



Does Effective Policy Implementation Affect Municipal Solid Waste Management in Bandung?

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Abstract

The continuous increase in generation and volume of solid waste in cities including Bandung could severely have a negative effect on health of the population and on the environment. This increase in the volume of waste generation is due to rapid population growth in Bandung because of urbanization. This phenomenon is expected to continue as the population of Bandung keeps growing due to urbanization. This growth in population also causes increase in volume of waste generated. This study assesses the implementation waste management of Bandung city in relation to the relevant articles of waste management Law No.18/2008 and No.9/2018. The study uses quantitative and qualitative descriptive analysis for analyzing the secondary data of waste management in relation waste management regulations. The findings of the study shows that the waste management activities of Bandung are not carried as stipulated by relevant Articles 5, 8, and 9 of the waste management regulations thus the waste management is not effective and efficient as stated in Law No.18/2008 and No.9/2018.

Keywords: policy implementation; regional cleaning department; waste management

1. Introduction

The issue of waste has become a major concern in Bandung city and remains a challenge for the city government (Rahayu, Putri, Hani and Basri, 2012). The overwhelming condition of final disposal sites, traditional markets and also streets with piles of waste is not uncommon in Bandung according to Rahayu et al., (2021b). The issues of increase waste generation in Bandung are attributed to factors such as rapid industrial and economic development (Suryani, 2012). High increase in waste generation can also be attributed to other factors that include the life style of the people and rapid population growth as a result of urbanization (Muliawaty, 2012; Yeboah-Assiamah, Asamoah and Kyeremeh, 2017; Amir and Anto, 2018) the consequence of which is change of life style, increase consumption, hence generation of more waste. However, the accumulation of waste in large volume is an indication that there is an issue with the waste management system. The problem of waste in Bandung has a negative impact on the city as tourist destination and this make it known as "The sea of waste" (Rachmawati et al., 2019). In an effort to solve the waste problem, Bandung city government came into partnership with city cleaning company call PDK to carryout waste management activities that includes, cleaning, collecting, transporting and disposal of waste (Muliawaty, 2012). Although this service carried out by PDK is not free, it is subsidized by the city government. Bandung is one of Indonesia's cities that is faced with a serious waste problem. However, this problem is related to collapse of the Leuwigajah landfill in 2005 causing the death of hundreds of people leaving Bandung city with no place for the processing of waste (Rachmawati et al., 2019). Meanwhile numerous activities relating to waste are performed in order to reduce waste in accordance

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with the needs of households in Bandung. In Addition, Bandung city waste management regulation No. 9/2011 was formulated by the local government in Article 22 (1) of this law categorized waste into organic, in-organic, and poisonous.

Bandung city government took numerous approaches to achieve their desire for a clean city that is aesthetic and conducive. In order to achieve this, article 6 of No. 18/ 2008 Indonesian waste management regulation state that the city government can perform the following functions; develop and increase public awareness in waste management, carry out waste management and facilitate the provision of waste management infrastructure and facilities, facilitate, develop, and implement efforts to reduce waste generation, coordinate between government agencies, the community, and the business world so that there is integration in waste management (Indonesian Law, 2008).

In order to enhance the improvement of waste management system, Article 42 (1) of regional waste management law states that it is the responsibility of the city Regional Government to provide guidance to waste management. This provision of guidance in waste management as in paragraph (1) of Article 42 includes; increase capacity and capability in waste management, and also to increase participation of persons concern in implementation of waste management system. Article 42 paragraph further states that guidance in waste management can be carried out by facilitation of improving management skills in waste management, socialization of waste management, consultation, give technical support, and provide other technical coaching related to management of waste. On the other hand, Article 50 of law No./18/2008 as in the mayor regulation shows a provision that is in relation to the involvement of the community and their role in waste management. While Article 51 (1) states that persons and business entities shall be sanctions if they fail to adhere to the waste management laws.

