

# The Policy of Sustainable Waste Management Towards Sustainable Development Goals



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## ABSTRACT

The research is focused on the sustainable waste management, with the specific concern on the use of waste management platform called waste bank being driven by local organizations in Lombok, Indonesia. The study aims to investigate the factors that attract the participation of local communities in using the platform for waste management and further to explore the lessons and good practices of waste banks driven by local community-driven organizations in Lombok, Indonesia. The method used for this research was qualitative with the analytic-descriptive approach. Data collection was through literature study and survey questionnaire. Based on the findings of the research, several factors including socio-economic characteristic and the lack of waste facilities and services influence the participation of local communities in sustainable waste management in Lombok. Those factors are critically shown based on its significance in influencing the involvement of local communities in implementing sustainable waste management. Thus, one of alternatives to use the waste bank initiated by local community-driven organizations may help in some ways such as improved participation of local communities in sustainable waste management. Furthermore, the lessons and good practices of waste banks driven by the selected two organizations in Lombok are highlighted.



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## 1. Introduction

It is such a big priority for most countries to see waste as a significant issue that requires effective and sustainable management. Various strategies in tackling the waste issue are applied, which cannot be denied depending on several factors including the political, social, economic and environmental aspects.<sup>1</sup> Even though there are significant differences in waste management if compared between

<sup>1</sup> Manuel Chica, Juan M. Hernández, and Matjaž Perc, 'Sustainability in Tourism Determined by an Asymmetric Game with Mobility', *Journal of Cleaner Production*, 355. December 2021 (2022), 131662 <https://doi.org/10.1016/j.jclepro.2022.131662>

developing and industrialized countries, generally both implement similar methods on waste treatment such as landfilling, incineration and recycling.<sup>2</sup>

However, tackling the problem of waste in developing countries is challenging. One of the reasons is that these countries have a lack of economic resources to provide technological alternatives compared to most developed nations. Also, lack of environmental awareness is believed to be an obstacle preventing local government from providing effective and efficient sustainable waste management.<sup>3</sup> Issues on waste has been also a huge concern in Indonesia where the country is struggling with millions of tons of waste every year. Some evidence put Indonesia as the world's biggest contributor to plastic waste in the oceans.<sup>4</sup> Several factors contribute to the rise of solid waste generation including the increasing population of Indonesia combined with the poor of waste management.<sup>5</sup>

The government of Indonesia has published a variety of rules to attempt in reducing the amount of waste by managing it sustainably. A regulation under *UU No. 18/2008*, further followed by Central Government Regulation on household waste management under *PP No. 81/2012*, emphasises that local government is supposed to work with the local community in handling waste issues by changing the common practice of waste treatment by collecting, transporting and dumping to landfill.<sup>6</sup> Practice should encourage effective implementation of the current system of "3R" reduce, reuse, and recycle. Also, waste management is carried out based on the principles of sustainability, responsibility, usefulness, justice, awareness, togetherness, safety and economic value.<sup>7</sup>

Furthermore, one of the efforts adopted by the Government of Indonesia through the Ministry of Environment (MoE) on the reduction of waste transported

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<sup>2</sup> Ema Gusheva and others, 'How Do Waste Climate Policies Contribute to Sustainable Development? A Case Study of North Macedonia', *Journal of Cleaner Production*, 354.December 2021 (2022), 131572 <https://doi.org/10.1016/j.jclepro.2022.131572>

<sup>3</sup> Hossein Shokri Garjan, Mohammad Mahdi Paydar, and Ali Divsalar, 'A Sustainable Supply Chain for a Wellness Tourism Center Considering Discount and Quality of Service', *Expert Systems with Applications*, 211.May 2022 (2023), 118682 <https://doi.org/10.1016/j.eswa.2022.118682>

<sup>4</sup> Mbaye Fall Diallo and others, 'How Do Tourism Sustainability and Nature Affinity Affect Social Engagement Propensity? The Central Roles of Nature Conservation Attitude and Personal Tourist Experience', *Ecological Economics*, 200.May (2022), 107503 <https://doi.org/10.1016/j.ecolecon.2022.107503>

<sup>5</sup> George E. Halkos and Panagiotis Stavros C. Aslanidis, 'New Circular Economy Perspectives on Measuring Sustainable Waste Management Productivity', *Economic Analysis and Policy*, 77 (2023), 764–79 <https://doi.org/10.1016/j.eap.2023.01.001>

<sup>6</sup> Rajvikram Madurai Elavarasan and others, 'The Untold Subtlety of Energy Consumption and Its Influence on Policy Drive towards Sustainable Development Goal 7', *Applied Energy*, 334.January (2023), 120698 <https://doi.org/10.1016/j.apenergy.2023.120698>

