

Research Paper

Construction Waste Management from Environmental Law Perspective in Indonesia

Seng Hansen¹

¹ Universitas Agung Podomoro. Jakarta, Indonesia.

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*Corresponding Author:

Seng Hansen
Email:
seng.hansen@gmail.com

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Abstract: Several prior studies have linked the relationship between construction activities and environmental degradation. This research focuses on one of the major issues confronting the Indonesian construction industry, namely construction waste management. In practice, construction waste cannot be avoided and thus must be managed properly. Using a descriptive normative legal study approach and a case approach, this research seeks to investigate the practices and conditions of construction waste management as well as the regulatory legal framework related to construction waste management in Indonesia. This study found that the practice of implementing construction waste management varies greatly depending on the understanding and skills of construction business actors, especially contractors and subcontractors. In addition, normative studies show that there is no regulation that specifically regulates the management of construction waste in Indonesia. Therefore, this research contributes by: (1) encouraging the government to make policies that specifically regulate construction waste management, (2) encouraging periodic monitoring and supervision efforts on the implementation of construction waste management, and (3) encouraging the active participation of the community to participate in supervising the execution of construction projects, especially regarding the management of construction waste. Therefore, this study emphasizes the importance of a legal framework for construction waste management in order to realize sustainable construction.

Keywords: Construction Project, Construction Waste, Environment, Legal Framework, Sustainable.



1. Introduction

The construction industry is a sector that plays a crucial role in the social and economic growth of the Indonesian people [1]. As a sector that contributes significantly, special attention needs to be given by the government to optimally manage construction work activities. One of the issues raised in this study is related to construction waste management. Construction waste is waste resulting from construction work activities which may come from new construction, renovation, demolition, or other construction activities. It is found that the construction industry is one of the main sectors causing environmental degradation [2].

2. Literature Review

Regarding the negative impact of the construction sector on the environment has also been researched in various publications. A report, for example, prove that the Thai construction industry plays a role in producing an average of 1.1 million tons of waste per year [3]. In China, construction waste accounts for 40% of total urban waste [4]. Meanwhile, in America and Europe, construction waste accounts for 26% and 37.5% of the total solid waste in the United States [5] and industrial waste in Europe [6].

Since construction waste is unavoidable in carrying out construction work [7], an effective and efficient construction waste management is needed to help reduce and handle construction waste in Indonesia. This is crucial considering that several construction materials used in the field are classified as hazardous and toxic materials (HTM) for the environment. Another study has linked construction waste production to construction project performance and environmental quality [8].

Excessive and unnecessary production of construction waste can be caused by errors in contract documents, changes in work design, errors in ordering materials, accidents in the field, lack of monitoring and control of construction activities in the field, ineffective management of construction waste in the field, material damage occurs during shipping and storage, and there is leftover material from a construction activity [9]. Poor management of construction waste can have an impact on increasing the cost of work, delaying the completion of work, decreasing the quality of work, and impacting the health of workers and the environment.

In contrast to the situation and conditions of construction waste management in developed countries such as the European Union and the United States which already have specific regulations and guidelines regarding construction waste management, the Indonesian government has not paid particular attention to construction waste management and has issued regulations and guidelines that specifically regulate the waste management in the construction sector. Hence, this study aims to investigate construction waste management practices as well as the regulatory legal framework related to construction waste management in Indonesia.

3. Methodology

This research applies descriptive normative legal approach. Thus, this research is qualitative in nature by examining the concept of construction waste management in Indonesia. The data sources used in this research are laws and other relevant regulations as the primary legal materials as well as scientific articles and literatures as the secondary legal materials. In addition, this research also adopts a case approach based on literature review techniques sourced from news articles related to construction waste management problems in Indonesia. Similar techniques have been used in several previous studies [10-12].

4. Findings and Discussion

4.1. Existing Construction Waste Management Practice in Indonesia

Construction waste management in Indonesia still faces many challenges. This is mainly due to the lack of guidelines and regulations related to construction waste management in Indonesia so that construction business actors, especially contractors who are responsible for carrying out work in the field, do not receive adequate understanding, training, and supervision regarding the proper management of construction waste.

