, 2021, p. 3).

Good management supported by adequate facilities will be able to encourage India to be ready to face disasters in the future. Environmentally friendly technology is also emphasized to produce a safe process. The results of this study are expected to be a reflection for stakeholders, especially policymakers, to develop an excellent hazardous medical waste treatment system and form preparedness for future disasters (Goswami *et al.*, 2021, p. 11).

### **2.3. Stakeholder Collaboration Perspective**

Myhre *et al.* (2022) became one of the researchers who examined stakeholder collaboration in overcoming Covid-19 hazardous medical waste. He examines the role of national public health institutions in bringing together agendas and actors from various groups. The study results indicate that there are five essential supporting factors in realizing the successful treatment of hazardous medical waste. These factors include a solid legal basis, scientific independence, public trust and legitimacy, global, national, and local networks and partnerships, and an adequate and stable budget. In addition, it is also essential to integrate public health infrastructure for various purposes such as increasing efficiency, reducing Covid-19 hazardous medical waste, and optimizing human resources (Myhre *et al.*, 2022).

### **2.4. Public Perception Perspective**

The perspective of public perception is rarely studied for hazardous medical waste management. However, this perspective is essential to knowing the public's perception of Covid-19 waste. Public perception is vital for the government to formulate policies according to community conditions and make them easier to implement.

One of the articles that use this perspective is from Alomari *et al.* (2021), entitled public perception towards medical waste generated in the environment during the Covid-19 pandemic in Eastern Province, Saudi Arabia. This study aims to determine the level of awareness of the Covid-19 protocol and concern for medical waste. In addition, this study also seeks to determine public awareness regarding regulations for the disposal and management of Covid-19 medical waste (Alomari *et al.*, 2021).

The results showed that 74% of respondents were aware of Covid-19 hazardous medical waste. The majority of respondents are aware of regulations regarding the collection and disposal of Covid-19 hazardous medical waste. Awareness of this regulation has a positive impact, one of which is the reduction in the spread of Covid-19. Sufficient knowledge of the Covid-19 medical waste management regulations makes the public aware of protecting themselves from inappropriate medical waste management practices (Alomari *et al.*, 2021).

### **2.5. Perspective Selection**

Based on the explanation above, the authors chose to analyze the construction of hazardous medical waste treatment facilities from health facilities using an environmental cost accounting perspective. The government has allocated a budget for various purposes ranging from preparation for development, development, and post-development, such as anticipating environmental impacts, socialization, and many more. This perspective is considered under the points outlined in the Government Work Plan (RKP) for 2022.

Analysis using this perspective will also lead to the formation of strategies and appropriate hazardous waste management.

There has not been much research on Covid-19 hazardous medical waste from a public policy perspective. A financial perspective is needed to analyze the government budget and external funding for program sustainability. Hazardous waste treatment systems must be prioritized so that the budget can achieve the planned goals and objectives. One example is the Wuhan City Government. In addition to utilizing hazardous medical waste treatment technology, the local government also relies on planning through strategic steps (Myhre *et al.*, 2022).

In addition to planning a suitable waste treatment system, the budget must also be managed based on accounting principles. The accounting will show the actual costs of the medical B3 waste management facility. Appropriate budget calculations within the framework will be able to increase productivity and profitability from an environmental point of view.