<sup>7</sup> Qing Ye and others, 'How Publications and Patents Are Contributing to the Development of Municipal Solid Waste Management: Viewing the UN Sustainable Development Goals as Ground Zero', *Journal of Environmental Management*, 325.PB (2023), 116496 <https://doi.org/10.1016/j.jenvman.2022.116496>

to landfills is the system of the waste bank.<sup>8</sup> This system could stimulate the direct participation of people, the behaviour change about waste treatment and the creation of economic opportunities. The waste bank is one of the alternative solutions to the problem of waste in Indonesia because of its principle in supporting the implementation of “3R” Reduce, Reuse and Recycle.<sup>9</sup> The system of waste bank in Indonesia is considered one of the new strategies for sustainable waste management in Indonesia because of its functions. First, the waste bank is designed as the place of sorted waste, differed by organic and inorganic waste. Second, the waste bank has a similar function to the conventional bank to deposit money. The customers of waste bank can also collect and divide profit proportionally if they store their waste in the waste banks.<sup>10</sup>

The implementation of waste bank as the alternatives to reduce waste volume in landfills is not that new. The operation of waste bank was initially started in Yogyakarta, Indonesia by a local community organization called Gempah Rimpah, which has lead the emergence of waste bank across Indonesia and has inspired the government of Indonesia to adopt the program as the national program. In contrast to the positive trends towards the existence of waste bank in national level, waste bank has not been fully adopted into local context of Lombok island where it can also fully attract the local community to participate in sustainable waste management. Also, there is a crucial need to promote potentials of Lombok island as the newly developed tourism destination in Indonesia without any issues on environment such as waste management problem.<sup>11</sup>

A major research gap to the most studies on waste management presents the aspect of waste management at the segment of waste treatment. In response to that most studies, this study propose a research that assess the specific aspect on waste mangement practice at the sector of waste prevention with the specific location in tourism destination. Thus, the goal of this study ranges from assessing participation of the local community in sustainable waste management along with assesing lessons and good practices of waste bank driven by local community organizations in Lombok, Indonesia for their efforts to work on waste prevention. Therefore, in this part, some literature regarding the implementation of the waste bank in several cities in Indonesia is reviewed to investigate the factors that

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<sup>8</sup> Saurabh Upadhyay, ‘Drivers for Sustainable Mining Waste Management – A Mixed-Method Study on the Indian Mining Industry’, *Resources Policy*, 79.December 2021 (2022), 102904 <https://doi.org/10.1016/j.resourpol.2022.102904>

<sup>9</sup> Ismail Erol and others, ‘Improving Sustainability in the Tourism Industry through Blockchain Technology: Challenges and Opportunities’, *Tourism Management*, 93.March (2022), 104628 <https://doi.org/10.1016/j.tourman.2022.104628>

<sup>10</sup> Zhuowei Huang, Lisheng Weng, and Jigang Bao, ‘How Do Visitors Respond to Sustainable Tourism Interpretations? A Further Investigation into Content and Media Format’, *Tourism Management*, 92.March (2022), 104535 <https://doi.org/10.1016/j.tourman.2022.104535>

<sup>11</sup> F. Calderón-Vargas, D. Asmat-Campos, and P. Chávez-Arroyo, ‘Sustainable Tourism Policies in Peru and Their Link with Renewable Energy: Analysis in the Main Museums of the Moche Route’, *Heliyon*, 7.10 (2021) <https://doi.org/10.1016/j.heliyon.2021.e08188>

influence local community participation in waste management through the program of the waste bank.<sup>12</sup>

A study conducted by Indrianti (2015) examined the sustainability model of the community-based solid waste bank through a model of waste bank applied at the Quran education park (TPA Miftahul Jannah) in Yogyakarta. The result of the study shows there was a sustainable interaction among the students as the members of the waste bank. Also, the income acquired from the operation of the waste bank was delivered to the development of the education park. Furthermore, regarding the environmental aspect, there are activities related to ecological campaign and sustainable waste management practice.<sup>13</sup>

The research conducted by Sutomo elaborates the factors motivating community in waste bank activities, the sustainability of waste banks operations, and the effective government mechanisms to support solid waste management in Yogyakarta. The result shows that the selected waste banks adopt a profit-sharing tool to cover operational costs and to attract local community in Yogyakarta to be customers of waste banks. Also, most of waste banks generated by local community organizations in Yogyakarta are considered to be sustainable as the aspects of sustainability can be achieved.