Drawn from achmawati et al., (2019), there are indications that waste management is ineffective because the strategies and policy directives that are relevant with PD *Kebersihan* are not performed. Also there are indications that waste management is ineffective due to lack public awareness in relation to waste reduction, waste handling and also lack of public participation in the management of waste. It is assumed that this is because of the way the waste management is implemented. Theoretical Policy implementation is application of an activity that is done practically in relation to the policy (Dunn, 2003). In order to gain results, the policy implementation should be a process till it achieve its objective. Based on this waste management in Bandung is expected to be effectively carried through the optimal application of Bandung city waste management regulation. This paper will identify, assess, and analyse the implementation of Bandung city waste management regulation.

Waste is the residue of human daily activities and/or natural processes in solid form according to Article 1 of Law No.18/ 2008. This regulation further states that a shift in the consumption pattern of the public along with growing population causes the increase in volume of the characteristics and forms of different waste (Indonesian Law, 2008). The absence of right methods, techniques, and approaches in waste management causes a negative impact not only on public health but on the environment as well. This regulation describes waste as a national issue; hence a more comprehensive and integrated approach is required from both upstream and downstream to enhance waste to become more beneficial economically, healthy for the community and non-hazardous to the environment. However, letter (d) of the waste management law No.18 / 2008 shows that in order to solve this issue, it is important to establish a legal certainty, a well-defined responsibility, have the authority of the national and regional Government, as well as partnering with the community and business entities. article 1, section 2 of the waste management law indicates that the types of waste to be managed under No./ year 2008 are household waste, and specific waste. In general, waste is a major issue in many cities of developing country, including Bandung.

The management of waste is a phenomenon that has become a serious developmental concern for most cities in developing countries (Muliawaty, 2012). This issue to some extent affects the developing countries that are experiencing a huge increase in volume of solid waste generation as a result of high population, urbanisation, industrial and economic development. In order to effectively manage municipal solid waste as shown in (Emmanuel et., 2017), the following activities should be considered; source of generation, collection, transportation and final disposal. In addition, four simple methods are widely considered as an improved way of managing municipal solid waste MSW and this include recycling, landfilling, biological and thermal treatment. meanwhile there are speculation as to how effective these methods are in relation to sustainable environmental development (Sefouhi, Kalla and Bahmed, 2014). Despite the differences in consideration as to what is considered as solid waste in different countries, this study is specifically looking at solid waste that a generated from households, offices, markets, and other institutions. Meanwhile economic development of a city has an impact on its waste generation capacity. According to Sefouhi et al., (2014). Many developing countries are having municipal solid waste management issues due to the following challenges;

1. Lack of solid waste awareness
2. lack of knowledge about solid waste
3. Lack of appropriate technology
4. Lack of sufficient funding

All of this condition immensely contribute to inadequate collection of waste, landfill dumping, and the burning of waste. Furthermore, inadequate amount of waste transportation trucks for disposal and the location distance of the disposal site has also contributed to accumulation in the volume of waste (Suryani, 2012). Meanwhile at community level, Suryani, (2012) shows that the issue of waste management is due to law of public awareness, lack of knowledge for waste processing and recycling. The formulation of

sound waste management regulations and their implementation in accordance with the law will help address the waste management issues mentioned. However, Bandung city has its own regional waste management regulations as mandated by Law No. 18 of 2008 states that the city governments are responsible for waste collection, waste transportation and disposal in Indonesia. According to Bandung city regulation, waste collection is the activity of taking and moving waste from the waste source to TPS or TPS3R which includes sweeping roads, sidewalks and public facilities, is the activity of bringing waste from the source or TPS or TPS3R to TPST or TPA by using motorized or nonmotorized vehicles designed to transport waste. Furthermore, Bandung city has in place policies and strategies in chapter (3) of law No.9/2018 that aims at curbing the issue of waste management as shown in the table below.

