**WASTE MANAGEMENT IN THE SERVICE COMPANY FOR HAZARDOUS WASTE TREATMENT IN BALIKPAPAN**

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*Abstract*

Because of the potential threats to the environment, hazardous waste management is critical. The design of a hazardous waste management system in Indonesia involves several regulations, including Government Regulation of the Republic of Indonesia or PP No. 22/2021 and the decree of The Head of Indonesian Environmental Impact Control Agency or BAPEDAL No. 01/1995. This study aims to assess the practice of these regulations by the service company for the hazardous waste treatment. The method is conducted with a descriptive idea and content analysis technique using a qualitative case study research approach to collect in-depth knowledge regarding waste management system. In this regard, the selected service company for hazardous waste treatment in Balikpapan could proof only six of the ten criteria of Indonesian legal standard examined so this study proposed a performance evaluation centered on hazardous waste management as sufficient for the implementation of hazardous waste management. To improve the waste management assessment, a series of alternatives based on the waste management hierarchy is suggested for further studies such as including reduction, storage, usage, processing, stockpiling, and dumping factors on their research.

**Keywords:** Waste management, Assessment, Service company, Hazardous waste, Environmental problem.

**INTRODUCTION**

Domestic, clinical, and industrial wastes are the most common types of trash, which are categorized according to their origin. A further classification is non-hazardous waste and hazardous waste, which includes all toxic chemicals, radioactive materials, biologic or infectious waste, and other waste that has been identified as hazardous through laboratory testing. The majority of hazardous waste is generated by industrial processes that produce unwanted byproducts, defective products, and spilled materials (Couto et al., 2013; Fernando, 2019).

Global waste projections show that waste production will increase from 2.01 billion tons in 2016 to roughly 3.40 billion tons by 2050. In Europe and Central Asia, waste production is predicted to increase by 25%, from 392 million tons to 490 million tons per year (Prajapati et al., 2021). In Indonesia, the disposing of waste is still classified as careless and increased by 68.5% during the Covid-19 pandemic accompanied by a lack of public understanding regarding waste disposal regulations (Pratama et al., 2021).

Even though the amount of waste differs from one sector to the next, it is always larger than the amount of waste created by other cultures on a yearly basis. With an expanding global population and climate change concerns that could threaten the stability of specific regions, forward-thinking thinkers are focusing on consumption levels and pollution as two areas to keep an eye on. One of the most pressing issues we face today is finding better ways to turn perishable items into nonperishable goods while causing the least amount of environmental damage possible (Huang & Koroteev, 2021; Kabirifar et al., 2020).

Increased waste volumes will have a substantial influence on system design and development (Cheela et al., 2021). Waste that is not handled and managed scientifically has a substantial influence on the ecological footprint (Ahmed & Wang, 2019). Many companies in underdeveloped nations, burnt and openly dumped the waste owing to the economic viability and availability of land. In any case, the waste produced must be properly managed (Coscieme et al., 2021).

Industrial hazardous wastes are now mostly immobilized and landfilled, used as raw material (used oil and spent solvents) for alternative fuels production, and used as raw material (used oil) for re-refining oil, whereas healthcare wastes are mostly incinerated or sterilized. Nonetheless, a significant portion of industrial hazardous wastes is still combined with non-hazardous wastes and landfilled, posing major environmental risks due to the presence of heavy metals and persistent organic pollutants in landfill leachate (Navia & Bezama, 2008).

The service company of hazardous waste treatment also generates important amounts of waste (Batchelor et al., 2011). Among the more well-known wastes are oil, metal sludge, arc spray, hexavalent chromium salts, and nickle sulfate. When it comes to hexavalent chromium salts and nickle sulfate, both of which are used in electroplating, substitutes are being sought, though problems handling the suggested replacement have made change difficult for the industry which endangers nature and is economically unfeasible (Bell & Dearnley, 1994). As a result, there is increasing interest in creating a new, superior method for storing and disposing of these hazardous industrial wastes (Girge et al., 2021). The costs of designing, building, maintaining, closing, and rehabilitating related to the method could be significant. Lessons from the past show that, while surface engineering is associated with economic growth and job creation, industrial waste management activities may have negative effects on the environment and human health. In some extreme cases, failures and accidents have resulted in environmental devastation and deterioration of human health, including fatalities (Ferraz de Campos et al., 2021).

Given this, our goal was to investigate hazardous waste management issues by the service company for hazardous waste treatment in order to provide information and insight into its programs, practices, and activities in order to help bridge the information and data gap identified in the literature. Additionally, this report also analyses the effectiveness of the implementation of its waste management compared to the existing regulations.

**METHODS**

With a descriptive idea and content analysis technique, we used a qualitative case study research approach to collect in-depth knowledge regarding waste management systems (Gustafsson, 2017) in the service company for hazardous wate treatment. It was carried out using documents provided by Indonesian local governments and waste authority. In order to compare theories and implementations, a review of literatures connected to the hazardous waste management was conducted.