A study conducted by Suryo and Cicik determines both internal and external factors influencing community participation in the management of Waste Bank in Surakarta, Indonesia. There is a positive impact shown from both internal and external element. Internal factors include age, education, and gender, while external factors comprise of access to information, the activeness of environmental cadres, psychological motive, social motive, the economic motive to the community participation in the management of waste bank in Surakarta. The study suggests that the government should improve the management of waste bank by involving relevant stakeholders and the local community about doing in-depth socialization about proper waste management.

Based on the previous research elaborated above, there are some similarities and differences. The similarities lie in the implementation of waste banks and the factors affecting motivation for people to participate in the program of waste bank. On the other hand, the difference lies in the investigation of the sustainability dimensions of the system of waste bank in Lombok. This concern is slightly similar with the study conducted by Sutomo, yet the difference lies on the locality context of the research and the rules of local government in Lombok about waste management. Also, good practices and lessons are crucial to being

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<sup>12</sup> Francisco Javier Blancas and Macarena Lozano-Oyola, 'Sustainable Tourism Evaluation Using a Composite Indicator with Different Compensatory Levels', *Environmental Impact Assessment Review*, 93.December 2021 (2022), 106733 <https://doi.org/10.1016/j.eiar.2021.106733>

<sup>13</sup> Sarah Schönherr, Mike Peters, and Kir Kuščer, 'Sustainable Tourism Policies: From Crisis-Related Awareness to Agendas towards Measures', *Journal of Destination Marketing & Management*, 27.January (2023), 100762 <https://doi.org/10.1016/j.jdmm.2023.100762>

assessed in the system of waste bank driven by selected local community-driven organizations in Lombok.

## 2. Research Method

The method used for this research is a qualitative approach with the analytic-descriptive method. The study describes data and analyses it with a normative theory as a comparison.<sup>14</sup> Data are collected from the literature study, questionnaires and online resources. Data is then analysed to study waste management system in Lombok. Data collected from the survey questionnaire is aimed to examine the current behaviour of the local community in waste management, as well as factors affecting the local participation in sustainable waste management. Furthermore, data regarding Operation of waste banks generated by local community-driven organizations in Lombok Island are analysed to study lessons and good practice of waste banks itself.<sup>15</sup>

Data collection in this research is from primary and secondary resources. The following parts explain how data collection works. This process of data collection is aimed to gather data from the secondary resources.<sup>16</sup> It is to review relevant documents that are available online on the Internet. As the constraint faced by the author to conduct field research, desk research is instrumental approaches for digging out the relevant information from the internet. Also, it can be conducted in the starting phase of gathering information related to government reports about waste management in Lombok, Indonesia.<sup>17</sup> Furthermore, most of the data represented about local community-driven organizations of waste bank in Lombok can be highlighted with the various viewpoints of sources collected through online.<sup>18</sup>

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<sup>14</sup> Taufik Hidayat, Resti Dian, and Suviwat Jenvitchuwong, 'Disharmonization of Supreme Court Regulations in Material Judicial Rights', *Journal of Human Rights, Culture and Legal System*, 2.3 (2022), 149–66 <https://doi.org/https://doi.org/10.53955/jhcls.v2i3.34>

<sup>15</sup> Fatma Ulfatun Najicha and others, 'The Conceptualization of Environmental Administration Law in Environmental Pollution Control', *Journal of Human Rights, Culture and Legal System*, 2.2 (2022), 87–99 <https://doi.org/https://doi.org/10.53955/jhcls.v2i3.55>

<sup>16</sup> Abdul Kadir Jaelani and Muhammad Jihadul Hayat, 'The Proliferation of Regional Regulation Cancellation in Indonesia', *Journal of Human Rights, Culture and Legal System*, 2.2 (2022), 121–38 <https://doi.org/https://doi.org/10.53955/jhcls.v2i3.55>

<sup>17</sup> Mohammad Jamin and Abdul Kadir Jaelani, 'Legal Protection of Indigenous Community in Protected Forest Areas Based Forest City', *Bestuur*, 10.2 (2022), 198–212 <https://doi.org/https://dx.doi.org/10.20961/bestuur.v10i2.66090>