Table 1: Waste Management Policies and Strategies of law No. 9/2018

Regulation	Article	Description
Bandung city waste management Law No.9/2018	Article 7	Regional Waste Management Policies and Strategies should include waste management policy, waste management strategy, and waste management program.
	Article 8	waste management based on the principles of sustainable development which is carried out through: <ul style="list-style-type: none"> • Efficient use of materials in the production and consumption system in the City Region area • Decentralized waste management • Segregated waste management • Prioritizing waste processing for material recycling • Minimize the use of materials toxic in the production process and material consumption. • Institutional strengthening for the implementation of comprehensive waste management • Community involvement in every aspect of waste management.
	Article 9	The Master Plan for Municipal Waste Management shall at least contain: waste generation restriction, waste recycling, waste reuse, waste sorting, garbage collection, garbage transport, waste processing, final processing of waste, and funding.

Source: Bandung city regulation Number 9 of year 2018

Community participation in waste management is very important because they contribute in the generation of household waste. Their involvement will provide them with the required skills in waste management process and encourage sorting of waste at the source. Article 12, paragraph (1) of the Bandung city regulation states that the “Municipal Government is obligated to involve the community and/or groups community in the process of taking decisions, administration, and supervision in waste management sector.”

Bandung’s waste management process still practices disposal of waste at final waste disposal locations known as TPA because the city’s waste management paradigm is not treating waste as a valuable resource (Rahayu, Putri, Hani and Hasan Basri, 2012; Muliawaty, Firdausijah and Suryadi, 2021). However, the city has a new developing paradigm that shows that with the implementation of the 3R waste management approach, waste can be a valuable resource to all stakeholders in waste management. According to Muliawaty et al., (2021), due to lack of implementing this new method of waste management in Bandung, the city experiences economic loss. Furthermore, the city continues to experience an increase in waste generation, overwhelming landfills beyond capacity, increase in the cost of waste transportation from TPS to TPA. These however have an impact on the effective and efficient handling of waste. Because of these above-mentioned issues, there is a need for this paper to assess the implementation of waste management in relation to Bandung city waste management regulation. Waste management should be carried out in a systematic, comprehensive, and sustainable activity that

In order to enhance the improvement of the waste management system, Article 42 (1) of the regional waste management law states that it is the responsibility of the city Regional Government to provide guidance to waste management. This provision of guidance in waste management as in paragraph (1) of Article 42 includes; increase capacity and capability in waste management, and also to increase participation of persons concerned in the implementation of the waste management system. Article 42 paragraph further states that guidance in waste management can be carried out by facilitation of improving management skills in waste management, socialization of waste management, consultation, give technical support, and provide other technical coaching related to management rubbish.

However, Article 50 of law No.18/2008 as in the mayor regulation shows a provision that is in relation to the involvement of the community and their role in waste management. While Article 51 (1) states that persons and business entities shall be sanctioned if they fail to adhere to the waste management laws. The objective of this study is to: 1. Assess waste management in Bandung as stated in waste management law number 18/2008 and 9 /2018 of Bandung city 2. Analyse the implementation of waste management law number 18/ 2008 and 9 / 2018.

2. Research Method

This study will use quantitative analysis based on the waste management regulation law No.18/2008 and regional waste management regulation No.9/2018 to categorize the activities that are carried out by Regional Cleaning Company PD *Kebersihan* in relation to relevant articles of the Waste Laws. The study will use secondary data from the performance evaluation report of PD *Kebersihan* 2009-2010. The study will also use a descriptive analysis method using secondary data. Descriptive Analysis is a method used for discovery of facts by examining the current condition (Baha Hafizullah, 2016). In other words it is a strategy for describing a current situation at the time of the investigation and how it impacts. Includes waste reduction and handling as in Law No. 9/ 2018, Article (1) of Bandung city regulation.