### **III. Results, Analysis, and Discussions**

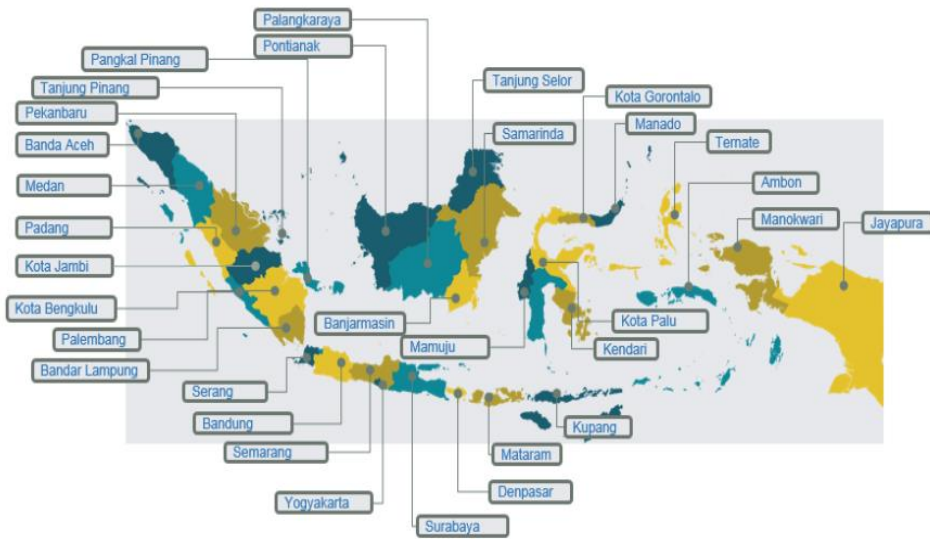
Based on the environmental cost accounting theory, the program for constructing hazardous medical waste treatment facilities from health facilities can be analyzed using four aspects such as the cost of prevention, the cost of detection, the cost of internal failure, and the cost of external failure.

#### **3.1. Cost of Prevention**

The first aspect concerns prevention costs, namely all costs allocated by the government for activities to prevent producing hazardous and toxic waste. This cost aims to reduce producing medical B3 waste from health facilities significantly. The cost of constructing a hazardous waste treatment facility is included in this aspect, which is 55 trillion rupiahs. This cost is the largest budget compared to other programs.

The Indonesian government has realized this budget by gradually building hazardous waste treatment facilities in 32 provinces from 2020 – 2024. Based on data from the Directorate General of Waste, Waste, and B3 Management of the Ministry of Environment and Forestry, in 2020, the government has built five units of waste treatment facilities. The construction sites are West Sumatra, Aceh, South Kalimantan, NTB, and NTT. By 2021, 6 units of hazardous waste construction facilities will be built. The construction sites are in Maluku, West Papua, Papua, Bangka Belitung Islands, and Sumba Island – NTT. Meanwhile, in 2022, 2023, and 2024, 7 units of hazardous waste treatment facilities will be built (Ditjen PSLB3 MoEF, 2020). However, the latest data regarding the specific construction sites are not available. The following is the entire location for the construction of a hazardous waste treatment facility:





**Figure 2.** Location of Construction of Hazardous Waste Treatment Facilities from Health Facilities  
 Source: Ditjen PSLB3

The cost plan was written in total, but the government did not elaborate on the costs required to build each facility. Another program included in this cost group is a sewage treatment plant. In this program, the government has not determined the costs incurred. The waste treatment plant consists of an autoclave, microwave, TPS, WWTP, LB3, incinerator, and cold storage of infectious medical waste. As the construction of waste facilities continues, this program is urgently needed, so the government must immediately arrange the costs. Even though the implementing agency is the local government, the guidelines in preparing the budget must be formulated by the central government so that all areas that become development sites can simultaneously take action to prevent and treat waste according to procedures.

**3.2. Cost of Detection**

The second aspect of environmental cost accounting is the cost of detection. This cost is needed to determine the environmental standards of products, processes, and activities in constructing hazardous medical waste treatment facilities from health facilities. Programs included in the detection fee are policies for analyzing the impact of environmental health programs and programs for monitoring, mentoring, and facilitating the implementation of environmental health.

The policy of analyzing the impact of environmental health programs is included in the cost of detection because it plays a role in preventing negative impacts that may occur during the development process. The budgeted cost for this program is 3 billion rupiahs. This number is appropriate considering the many needs in conducting an impact analysis of environmental health programs.