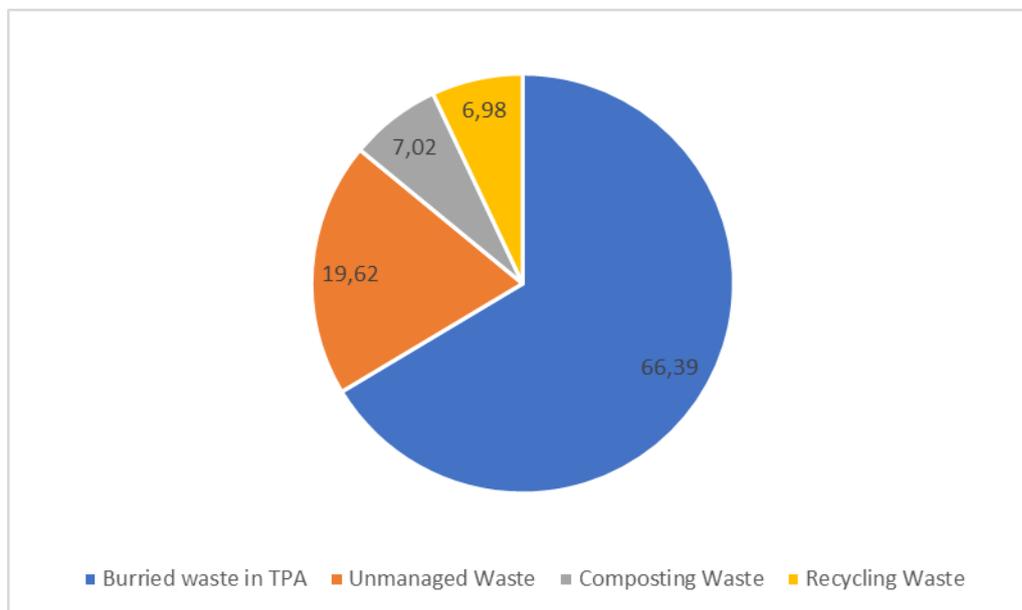
<sup>18</sup> Rian Saputra, M Zaid, and Silaas Oghenemaro, 'The Court Online Content Moderation : A Constitutional Framework', *Journal of Human Rights, Culture and Legal System*, 2.3 (2022), 139–48 <https://doi.org/https://doi.org/10.53955/jhcls.v2i3.54>

### 3. Results and Discussion

#### *Waste Management in Indonesia*

Spread across a chain of more than 17 thousand islands between Asia and Australia, Indonesia has become one of the world's major emerging economies. Indonesian population has reached more than 260 million, spread across 34 provinces.<sup>19</sup> However, Indonesia is vulnerable to the issue of waste. It is revealed by the production of municipal solid waste ranging from 0.8 kg per capita to 2.1 kilograms per capita over the past decade.<sup>20</sup> Ministry of Environment and Forestry Republic of Indonesia highlights that the amount of waste produced by the whole provinces in Indonesia reached more than 65 million tons every day. It is predicted to increase five times by 2022. The pie chart below shows the proportion of waste management in 2022.

**Chart 1:** The Percentage of Waste Management in Indonesia



Source: The Ministry of Environment, 2022

From the data shown, it is clear that the unmanaged waste combined with the buried waste (total percentage: 86.61%) revealing the waste in Indonesia is poorly managed. Some issues are attributed to the challenges in improving the system of waste management in Indonesia. For example, low quality of waste management,

<sup>19</sup> A. Rongna and Jiuxia Sun, 'Tourism Livelihood Transition and Rhythmic Sustainability: The Case of the Reindeer Evenki in China', *Annals of Tourism Research*, 94.135 (2022), 103381 <https://doi.org/10.1016/j.annals.2022.103381>

<sup>20</sup> Dan Cudjoe, Bangzhu Zhu, and Hong Wang, 'Towards the Realization of Sustainable Development Goals: Benefits of Hydrogen from Biogas Using Food Waste in China', *Journal of Cleaner Production*, 360.May 2021 (2022), 132161 <https://doi.org/10.1016/j.jclepro.2022.132161>

insufficient final disposal sites or TPA, complexities in waste management institution and funding issues exacerbate the system of waste management in Indonesia.<sup>21</sup> Those kinds of obstacles influence the community to manage their waste by themselves. They are either following the scheme of national waste management or even managing waste based on their preference such as buried underground, composted, burnt in open air and thrown into the rivers. The approximate amount of waste managed by the community reached 1,300,014.6 tons of waste per year. Thus, there might be a big challenge on how Indonesia manage such the massive amount of waste.<sup>22</sup>

Based on the current system of waste management in Indonesia, some steps are commonly practised. First, the garbage is collected by the cleaning officer and is brought to the temporary dump sites (TPS).<sup>23</sup> It then has to be sorted based on the economic value embedded in the type of waste such as plastic and paper. Then the waste should be disposed to the final dump sites (TPA). Until now, this practice is still widely applied to the regions in Indonesia.<sup>24</sup> The figure below may illustrate.