3. Results and Discussions

3.1 Waste Management in Bandung

Waste in general is an issue that is affecting cities of many developing countries and Bandung is no exception. This phenomenon mostly affects developing countries because of high waste generation due to high growing urban population, rapid development of manufacturing and other economic activities (Muliawaty, 2012; Yeboah-Assiamah, Asamoah and Kyeremeh, 2017). The regional waste management regulation No.9 / 2018 of Bandung city shows that waste is an issue that affects the physical appearance of the city but also affects public health because of the pollution from waste that is toxic (Regulation, 2018). This regulation aims at strengthening economic sustainability of the city while enhancing natural resource increment through waste recycling. In order to make waste management more efficient, the regulation makes it the responsibility of city government to plan, organize, supervise the implementation of waste management in a way that is sustainable and environment friendly.

However, article 13 paragraph 2 of law 9/2018 shows that waste management in Bandung city includes two areas namely; Managed Area and Unmanaged Area. Managed area includes residential areas, commercial areas, industrial and warehousing areas, social, and public facilities as referred to in paragraph (1) letter a. While Unmanaged areas include unmanaged residential areas, unmanaged commercial areas, industrial estates and unmanaged warehousing, social facilities, public facilities and other facilities as referred to in paragraph (1) letter b. Article 26 of the Bandung city waste management regulation states that Waste collection facilities consisting of TPS and collection infrastructure should be made available in these areas. On the other hand, the regulation also states that the provision of waste collection facilities in managed area is the area manager's responsibility while the government is responsible for providing such facilities for unmanaged areas.

The environment and hygiene department (*Dinas Lingkungan Hidup dan Kebersihan/DLHK*) in 2017 became responsible for carrying out waste management in Bandung. This is in accordance with law No. 8/2016 of regional government regulation, Law No. 9/2011 of waste management and Law No. 14/2011 for regional hygiene in Bandung (Muliawaty, 2012). The waste management of the city was carried out in a more professional way under this new law by DLHK through PD *Kebersihan*. This waste management service is carried out by PD *Kebersihan* and is subsidized by the city government to transport and process the waste collected from Bandung.

Table 2 showing the role of Bandung city government as stipulated in regional waste management regulation of Bandung No. 9 year 2018

Regulation	Article	Item	Explanation
No. 9 year 2018	Article 5		Duties of the Municipal Government as referred to in paragraph (1) include
		a.	Enhance public awareness in waste management
		b.	conduct research and development of waste reduction and handling technology
		c.	Facilitate, develop, and enhance reduction, handling and utilization of waste
		d.	Encourage and facilitate waste processing to produce value
		e.	facilitate the application of local specific technologies that develops in the local community to reduce and manage waste
		f.	Facilitate the provision of waste management infrastructure
		g.	Coordinate with other partners, local governments, individuals and communities to create cohesiveness in waste management
		h.	Provide public complaint service units.

Source: Adopted from (Indonesian Law, 2008; Regulation, 2018)

Bandung is the largest metropolitan city in West Java as well as being the capital of the province. The city despite having a relatively small area is considered to be densely populated. Meanwhile the city has 2.5 million people in 2017 (*Badan Pusat Statistik/BPS*). In addition, Bandung grows and develops into a big city which is characterized by various daily activities (Suryani, 2012). As the city of Bandung's

population and activity grow, so do the city's issues. One of the issues that has yet to receive adequate attention is waste management. However, each household in Bandung according to Muliawaty, (2012) is estimated to generates roughly 2-5 kg of daily waste garbage, or 800-1000 g/day/capita and 60% to 75% of this waste constitutes of organic waste.

This growth in the volume of waste is related to various factors which include improved standard of life, and rapid growing of population. In addition to that, the number of people in each household, the income level, education level of the household and consumption level are also attributes to waste generation. The handling of waste from the source still remains a challenge because up till now waste separation is not practice as a result the waste from households both wet and dry are disposed while mixed up. The waste collectors experience lot of problems from this disposal method because they find it difficult to perform the 3R waste processing method. In addition to this, waste management continuous to meet some more challenges due to lack of community awareness of waste sorting from households, different containers to facilitate the sorting of organic and inorganic waste because the economically constraint cannot afford it (Muliawaty, 2012). Although waste collecting bins are provided by the city government of Bandung as stipulated in Article 5 letter (f) that city government should provide waste management infrastructure, they are in low supply which make them insufficient according to Muliawaty, (2012), hence, they are mostly placed at public spaces. The provision of waste collection bins in great numbers is important and placing them by households within communities is equally important because these are the main source of waste generation.