Several previous studies have revealed the poor management of construction waste in Indonesia. For example, a case study of construction waste management by three contractors for projects in Surakarta, namely the Penggawan Village Building project, the Karangasem Village Building project, and the Purwodiningratan Village Building project [13]. The results of this study found that construction waste management was ranked very ineffective with a value of 34.19%. These findings indicate poor planning and management of construction waste in building projects carried out by

contractors. The results of the investigation showed that the contractors did not understand and know about construction waste management properly and only carried out waste management based on project habits.

The most common and easiest way to do this is by landfilling construction waste on project sites. However, landfilling of construction waste must consider several things because not all construction waste can be managed by landfilling. There are types of construction materials that are harmful to the environment. Recommendation of the use of construction waste such as sand and leftover rock as backfill material is prominent [14]. However, chemical-based materials such as sulphates, chlorides, sodium, and ammonia must be managed through a screening process for construction waste materials because they can contaminate groundwater when they are piled up. The decline in groundwater quality can also be affected by the accumulation of other HTM materials, especially heavy metals and organic compounds [15]. Thus, landfilling is suggested to be the last option in managing construction waste [16]. Good construction waste management must be based on the principles of reduction (minimizing construction waste through planning and managing materials effectively and efficiently), reuse (using waste as an alternative to other materials), and recycle (reprocessing waste into new materials).

There are several causes of construction waste in Indonesia including poor material quality, poor material handling, lack of knowledge and skills in managing construction waste, and inappropriate work methods [17]. Another case that has received quite a lot of attention is the dumping of construction waste from the Jakarta-Bandung high-speed rail line construction project, which was reported by a number of community representatives in the project area to the West Java Forum for the Environment (Walhi) complaint post for disposing and hoarding project waste in the rice fields of the Walini area [18]. Conflicts between residents and construction actors also occurred in Lamongan. Steel factory waste is suspected of damaging tens of hectares of farmers' rice fields in Brengkok Village, Lamongan Regency, East Java so that rice crops fail to harvest [19].

However, not all construction waste management practices in Indonesia are bad. The results of the investigation found several cases where contractors had implemented proper construction waste management, especially large construction service actors who applied green construction principles. For instance, the main contractor of the Neo Soho Podomoro City Building project in West Jakarta already have construction waste management standards through primary, secondary, and tertiary treatment that are implemented effectively [16]. Likewise with the contractors in the Prawirotaman Market Rehabilitation project who have implemented 75% of the green construction concept in the planning stage and 85.7% in the implementation stage of the Green Building Performance in an effort to minimize material waste and construction waste [20].

4.2. Legal Framework of Construction Waste Management in Indonesia

The law aims to provide justice and certainty for society. In addition, law plays a vital role in maintaining public order and fulfilling the basic needs of society. In order to achieve the aspirations of the nation, the government continues to encourage economic growth through sustainable development. The construction sector as a support for development in Indonesia has a significant contribution in achieving this goal. Article 33 paragraph (3) of the 1945 Constitution mandates that the land, water, and natural resources contained therein shall be controlled by the state and used for the greatest prosperity of the people. However, this development must be accompanied by monitoring and controlling the impact on the environment. Even Article 28 H paragraph (1) of the 1945 Constitution has also emphasized the right of every person to get a good and healthy environment.

In the context of construction waste management, this research focuses on normative studies of legislation. The results of the study show the absence of government regulations, policies or guidelines that specifically regulate waste management in the construction sector. Even though the construction sector is one of the main sectors that contributes solid and liquid waste. In addition, several types of construction waste are also classified as hazardous & toxic material waste which require special handling. Table 1 below presents the legal framework related to garbage, waste, and hazardous & toxic materials (HTM) management relevant to the construction sector in Indonesia. The arrangement of this legal framework is made in chronological order.

Table 1. Legal Framework for Garbage, Waste and HTM Management Relevant to the Construction Sector.