**Figure 1:** The Current System of waste management in Indonesia



<sup>21</sup> Suraj K. Mallick and others, 'Plastic Waste Footprint in the Context of COVID-19: Reduction Challenges and Policy Recommendations towards Sustainable Development Goals', *Science of the Total Environment*, 796 (2021), 148951 <https://doi.org/10.1016/j.scitotenv.2021.148951>

<sup>22</sup> Marym Mohamad Razip and others, 'The Development of Sustainable IoT E-Waste Management Guideline for Households', *Chemosphere*, 303.P1 (2022), 134767 <https://doi.org/10.1016/j.chemosphere.2022.134767>

<sup>23</sup> Xue Zhao and others, 'How Digitalization Promotes the Sustainable Integration of Culture and Tourism for Economic Recovery', *Economic Analysis and Policy*, 77 (2023), 988–1000 <https://doi.org/10.1016/j.eap.2023.01.005>

<sup>24</sup> Francisco Javier Blancas, Ignacio Contreras, and Macarena Lozano-Oyola, 'Evaluating Destinations' Efforts to Improve Sustainability in Tourism Using the Inter-Temporal Decomposition of a Composite Indicator', *Environmental Impact Assessment Review*, 98.September 2022 (2023), 106947 <https://doi.org/10.1016/j.eiar.2022.106947>

An issue emerges when the landfills cannot accommodate all the waste disposed of. Therefore, there should be a different approach to maintain the current system of waste management in Indonesia. According to several studies, the best waste management system should consider five critical aspects. They are a legal, institutional, financial, the technological and the socio-cultural element.<sup>25</sup>

### *Waste Management in the Context of Lombok region, Indonesia*

The general standard of waste management in Lombok is the same as the Indonesian national standard. The national policy on Waste Management which was issued in 2008 under the regulation. *No. 18/2008* is also applied equally in Lombok. However, the implementation of waste management in the local context is considered to have poor performance. Therefore, it requires particular modifies in the management of waste at the local level which entails the involvement of all stakeholders. Administratively, Lombok is under the Governor of the province of West Nusa Tenggara (*Nusa Tenggara Barat*) and is divided into four *Kabupaten* (regencies) and one *Kota* (city). The island of Lombok sits just east of Bali, and both represent popular tourist destinations for people around the world. The map below shows the position of Lombok just beside Bali.<sup>26</sup>

The statistics highlight that the population in 2021 Census for Lombok's people in total was 3,474,247. BPS (2021) also provides the information that the population has increased significantly during the last five years, which boosts the volume of daily waste mass in landfills. It is shown from the data below regarding waste volume in each region of Lombok for the year 2021.

**Table 1:** The Population Number and Waste Collection in Lombok Regencies

Kabupaten/Kota (Regencies)	Populations	Waste mass (kg/day)
West Lombok	711,712	216,048.09
Central Lombok	1,032,258	301,522.69
East Lombok	1,286,048	385,105.72
North Lombok	232,747	68,820.08
Mataram	417,354	181,640.14
TOTAL	3,680,119	1,153,136.72

Source: Department of Environment and Forestry of Province of NTB, 2021

Based on the data provided above, it is calculated that the amount of waste in each region in Lombok is in line with the number of inhabitants. However, it is not

<sup>25</sup> Lucila Carbonell and others, 'Localisation of Links between Sanitation and the Sustainable Development Goals to Inform Municipal Policy in EThekweni Municipality, South Africa', *World Development Sustainability*, 2.March 2022 (2023), 100038 <https://doi.org/10.1016/j.wds.2022.100038>

<sup>26</sup> Fiona Bénard and Bruno Malet-Damour, 'Assessing Potential of Plastic Waste Management Policies for Territories Sustainability: Case Study of Reunion Island', *World Development Sustainability*, 1.March (2022), 100030 <https://doi.org/10.1016/j.wds.2022.100030>

necessarily to say that the local government of Lombok has appropriately managed the problem of waste.<sup>27</sup> It is evident that the concerns of burning and dumping practices have been a long-standing issue over the small tourist island of Gili Trawangan, Lombok. It means that the waste problem has been affected the sustainability of tourism destination in Lombok such as Gili Trawangan and Senggigi.<sup>28</sup>

**Photograph 1:** The Landfill in Gili Trawangan, Lombok



The image above describes the condition of a landfill in one of the popular tourist destination in Lombok namely Gili Trawangan. According to the information delivered by a head of the area (*Ketua RT*) in Gili Trawangan, the statement of *Ketua RT* was quoted from the interview with Kompas.com, one of the leading national media in Indonesia. According to the information above, it indicates that the tourism destination in which relevant stakeholders should pay more attention towards waste issues, but it seems that there is a lack of concern to deal with the problem.