The composition of other types of waste generated are 70% of organic waste forming the highest percentage of waste generated followed by paper constituting 13% of waste, then 9% of textile. While plastic and iron form the least quantity of waste generated at 0% each (Suryani, 2012), as shown on figure 2 below. This data indicates that most of the waste processing required is composting which will be of value to urban farming and vegetable growing. This provision is made in Bandung city regulation No. 9/2018, Article 27 paragraph (3). Therefore, it is important to analyse the waste management activities of PD *Kebersihan* in relation to the relevant articles of the waste management law of Bandung city.

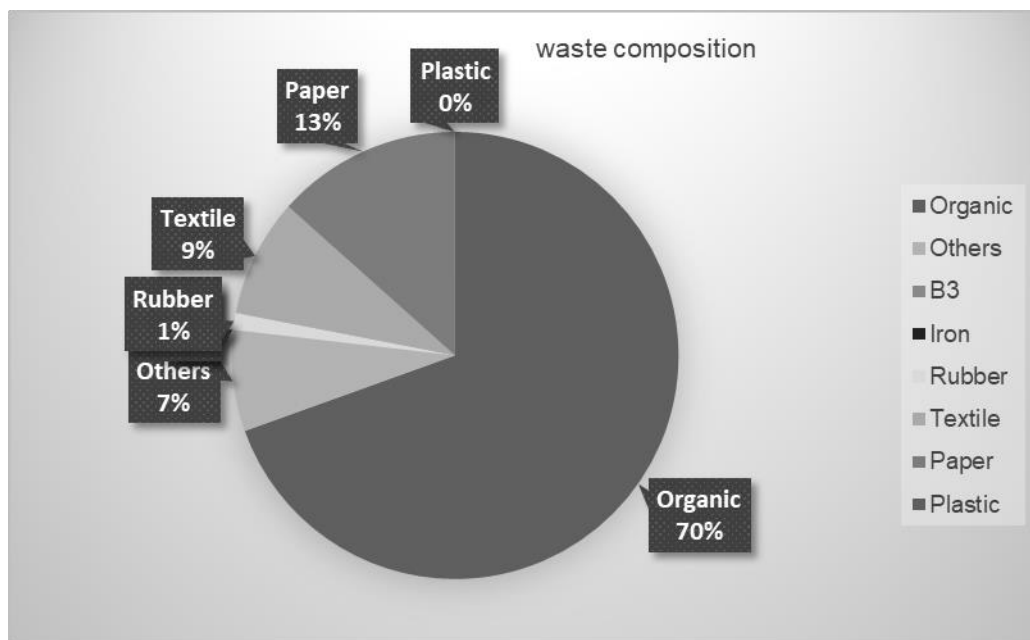


Figure 1. Composition of waste generated in Bandung that can be processed in to compost

Waste management facilities (waste collecting bins) available are inadequate and far from households where bulk of the waste is generated. Also, the number of personnel for the management of waste is also limited. Due to lack of sorting of waste from source, the processing of waste using the 3R (Reuse, Recycle, Reduce) becomes difficult for the waste collectors. Studies shows that Bandung waste management is challenged with lack of infrastructure insufficient human resource for the management of waste, waste management awareness especially among the lower income communities (Muliawaty, 2012).