Meanwhile, the program for monitoring, mentoring, and facilitating the implementation of environmental health is included in the detection cost because it is part of

a fundamental process and activity in development. Without monitoring and assistance, the construction of this hazardous medical waste facility will not proceed as planned due to the absence of good management. Although it is an important aspect, the budget allocated is among the two lowest compared to other programs, which is 907 million rupiahs. The 2022 RKP also does not describe the technical implementation of this program to require such a large budget. The government needs to formulate policies that regulate monitoring and development in building hazardous medical waste treatment facilities. In essence, detection costs are allocated to reduce the negative impacts that may arise from development, so standardization is needed. The field that will be directly affected is public health, but the negative impact has the potential to occur in other fields.

Some of the negative impacts that may arise from the construction of this waste treatment facility are improper site selection which can affect the environment and public health; the cost of healthcare for areas adjacent to waste facilities is quite high; areas that become hazardous waste treatment facilities are difficult to develop.

### **3.3. Cost of Internal Failure**

The third aspect of environmental cost accounting is the cost of internal failure. This aspect is the failure cost because it prevents errors from occurring during construction. Programs that include this cost are medical waste training in health facilities, conferences, and environmental improvement activities. This program is a supporting program that can support the successful construction of hazardous medical waste treatment facilities.

The first program on internal failure costs is medical waste training from health facilities. This training focuses explicitly on segregating infectious medical waste so that it does not mix with other wastes. Besides facilitating processing, the government can also have accurate data on the amount of hazardous medical waste. This program can be regarded as the spearhead of hazardous medical waste treatment from health facilities. However, hazardous medical waste training is not supported by an adequate budget. The cost allocation for this program is the lowest, 390 million rupiahs.

Compared to the previous program, conferences and events implementing healthy environment improvement have a reasonably large budget. A total of 6 billion rupiahs is budgeted for this program. It is not explained why this program has a higher cost. The need for conferences and events to implement a healthy environment is perhaps one of the government's considerations in providing a reasonably large budget. Even so, the cost of this program needs to be evaluated to determine the absorption of the budget. During the Covid-19 pandemic, various conferences and events are held virtually, so there are fewer costs than those held non-virtually. The publication can also be done for free through social media. If the evaluation results show that the allocated cost is too high, it can be diverted to other programs that require more costs.

In addition to these programs, several programs are included in the internal failure costs carried out by the Directorate General of Waste, Waste, and B3 Management of the Ministry of Environment and Forestry.

Based on the duties and functions of the Directorate General of PSLB3 in Permen LHK 18/2015, several programs related to hazardous waste management are (1) Hazardous waste management, namely programs that support the achievement of hazardous waste management targets. (2) Hazardous and non-hazardous waste management verification.

This program is essential to improve licensing services for hazardous and non-hazardous waste management. The waste is classified to facilitate the process of data collection and management. (3) Performance Assessment of Hazardous Waste and Non-hazardous Waste Management. (4) Contamination Recovery and Hazardous Waste Emergency Response. The recovery program is carried out to increase the amount of hazardous waste managed, restore contaminated land, and improve the handling of hazardous waste emergencies. (5) Waste Management. This program is implemented to reduce the volume of waste, increase the amount of waste handling, reduce the rate of waste leakage into the sea, and increase the economic value of waste. (6) Management Support and Implementation of Other Technical Duties of the Directorate General of Waste, Waste, and Hazardous Waste Management. This program is crucial to producing accountable financial reports (Ditjen PSLB3 MoEF, 2020).

### **3.4. Cost of External Failure**

The last aspect of environmental cost accounting theory is the cost of external failure. These costs are for handling or activities after processing hazardous medical waste from health facilities. Programs that are included in this cost group are coordination of advocacy for environmental health programs as well as socialization and dissemination of environmental health programs. Both of these programs include supporting programs with a reasonably large budget.

Environmental health program advocacy coordination has a budget of 7.8 billion rupiahs. This figure is the highest supporting program budget compared to other programs. The number of parties and areas related to the construction of hazardous medical waste treatment facilities makes this program require a large amount of money. Coordination and advocacy are carried out with various parties, ranging from communities adjacent to the construction site, health facilities, medical personnel, and health leaders to the broader community.