### ***Waste Bank as the Tool of Sustainable Waste Management Policy***

It could be perceived that people's awareness towards the environmental concerns is relatively low. It is supported by the fact that there is an increasing trend of waste generation and the change of waste composition. The Government of Indonesia through the Ministry of Environment has adopted the system of waste bank as a social capital to gain community participation in implementing 3R (Reduce, Reuse and Recycling) concept. Also, with the existence of waste

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<sup>27</sup> Chang Yeon Park and others, 'Volunteer Tourists' Environmentally Friendly Behavior and Support for Sustainable Tourism Development Using Value-Belief-Norm Theory: Moderating Role of Altruism', *Journal of Destination Marketing and Management*, 25.May (2022), 100712 <https://doi.org/10.1016/j.jdmm.2022.100712>

<sup>28</sup> Idiano D'Adamo and others, 'Assessing the Relation between Waste Management Policies and Circular Economy Goals', *Waste Management*, 154.September (2022), 27-35 <https://doi.org/10.1016/j.wasman.2022.09.031>

bank, the government can easily promote 3R as a mean to increase material recovery and to reduce waste disposed of in landfills.<sup>29</sup>

Regarding the definition of a waste bank, The Ministry of Environment of the Republic of Indonesia under *UU NO. 13/2012* defines a waste bank as a place of waste sorting and collecting that can be recycled and or reused which has economic value. Other describe the waste bank as the similar function as a conventional bank, which enables members of the waste bank to withdraw the amount of saving in occasional time. In general, Waste bank is basically aimed as the attempt to deal with household waste. The waste bank works based on its fundamental principle in involving public and private sectors to create a clean environment. Also, the local community can make waste bank as the place to store waste collectively. By doing so, it means that the economic value from waste can be gained by turning waste into a saving.<sup>30</sup>

Since the launching of the waste bank in 2008, the program can be considered as one of the successful programs in managing waste in Indonesia. It is evident that during the five years of its implementation, the number of waste banks in Indonesia increased significantly. The data published by the Ministry of Environment and Forestry of Indonesia 2016 shows that the number of waste banks has reached 4280 units spread over the regions in Indonesia with 163,128 members and the amount of 1,099,188.47 tons of collected waste per year.

**Chart 2: The Progress of Waste Bank in Indonesia**



Source: Ministry of Environment and Forestry of Indonesia, 2016

<sup>29</sup> Mario Villalba Ferreira and others, 'The Effectiveness of Inter-Municipal Cooperation for Integrated Sustainable Waste Management: A Case Study in Ecuador', *Waste Management*, 150.January (2022), 208–17 <https://doi.org/10.1016/j.wasman.2022.07.008>

<sup>30</sup> Shreya Some and others, 'Low Demand Mitigation Options for Achieving Sustainable Development Goals: Role of Reduced Food Waste and Sustainable Dietary Choice', *Journal of Cleaner Production*, 369.October 2021 (2022), 133432 <https://doi.org/10.1016/j.jclepro.2022.133432>

With regards to the aspects of sustainable development, the program of waste could be categorized sustainable. It is supported with the fact that there is fast progress for the last five years in reducing waste dump in a landfill and there is evidence of high level of community participation as well as improving the income of the community. The existence of waste bank in Indonesia is believed to accelerate the local economic growth and community well-being as well as environmental preservation.<sup>31</sup>

Proper waste management may be considered as the indicator of the sustainability of any country. Poor waste management may indicate the weak level of sustainability of the nation itself. As happened in most developing countries, waste management is prioritized after basic needs such as food and livelihood being fulfilled. It means that environmental concern is received less attention from relevant stakeholders and community compared to other aspects such as socio-economic sectors. Therefore, for recent decades, the Indonesian government has been widely encouraging the alternative solution from the emerging issue of waste. Along with the technological approach, the government emphasizes the importance of strategies to increase awareness and behavioural change of communities in the management of household waste.<sup>32</sup>

Regarding sustainable performance of the waste bank, some local government of different regions in Indonesia attract the local community participation in a variety of ways. Some factors may influence the involvement of the community in waste management. For example, a demography factor including age, gender and household typology became the significant factors affecting community participation in waste management. However, the most influencing factor towards the level of community participation is determined by the socioeconomic backgrounds of the community it self.<sup>33</sup>

### ***Sustainable Waste Management Policy Towards Sustainable Development Goals***

Based on the findings in the previous chapter, the participation of local communities in waste management is relatively low. It is analyzed from the current behavior of local communities in sorting and disposing of their household waste. Firstly, there is an indication of a small proportion of people sorting their waste according to its types. Secondly, based on the data gained from the questionnaire, more than half of respondents disposed of their waste by throwing