According to Muliawaty, (2012), the facilities that PDK has to facilitate their waste management process includes 160 sites for temporary disposal (*Tempat Penampungan Sementara/TPS*), 10 of these TPS process the waste using the 3R processing method. Another TPS is located at Babakan Sari, in Kiaracandong Sub-district. This facility can process organic solid waste generated from households in gas but it has a small processing capacity of up to 300 kilograms/day. However, if one considers the amount of continuous generated waste in Bandung, the infrastructure is inadequate to handle such volume. waste management facilities (waste collecting bins) available are inadequate and far from households where bulk of the waste is generated. Also, the number of personnel for the management of waste is also limited. Due to lack of sorting of waste from source, the processing of waste using the 3R (Reuse, Recycle, Reduce)

becomes difficult for the waste collectors. Studies shows that Bandung waste management is challenged with lack of infrastructure insufficient human resource for the management of waste, waste management awareness especially among the lower income communities (Muliawaty, 2012).

3.2 Community Participation

Article 5 of Bandung waste management regulation does not only stipulate the community to be made aware of waste management but also, they should be involved in waste management process. This however is important because it will enhance the effective implementation of waste management as contributors to the high waste generation. The initiation of a waste management pilot project of Batu Nunggal District is a typical example of community participatory approach in waste management (Suryani, 2012). This project tries to encourage the community to practice sorting of waste from source, through a non-mixed waste collection schedule. The collection of the waste is in this theme and any violation results to no collection of waste by the cleaners. However, this approach to ensure sorting of waste is only successful with the rich and middle-income people according Suryani, (2012), because they are aware of the importance of waste sorting in the 3R waste processing. On the contrary, the low-income people who are mostly resident in slums and densely populated communities are not adhering to waste sorting practice. This is because majority of them are not aware of the importance of this practice to waste processing hence they continue to mix their household solid waste.

3.3 Regional Cleaning Company's Waste Management Activities in Relation to Regulation

The regional cleaning company PDK is the body that is tasked by Bandung city government to carry out the city's waste management activities which ranges from collection, transportation to processing and disposal. According to Article 7 of Bandung city waste management regulation No. 9/2018, "regional waste management policies and strategies must be reference for the city regional government in preparing regional development plan documents. it further states that waste management be carried out based on the principles of sustainable development which is carried out through efficient use of materials in the production and consumption system in the city region area.". However the PDK company according to Suryani, (2012), conducted 99 activities in relation to waste management that are thought to be relevant to various articles of the Waste Law within the years 2009 to 2010. These activities that are carried out by PDK are that of paragraph 6d and 6e of Article 6 of the waste management law that stipulates the responsibilities of the regional government in management of solid waste. This laws **6d of Article 6** shows how waste management should be implemented and also the provision of infrastructure and facilities relating to waste management while the provision of waste processing facilities is stated in **6e of Article 6**.

Furthermore, the activities of the regional cleaning company when compared to that of the city government as stated in Article 9 of waste management law, they have carried out coaching and supervising the performance of waste management carried out by other parties. They also conduct periodic monitoring and evaluation of the final waste processing sites with open disposal system that has been closed, implemented district/city scale waste management in accordance with the norms, standards, procedures, and criteria set by the government. On the contrary, Suryani (2012) shows that many of the city government's activities that are indicated in the waste management law are not being implemented by PDK a company tasked with the handling the management of waste in Bandung.

These activities includes raising the awareness of the public in solid waste management and its importance, develop waste reduction technologies that will enhance proper waste handling, and processing. Therefore it can be understood that the community is not involved, does not benefit from capacity building through training in management of waste. Despite they are very crucial partners because they contribute in the generation of the household solid waste. In addition the company as a representative of the city government did not make any coordination between stake holders such as the community, government institutions, and businesses for integration in the management of waste. The lack of emergency response system implementation by the authorities is of concern because such systems can mitigate the reoccurrence of Leuwigajah TPA landslide.