No	National Laws and Regulations	Category
1	Government Regulation Number 22 of 2021 concerning Implementation of Environmental Protection and Management (GR 22/2021)	Government Regulation
2	Ministry of Environment and Forestry Regulation Number 6 of 2021 concerning Procedures and Requirements for the Management of Hazardous and Toxic Waste (MEFR 6/2021)	Ministry Regulation
3	Ministry of Environment and Forestry Regulation Number 63 of 2016 concerning Requirements and Procedures for Landfilling of Hazardous and Toxic Waste at Final Landfill Facilities (MEFR 63/2016)	Ministry Regulation
4	Ministry of Environment and Forestry Regulation Number 55 of 2015 concerning Procedures for Testing the Characteristics of Hazardous and Toxic Waste (MEFR 55/2015)	Ministry Regulation
5	Government Regulation Number 101 of 2014 concerning Hazardous and Toxic Waste Management (GR 101/2014)	Government Regulation
6	Law Number 32 of 2009 concerning Environmental Protection and Management (Law 32/2009)	Law
7	Law Number 18 of 2008 concerning Waste Management (Law 18/2008)	Law
8	Government Regulation Number 74 of 2001 concerning Management of Hazardous and Toxic Materials (GR 74/2001)	Government Regulation
9	The 1945 Constitution of the Republic of Indonesia	Constitution

Source: Author's work, 2023.

The analysis shows the urgency of waste management in the construction sector as seen in the several laws and regulations above. For example, Article 4 of Law 18/2008 states that the goal of waste management is to improve public health and environmental quality and to turn waste into a resource. Construction waste itself can be categorized as "specific waste" as defined in Article 2 (4) of Law 18/2008 which includes HTM waste and demolition of buildings.

In addition, several types of construction waste can be categorized as hazardous and toxic material. According to Article 1 of MEFR 6/2021, HTM are substances or components that can pollute and damage the environment. Examples of hazardous and toxic construction materials include lead, asbestos, cadmium, and polyvinyl chloride. The MEFR 6/2021 also regulates the determination of the status of HTM waste as stated in Article 3 into HTM waste and non-HTM waste.

Based on Table 3 List of HTM Waste from General Specific Sources, it is clearly stated that the construction sector is classified as a general specific source of HTM waste with industry/activity code number "54" which applies to all types of construction industry. The sources of waste can come from (1) replacement of coolers (fireproof insulation), roofing, insulation, and (2) construction and demolition activities. There are five types of waste, namely (1) B354-1 for mixed or separate fractions of concrete, brick and ceramics containing HTM, (2) B354-2 for glass, plastic and wood contaminated with HTM, (3) B354-3 for metal waste contaminated with HTM, (4) B354-4 for insulation material containing asbestos, and (5) B352-5 for construction materials containing asbestos. The hazard category for these five types of waste is Category 2.

Furthermore, Article 4 of the MEFR 6/2021 outlines that the determination of the status of HTM waste is carried out through a HTM waste characteristic test which includes:

- a) explosive;
- b) easy to ignite;
- c) reactive;
- d) infectious;
- e) corrosive; and/or
- f) toxic through:
 1. TCLP (toxicity characteristic leaching procedure) test;
 2. Toxicological Test LD50 (median lethal dose); And
 3. Sub-chronic toxicology test.

The detailed explanation regarding the HTM waste characteristic test can be seen in the MEFR 55/2015. Article 17 (1) of the MEFR 6/2021 states that based on the results of the evaluation, the expert team will issue recommendations for determining waste as:

- a) Category 1;
- b) Category 2; or
- c) non-HTM waste.

Article 3 of the GR 101/2014 emphasizes the obligation of everyone who generates HTM waste to manage the HTM waste they produce. Regarding waste handling, Article 22 of Law 18/2008 mentioned five waste handling activities including segregation, collection, transportation, processing, and final treatment of waste. Paragraph 2 of this article emphasizes the need for further provisions regarding waste handling by the relevant authorities.

Examples of these further provisions can be seen in the GR 22/2021 Articles 133 and 461. Article 133 (4) describes the disposal and/or utilization of waste water is regulated in which includes:

- a. source, volume, characteristics of the waste water to be injected;
- b. wastewater treatment and/or injection facilities;
- c. the injection study area which describes the location of the injection well in relation to the distance to community wells, the nearest water body, and/or the groundwater conservation zone;
- d. injection well data and injection target zone characteristics. includes impermeable zone layers and buffer zone layers;
- e. tamping volume/capacity of injection target zone and estimation of distribution of waste water in injection target zone;
- f. mechanical integrity test;
- g. drilled well construction;
- h. monitoring wells;
- i. discharge and injection pressure at the wellhead;
- j. maximum fracture pressure in the impermeable zone layer which causes the transfer of Wastewater from the formation to underground drinking water sources;
- k. wastewater injection performance monitoring plan;
- l. Emergency Response System; and
- m. plans to close injection wells that have completed their operational period.