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<sup>31</sup> Najid Ahmad, Liu Youjin, and Mouna Hdia, 'The Role of Innovation and Tourism in Sustainability: Why Is Environment-Friendly Tourism Necessary for Entrepreneurship?', *Journal of Cleaner Production*, 379.P2 (2022), 134799 <https://doi.org/10.1016/j.jclepro.2022.134799>

<sup>32</sup> Saurabh Ardra and Mukesh Kumar Barua, 'Halving Food Waste Generation by 2030: The Challenges and Strategies of Monitoring UN Sustainable Development Goal Target 12.3', *Journal of Cleaner Production*, 380.P1 (2022), 135042 <https://doi.org/10.1016/j.jclepro.2022.135042>

<sup>33</sup> Yuan Chi and Dahai Liu, 'Measuring the Island Tourism Development Sustainability at Dual Spatial Scales Using a Four-Dimensional Model: A Case Study of Shengsi Archipelago, China', *Journal of Cleaner Production*, 388.6 (2023), 135775 <https://doi.org/10.1016/j.jclepro.2022.135775>

into the river, burying and burning. It means that there is an indication of the weak level of community participation in sustainable waste management.<sup>34</sup>

The environment and biodiversity may be impacted as the consequence of the activities previously mentioned such as burying and burning waste. Darmono states that both waste burning and burying lead to the several impacts. First, there is air pollution which leads to the damage of the ozone layer causing global warming. Second, it triggers water pollution in the form of contamination of chemical and radioactive substances that interfere fauna such as poisoning to genetic damage and reproductive disorders. Furthermore, the transfer of metal emissions from waste burning may affect the health of living things.<sup>35</sup>

Based on the elaboration of the current behavior of local communities above, there is a contradictory between the perception and practice. In this case, the finding reveals that most of the respondents are aware of the importance of waste recycling. It can be analyzed from their opinion that recycling is the appropriate way for waste management. However, it is not in line with the reality determined by the finding of this research which reveals most respondents manage their waste sustainably.<sup>36</sup> To simplify, various conflicting and competing factors affect the daily decisions and actions towards sustainable waste management. Kollmuss and Agyeman concluded in his research that people might be correctly wanting to change their behaviour until the people persist enough in applying the new behaviour to be a habit. Thus, there should be efforts for the local communities in Lombok and relevant stakeholders to create sustainable waste management as a routine activity until it reflects on the pro-environmental behaviour.<sup>37</sup>

According to the elaboration of findings of this research, several factors may influence the participation among the locals in Lombok in implementing sustainable waste management. Even though the characteristics of socio-economic are categorized as the indicator of the issue, in general, it does not significantly affect the current behavior of the communities in implementing sustainable waste management. Even so, the factors like the availability of waste facilities and role of

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<sup>34</sup> Arfat Ahmad Sofi and others, 'Renewable Energy and Transitioning towards Sustainable Tourism: Inferences from Kernel Density and Nonparametric Approach', *Renewable Energy*, 193 (2022), 963–75 <https://doi.org/10.1016/j.renene.2022.04.132>

<sup>35</sup> Tiffany M.W. Mak and others, 'Sustainable Food Waste Management towards Circular Bioeconomy: Policy Review, Limitations and Opportunities', *Bioresource Technology*, 297.November 2019 (2020) <https://doi.org/10.1016/j.biortech.2019.122497>

<sup>36</sup> Vikas Kumar and others, 'Micro- and Nano-Plastics (MNPs) as Emerging Pollutant in Ground Water: Environmental Impact, Potential Risks, Limitations and Way Forward towards Sustainable Management', *Chemical Engineering Journal*, 459.January (2023), 141568 <https://doi.org/10.1016/j.cej.2023.141568>

<sup>37</sup> Ömer Ceyhun Apak and Ahmet Gürbüz, 'The Effect of Local Food Consumption of Domestic Tourists on Sustainable Tourism', *Journal of Retailing and Consumer Services*, 71.November 2022 (2023) <https://doi.org/10.1016/j.jretconser.2022.103192>

leadership may change the behavior of local communities in achieving sustainable waste management.<sup>38</sup>

It can be analyzed from the findings of this study that shows several items from the socioeconomic characteristic of respondents including the level of education, age and status of work. In general, although the socio-economic characteristics affect the communities' behavior in waste management, it does not influence the current behavior of respondents regarding sorting waste and disposing of waste significantly. To illustrate, most respondents are categorized profoundly well-educated people as the data shows their level of education dominating university level. However, they are less likely affected to change their behavior in managing waste appropriately. It is contrary to the study conducted by Suryo and Cicik which highlights several factors pushing the level of community participation in waste management including the consideration of education.<sup>39</sup>