Since there was no publicly available data from which to determine waste management systems in place, we began by interviewing staff of the industry, who work directly on
waste management in the industry (Assuah & Sinclair, 2021). To be selected as a case, an established service company of hazardous waste treatment in Balikpapan, called PT. Sinar Wandiole Balikpapan, needed to meet the above criteria. Five (5) workers of the information services division (one project manager; one Health, Safety, Security, and Environmental (HSSE) Supervisor; and three staffs) were questioned for 45 minutes each, with questions focusing on communities in the company that are relatively advanced in waste management. During the interviews, the employees were asked focused on basic information about hazardous waste management in the company, including waste management systems in place, practices, training, programs, and success and challenges of programs. We also sought information on overall waste management capacity, waste management education pursuit, and waste management attitudes and behaviors in the industry. Besides discussion with each, we either used quotes from participants to get their feedback.

***OUTPUT***

Comparing real conditions with reference standards

**PROCESS**

Compatibility of hazardous waste management in the service company for hazardous waste treatment

Compatible/Not

PP No. 22/2021 and

Decree of the Head of

BAPEDAL No. 01/1995

PP No. 22/2021

PerMen LHK No. 4/2020

Hazardous waste transportation

Real conditon

***INPUT***

Input reform

Collect Hazardous waste

**RESULTS AND DISCUSSION**

 PT. Sinar Wandiole Balikpapan is a significant company in Balikpapan, East

 **Picture 1.** Flowchart depicting the conceptual of this study.

Rekomendasi



a

**Picture 2.** One of hazardous waste transport equipment owned by PT. Sinar Wandiole Balikpapan (a);hazardous waste collection building at PT. Sinar Wandiole Balikpapan (b); and the collected waste given a name and characteristic of hazardous waste (c).

c

b

Kalimantan, Indonesia that manages hazardous waste, and is currently involved in hazardous and toxic waste both transportation and collection. It is devoted to processing waste in line with Indonesian legalitation, so that changes to these regulations can be made in a sustainable manner and environmentally friendly operations can be carried out as shown at **Picture 1**.

Observation and interview conducted at this study were arranged in the form of checklist consist of one variable which is hazardous waste collection. **Tabel 1** shows the evaluation related to the collection of hazardous waste consisting of 10 points obtained, 60% were appropriate and 40% were not appropriate. From the percentage results related to the collection of hazardous waste held by the service company for hazardous waste in Balikpapan could be categorized as sufficient at the application of waste collection.

Based on the results of observations and interviews with participants, there were several points of incompatibility in the application of hazardous waste management, in this case related to the collection of hazardous

**Table 1.** Result of interview participants and observation of hazardous waste collection.

|  |  |  |  |
| --- | --- | --- | --- |
| **No** | **DESCRIPTION** | **STANDARD** | **DETAILS** |
| **Legal** | **Chapter** | **Compatible** | **Not Compatible** | **Score** | **Averment** |
| **COLLECTING OF HAZARDOUS WASTE**  |
| 1 | Submitting hazardous waste to the collector, receipt is required.  | PP No. 22/2021 | 298verse 1 | V |  | 1 | Receipt found. |
| 2 | Collecting hazardous waste by collector, receipt is required, as:1. Segregation of hazardous waste
2. Storage of hazardous waste.
 | PP No. 22/2021 | 299verse 1a, b | V |  | 1 | Receipt found for both segregetion and storage of hazardous waste. |
| 3 | Segregation of hazardous waste conducted, receipt is required:1. Name of hazardous waste
2. Characteristic of waste.
 | PP No. 22/2021 | 299verse 2a, b | V |  | 1 | Receipt found. |
| 4 | To be able to collect hazardous waste, the collector must get:1. Environmental approval
2. Business license for hazardous