Whereas Article 461 (1) regulates the utilization of non-HTM waste which can be used as an alternative for raw materials as referred to in Article 459 paragraph (3) letter (a) can be carried out in the following activities:

- a. cement industry;
- b. soil compaction; and
- c. other forms in accordance with the advancement of science and technology.

Regarding waste collection activities, it has been regulated in the MEFR 63/2016. Article 2 (1) states that everyone who produces HTM waste is obliged to store HTM waste. If the person is unable to carry out the landfilling himself, then the HTM waste landfill can be handed over to the HTM waste landfiller (Article 2 (2)). Furthermore, Article 3 states that landfilling of HTM waste is carried out at a final landfill facility which must comply with the following conditions:

- a) requirements for hazardous waste storage facilities;
- b) location requirements for the final hazardous waste landfill facility;
- c) procedures for storing hazardous waste at the final disposal facility for hazardous waste;
- d) procedures and requirements for environmental monitoring;
- e) procedures and details for closing the uppermost part of the HTM waste final disposal facility; and
- f) stipulation of cessation of hazardous waste storage activities at the final disposal facility for hazardous waste.

4.3. Legal Issues and Recommendations

Based on the description above, it can be seen that the management of construction waste is still not regulated comprehensively and systematically. Various existing regulations tend to view construction

waste as HTM waste, even though in-depth investigations are needed regarding the identification of various types of waste from construction products and activities in the project. In addition, while the construction industry is one of the most important sectors in the socio-economic growth of society and has a major impact on the environment, there is no specific regulation that specifically regulates the management of construction waste. This is reflected in all existing regulations that only regulate procedures for HTM waste management in general.

This study highlights the need for regulations, policies and guidelines that specifically regulate and guide the management of construction waste so that it can become a reference for key stakeholders in the construction sector, especially contractors and subcontractors. Currently, the government's attention is only limited to issuing regulations on the management of household waste and household-like waste through GR 81/2012 and on procedures and technical requirements for the management of HTM waste from health care facilities through MEFR 56/2015.

This study also emphasizes the need for the industry to know, comprehend, and practice proper construction waste management for the realization of sustainable construction in order to maintain and achieve sustainable environment. In fact, this study found a legal gap where there is no regulation that specifically regulates construction waste management even though it has been mandated in several laws and regulations, including:

- Article 23 (2) of Law 18/2008
- Article 5 of Law 18/2008
- Article 53 (3) Law 32/2009
- Article 56 of Law 32/2009
- Article 58 (2) of Law 32/2009
- Article 61 (3) of Law 32/2009
- Article 100 paragraph (3) of GR 101/2014

Regarding the above, there is potential for further legal studies to assist the government in issuing regulations related to construction waste management. Since these studies involve multiple disciplines and practices, the role of the relevant ministries, especially the Ministry of Public Works and Housing (MPWH), the Ministry of Health (MH), and the Ministry of Environment and Forestry (MEF) becomes crucial.

5. Conclusion

The construction industry is one of the most crucial sectors in supporting the socio-economic growth of society. On the other hand, the activities and results of the construction sector also have an impact on the environment, including changes in the carrying capacity and quality of the natural environment. The environmental impact of the construction sector should be mitigated from the outset through the planning and management of construction waste from the planning, design, implementation, to completion of the construction project. However, this study found that the practice of implementing construction waste management varies greatly depending on the understanding and skills of construction business players, especially contractors and subcontractors. In addition, this study found that there is no regulation that specifically regulates the management of construction waste in Indonesia. The various existing regulations only regulate HTM waste management in general.

Looking at the findings above, this study provides three recommendations. First and foremost is to encourage the government to make regulations that specifically regulate the management of construction waste, which is preceded by in-depth academic studies. It should be acknowledged that efforts to move in this direction have not yet become a concern of the government, even though there is a need in the industrial world to realize sustainable construction. These waste management regulations, policies and guidelines will play an important role in raising awareness and implementing waste management by contractors and subcontractors in the field. The second suggestion is to encourage periodic monitoring and supervision by the government of the implementation of construction waste management in projects. The last is to encourage the active participation of the community to participate in supervising the implementation of development projects around them, especially regarding the management of construction waste.

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