Table 3 showing waste management laws No.18/2008 and No. 9/2018 relating to waste management activities carried out by PDK (2009-2010)

Article	Explanation	Number of activities	%
Article 24 paragraph 1	Regarding the financing of waste management	25	25.25
Article 9 paragraph 1 a	Carrying out waste management, district/city governments have the authority to determine waste management policies and strategies based on national and provincial policies	22	22.22
Article 6d	The duties of the government and local government consist of: implementing waste management and facilitating the provision of waste management infrastructure and facilities	19	19.19
Article 6e	The task of the government and local government consists of: encouraging and facilitating the development of benefits from waste	14	14.14

Article	Explanation	Number of activities	%
	processing		
Article 9 paragraph 1c	"In carrying out waste management, district/city governments have the authority to provide guidance and supervision of waste management performance carried out by other parties"	9	9.09
Article 9 paragraph 1e	"In carrying out waste management, district/city governments have the authority to monitor and evaluate periodically every 6 (six) months for 20 (twenty) years on the final waste processing site with an open disposal system that has been closed"	5	5.05
Article 9 paragraph 1b	"Local governments have the authority to carry out regency/municipal scale waste management in accordance with the norms, standards, procedures, and criteria set by the government"	3	3.03
Article 27 paragraph 1	"Regency/city governments individually or jointly can partner with waste management business entities in the implementation of waste management."	2	2.02
Total		99	100

Source: adopted from (Suryani, 2012)

The results of the data above shows that the operations of PDK are primarily concerned with the management of finances in order to organize waste management. Although funding is an important component of the waste management activities of the PDK company, it appears to be distracting the company from their main obligation which is carrying out waste management in the city.

The company has not only been occupied implementing Article 24 paragraph (1) Regarding the financing of waste management but it gives very little consideration to other relevant articles of Bandung waste management regulation, like Article 27 paragraph 1. Regarding governments individually or jointly can partner with waste management business entities in the implementation of waste management, and Article 6d regarding waste infrastructure provision. Partnership of the city government with other stakeholders is important because it will provide funding, enhance provision of waste management infrastructure adequately. Also, adequate provision of waste infrastructure will facilitate at the source sorting of waste, collection and transportation in an effective and efficient manner. Furthermore, Article 5, 8, and 9 of Bandung city regulation No. 9/2018 is not implemented by the PD *Kebersihan*. This article is very relevant to waste management because it will provide a comprehensive and a more sustainable waste management in Bandung if implemented. Article (5) is concern with community awareness in waste management, development of waste reduction and handling technology, facilitate waste processing to produce value, apply local specific technologies that are developed in local community to reduce and manage waste, facilitate the provision of waste management infrastructure, and coordinate with other partners, local governments, individuals and communities to create cohesiveness in waste management. While Article (8) states decentralization, prioritizing processing of waste, community involvement, strengthening institutions, and Article (9) states waste generation restriction, waste recycling, waste reuse, waste sorting, garbage collection, garbage transport, waste processing, final processing of waste, and funding.

4. Conclusion

The issue of waste is a great concern in many cities of developing country, including Bandung. This phenomenon has become a serious developmental concern for most cities in developing countries. Most of the developing countries that are mostly affected by the problem of increase waste generation are those countries that have rapid growth in population due to urbanization, industrial and economic development. The goal of this paper is to assess the implementation of waste management of Bandung in relation the its waste management regulation. In order to achieve this, the paper set to assess waste management in Bandung as stated in waste management law number 18/2008 and 9 /2018 of Bandung city, and analyse waste management carried out by PD *Kebersihan* in relation to law No.18/2008 and No. 9/2018. The findings of this study reveal that Bandung's waste management process still practices traditional method of collection, transportation and disposal of waste at final waste disposal locations known as TPA, without processing. In addition, adequate infrastructure, facilities, community awareness, coordination with actors is lacking in the waste management of Bandung. This is because most of the relevant articles of the waste management regulation of the law No.18/2008 and No.9/2018 are not effectively implemented. Therefore, it can be concluded that effective implementation of waste management regulation has an impact on waste management in Bandung.

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