On the other hand, the socialization and dissemination of environmental health programs also have a relatively high cost of 5.5 billion rupiahs. Overall, programs related to socialization have a relatively high cost. The government wants to focus on this aspect because it is considered essential for the successful treatment of Covid-19 hazardous waste. It can be concluded that in addition to physical development, the government also wants to prepare for development regarding human resources.

Of all the companion programs prepared by the government, positive impacts are expected to emerge in the community. The positive impact is not only on the environmental and health aspects but also on the economy. Some of the positive impacts that have the potential to arise from the construction of a Covid-19 hazardous medical waste treatment facility are to cut off the spread of Covid-19 originating from medical waste; reduce the volume of medical waste from health facilities; prevent the emergence of new diseases that can threaten public health and safety; opening employment opportunities for local communities based on qualifications and experience according to the needs of each region; improve the country's economy through cooperation between the central and regional governments with the private sector.

Of the four environmental cost aspects, the Government of Indonesia has been able to fulfill them quite well. However, the aspect of human resource development has not been a concern. The government has not allocated a budget for developing human resources,

especially those in charge of constructing hazardous waste management facilities. This program has been running since 2020 and continues to this day. Some areas that have completed construction have also started operating the facility. Minister of Health Regulation No. 18 of 2020 concerning Medical Waste Management for Regional-Based Health Service Facilities has outlined that human resources is one of the resources that must be fulfilled. The human resources needed in managing hazardous medical waste are experienced and competent human resources medical waste management, capable of being responsible for regional-based waste management. The determination of human resources is carried out by the respective Regional Heads (Permenkes Nomor 18 Tahun 2020 Tentang Pengelolaan Limbah Medis Fasilitas Pelayanan Kesehatan Berbasis Wilayah, 2020).

Training is one form of human resources development that is quite effective. Training programs can increase the knowledge and awareness of medical staff and waste managers. The training provided should focus on presenting a waste management plan, risks posed by waste, protection measures, roles and responsibilities of each individual, to technical instructions in carrying out tasks (Bandaso & Ayuningtyas, 2019).

Besides developing infrastructure and human resources, the government should also invest in technology. As technology advances, the tools can ease the burden of managing hazardous medical waste. This development certainly requires a larger budget, both in terms of procurement and maintenance. Even though the budget is quite large, the many benefits it brings in the long term can support the sustainable development movement.

One of the countries that have succeeded in taking advantage of technological advances to reduce Covid-19 hazardous medical waste is China, precisely in the city of Wuhan. Based on the research results of Singh *et al.* (2020), the local government changed the hazardous waste treatment system. First, decentralization to centralization. Second, from irregular to regular management. Third, utilizing most technologies such as incineration to non-incineration disposals such as autoclaving steam, dry heat, chemical disinfection, or microwave. Not only that, but the Covid-19 hazardous medical waste treatment facility is also automatically connected to the internet or commonly referred to as the Internet of Things (Singh *et al.*, 2020, p. 2).

The utilization of IoT simplifies the entire waste disposal process with real-time tracking and control in Wuhan City. The system is capable of managing equipment information sensing, location systems, video scanning, and surveillance, as well as internet access with each device.

The research of Patricio *et al.* (2020) also supports the use of technology for managing Covid-19 hazardous medical waste. Technology can be used as a function of monitoring and mapping waste, such as using drones. This method can prevent and reduce hazardous medical waste that can damage the environment (Patrício *et al.*, 2020). Strategies and approaches to using digital technology have been proven in several countries. Therefore, this utilization must be a priority and implemented in the future.

The provision of hazardous medical waste management facilities is not only carried out by the government. Private parties engaged in waste management services can also participate in this program. Cooperation between the government and the private sector is a public-private partnership. The private sector can assist the government in achieving the target of hazardous medical waste management. The private sector can also run a business and earn profits for the company's development. Both parties will benefit if this hazardous

waste management collaboration is carried out. Therefore, policies regarding public-private partnership cooperation should be considered.