 waste management. | PP No 22/ 2021 | 300verse 1a, b | V |  | 1 | Approval and license foumd. |
| 5 | Hazardous waste collector is required to geta technical approval for the hazardous waste management. | PP No 22/ 2021 | 300verse 2 |  | V | 0 | No technical approval for hazardous waste management. |
| 6 | The collection of hazardous waste is prohibited to:1. Utilize and process hazardous waste on part or all of the collected hazardous waste
2. Submit the collected hazardous waste to other hazardous waste collectors
3. Mix hazardous waste.
 | PP No 22/ 2021 | 300verse 3a, b, c | V |  | 1 | Found evidence in the form of document that the company did not utilize and mix hazardous waste. |
| 7 | The obligation of the holder of the technical approval for hazardous waste management as referred to:1. Collecting hazardous waste according to the name and characteristics of the hazardous waste
2. Functioning the hazardous waste storage area
3. Storing the collected hazardous waste in a determined hazardous area
4. Packaging the hazardous waste according to the characteristics
5. Attaching the hazardous waste symbol to the packaging
6. Identifying the collected hazardous waste
7. Carrying out the hazardous waste segregation in accordance with the provisions
8. Recording the name, source, characteristics, and quantity of hazardous waste collected
9. Preparing and submiting hazardous waste collection reports
10. Implementing an emergency response system in the form of a hazardous waste management emergency program document
11. Having a workforce that has a certificate of competence in the field of hazardous waste management.
 | PP No 22/ 2021 | 305 a- k |  | V | 0 | Found evidence in the form of documents and photos. Collection of hazardous waste according to name and characteristics, collected in hazardous waste storage with symbols on packaging, and identifying the hazardous waste, segregating hazardous waste. But no found a workforce with certificate of competence in the field of hazardous waste management. |
| 8 | Mandatory of hazardous waste collector:1. Carrying out the obligations as stated in the technical management agreement of hazardous waste
2. Performing hazardous waste segregation
3. Storage of hazardous waste no later than 90 days after the hazardous waste is handed over by everyone who produces hazardous waste
4. Preparing and submiting reports on the construction of hazardous waste collection facilities, for hazardous waste collectors who are still constructing hazardous waste collection facilities
5. Prepare and submit hazardous waste collection reports.
 | PP No 22/ 2021 | 306verse 1 | V |  | 1 | Found evidence in the form of photos in carrying out the segregation and storage of hazardous waste (**Picture 2**). |
| 9 | Requirement of hazardous waste collection location:1. land area including for storage building and other facilities is at least 1 (one) hectare
2. the area is geologically an annual flood free area
3. the location must be sufficient from public facilities and certain ecosystems. Closest distance allowed:
4. 150 m from the main road or toll road; 50 m from other roads
5. 300 m from public facilities such as residential areas, trade, hospitals, health services or social activities, hotels, restaurants, religious facilities, educational facilities
6. 300 m from waters such as, the highest tide line of sea water, river bodies, tidal areas, ponds, lakes, swamps, springs, resident wells
7. 300 m from protected areas such as nature reserves, protected forest, sanctuary area.
 | Decree of the Head of BAPEDAL No. 01/1995 | Appendix |  | V | 0 | Found evidence in the form of photos of the collection location with an area of more than a hectare and an area that is free from flooding. But land area including storage building has not reached 1 hectare. |
| 10 | Requirement of collection building:1. each hazardous waste building is specially designed to store only one characteristic of waste, and is equipped with a waste spill/splash container designed in such a way as to facilitate removal
2. collection facilities must be equipped with:
3. fire fighting equipment and systems
4. backup power plant.
 | Decree of the Head of BAPEDAL No. 01/1995 | Appendix |  | V | 0 | Found evidence in the form of photos of buildings designed specifically for one characteristic and facilitated by emergency facilities as well as a backup power plant, but not equipped with a waste spill reservoir.  |

**Note:** PP = Government Regulation of the Republic of Indonesia; BAPEDAL = The Indonesian Environmental Impact Control Agency

waste, especially liquid hazardous waste, namely Government Regulation of the Republic of Indonesia or PP 22/2021 Chapter 300 verse 2 stated that hazardous waste collectors must have approval hazardous waste management technical.

For the meantime, the company did not have any technical approval for hazardous waste management. Other discrepancy found at this study was the holder of the technical approval must have a workforce who has a certificate of competence in the field of hazardous waste management, but in fact the company did not have a competency certificate in the field of hazardous waste management. Although specialist knowledge, management skills, and practical experience are difficult to quantify, the human effect in everyday landfill operations is measured by the percentage of professionals on staff. A larger proportion is thought to indicate that the disposal facilities will be professionally maintained, that there will be less environmental harm, and that risk control and interception will be superior when environmental contamination events do occur (Li et al., 2012).

Furthermore, regarding the decree of the head of The Indonesian Environmental Impact Control Agency or BAPEDAL no. 01/1995 in the Appendix which states that the land area including for storage buildings and other facilities is at least 1 hectare. While in real, the land area of the company was not reached 1 hectare. The last discrepancy in the application of hazardous waste collection of the company was no reservoir for liquid hazardous waste found. In the meantime, the decree of the head of BAPEDAL no. 01/1995 in the Appendix states that the collection building must be equipped with a container for handling spills of waste that is designed in such a way as to facilitate removal. Specific criteria for landfill site selection, design, building, and operation have been established by a set of rules and recommendations aimed at controlling the management of hazardous waste landuse and reducing the likelihood and severity of environmental contamination and ecological harm.

As a result of both human constraints and natural factors, there are inconsistencies and harmful practices. Such incidents might expose the environment to concealed dangers. As a result, the quality of daily hazardous waste landfill activities has a significant impact on groundwater around dump sites (Huber et al., 2004). The quality of daily operations, on the other hand, is a nebulous concept that is difficult to pinpoint precisely and scientifically. Whereas, good waste management is basically a shared responsibility, so its implementation cannot be seen unilaterally at certain layers (Addahlawi et al., 2019).

**CONCLUSION**

As six of the ten criteria of Indonesian legal standard examined in the service company for hazardous waste treatment, this study proposed a performance evaluation centered on hazardous waste management as sufficient in its application. It is based on the findings of the percentage connected to the collection of hazardous waste in the service company for hazardous waste treatment. As for recommendation for the next studies, they should include other factors such as reduction, storage, usage, processing, stockpiling, and dumping in order to maximize the hazardous waste management research outcomes.

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