One of the studies that show the success of cooperation between the government and the private sector is the research of Kriswibowo *et al.* (2021). The research was conducted in Madiun City, involving RSUD dr. Soedono as a waste producer and PT. Triata Mulia Indonesia is a private company that manages hazardous medical waste. The results showed that the collaboration between the Madiun City Government and the private sector in handling Covid-19 hazardous medical waste was quite successful. Each party carries out its respective roles according to the agreement. This success is also due to the government's ability to choose cooperation partners. There are many providers of hazardous waste management services, but the operating license and history of cooperation are the primary considerations (Kriswibowo *et al.*, 2021).

A similar collaboration is also carried out by the DKI Jakarta Provincial Government with the non-profit company Human Initiative and Agile Innovation Labs. The research was analyzed using three main factors, namely process factors, partner factors, and structural factors. The results showed that the collaboration went well and had a positive impact on each stakeholder. However, several obstacles were encountered, such as changing officials in the DKI Jakarta Provincial Government without any knowledge transfer process. Substitute officials were not given information about the cooperation established with the previous official. This problem is enough to hinder managing Covid-19 hazardous medical waste (Adiyasha, 2021). In addition to entering into cooperation agreements with the private sector, government officials as leaders must be able to adapt and resolve existing problems. If the problem continues, not only will waste continue to grow, but it will also be detrimental to the state budget.

#### **IV. Conclusion and Recommendation**

Based on the explanation and analysis above, the government's efforts in dealing with Covid-19 waste through the development program of hazardous medical waste management facilities from health facilities have been quite reasonable. Every aspect required for the management process has been described. From the budget side, sufficient funds have been allocated for the program implementation. The analysis using environmental cost accounting theory shows that the government's efforts in planning the management of hazardous medical waste from health facilities are pretty good. Necessary costs such as prevention costs, detection costs, internal failure costs, and external failure costs are allocated accordingly. However, the government has not yet drawn up budget specifications.

The budget data described only contains nominal in total. The government needs to detail these needs to determine how far the budget has been absorbed. The government also needs periodic evaluations by compiling reports on areas where hazardous medical waste treatment facilities have been built from health facilities. This report serves as a form of accountability and material for improvement.

If the evaluation has been carried out and the report has been prepared, the government must publish it through the website, social media, or workshops. One of the functions of this report publication is to be able to carry out joint supervision. Collective supervision will produce more objective criticism and suggestions from various points of

view, which can be taken into consideration by the government in implementing the program.

Some recommendations that can be an option for the government to improve the performance of the hazardous medical waste treatment facility construction are as follows: (1) Formulate regulations regarding the processing of Covid-19 hazardous medical waste at the city/district and provincial levels to accelerate the reduction of the volume of hazardous medical waste in Indonesia; (2) Develop a more specific budget plan to determine the amount of each need in each region. Regional development in each region varies, depending on the conditions of the physical, social, and cultural environment of the community; (3) Fulfill the number of human resources who will manage hazardous waste management facilities with adequate background and experience; (4) Improving medical waste management. Local and central governments need to coordinate so that hazardous medical facilities can be used correctly. Of these recommendations, city and provincial level policies are the most urgent. Policy is the basis of all hazardous medical waste management activities. Clear regulations will make it easier for all stakeholders to get involved and carry out their respective roles to achieve common goals.

### Acknowledgements

The writer would like to express her deepest gratitude to all lecturers of the Public Policy Department at Airlangga University. In particular, the writer would like to thank Dr. Bintoro Wardiyanto, as a lecturer in the Public Economy and Policy course who has helped her understand public policy in terms of development and economy. With the support and direction given, the writer can complete this research well. Furthermore, the writer would also like to thank the Ministry of National Development Planning (BAPPENAS) for providing her with the opportunity to publish the results of the research that has been carried out.

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