Regarding the age and gender, the respondents are also under the productive age between 15 and 60 years, dominated by the female. It seems that age and gender are not considered to be the significant factor affecting the local communities to manage their waste properly. It is in line with the research conducted by Tulut and Maulina indicating the gender and age does not affect the level of community participation in waste management substantially. Moreover, the status of working also does not significantly influence the communities to internalize the sustainable waste management into their behavior.<sup>40</sup>

The socioeconomic factors may not significantly affect the current behavior of local communities in the implementation of sustainable waste management in Lombok. Even so, the findings of this research revealed some significant factors stimulate the local communities' behavior to implement sustainable waste management in Lombok. First and foremost, it is revealed that the lack of facilities ultimately influences the current behavior of local communities in disposing of their waste. Based on the respondent's answer towards the research question about the availability of waste facilities provided in their residence, it shows that only certain places are equipped with the facilities of waste such as landfills and waste containers. It means that the community access to waste facilities are still restricted

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<sup>38</sup> Thi Quynh Trang Nguyen, Patricia Johnson, and Tamara Young, 'Networking, Coopetition and Sustainability of Tourism Destinations', *Journal of Hospitality and Tourism Management*, 50.June 2021 (2022), 400–411 <https://doi.org/10.1016/j.jhtm.2022.01.003>

<sup>39</sup> Radoslaw Depczynski, 'The Assessment of Product Groups and Efficiency in the Use of Raw Materials and Waste Management towards Sustainable Development - Case Study of the Steel Manufacturing Company in Poland', *Procedia Computer Science*, 207.Kes (2022), 4306–17 <https://doi.org/10.1016/j.procs.2022.09.494>

<sup>40</sup> Pietro Castellani, Navarro Ferronato, and Vincenzo Torretta, 'Setting Priorities to Achieve Sustainable Development Goals through Appropriate Waste Management Systems in Uganda', *Environmental Development*, 44.May (2022), 100764 <https://doi.org/10.1016/j.envdev.2022.100764>

to the particular extent of regions in Lombok. For example, the local government is more concerned to provide waste facilities in the capital city of Mataram.<sup>41</sup>

Therefore, the challenge of sustainable waste development in developing countries like inadequate financing and limited raw materials as elaborated by Marshall and Farahbakhsh, Tchobanoglous et al., naturally happens in Indonesia. It can be analyzed by the lack of waste facilities such as landfills and waste containers. The locals can be triggered to make open dumping such as throwing waste into the river and burying. Also, these issues are more likely to happen if it is not handled severely. It is because there is an increasing trend of population in Lombok over the past decades, affecting the inevitable growth of waste generation.<sup>42</sup>

Secondly, the lack of concern of relevant stakeholders in facilitating the local communities with programs related to the implementation of sustainable waste management also affects the local community participation itself. Based on the research finding, there is a high trend showing the response of participants regarding the lack of attention of relevant stakeholders in providing sustainable programs in waste management. The issue may be correlated to the reduced function of institutional aspects for instilling sustainable waste management. It has been suggested by Marshal and Farahbakhsh; Eco Invest, which they stipulate the institutional aspects should be taken into high consideration for the acceleration of the implementation of sustainable waste management. However, it seems that the function of institutional elements does not give the significant impact in changing the current behavior of most locals towards the implementation of sustainable waste management in Lombok.<sup>43</sup>

There is a need for relevant stakeholders to use a multidimensional approach. Guerrero et al., suggested using the strategy which can accommodate sociocultural, economic linkages and legal institution approach. It is slightly in line with the explanation of Munton. He stated that “although sustainable development acquired its initial currency in the international area, it will be the local responses ... that will determine its success or failure as practical programs”. It means that successful sustainable development concept internalized into practical programs is determined by the local response which should be adjusted with the aspects of socioeconomic and cultural of the regions. This strategy may suit with the case of Lombok regarding the less concern of the locals in the

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<sup>41</sup> Martin Balas and David J. Abson, ‘Characterising and Identifying Gaps in Sustainability Assessments of Tourism - a Review’, *Tourism Management Perspectives*, 43, January (2022), 101004 <https://doi.org/10.1016/j.tmp.2022.101004>

<sup>42</sup> Sonia Rebouças Silva Melo and others, ‘The Practice of (Un)Sustainable Tourism in a National Park: An Empirical Study Focusing on Structural Elements’, *Journal of Outdoor Recreation and Tourism*, 39, May (2022), 100548 <https://doi.org/10.1016/j.jort.2022.100548>

<sup>43</sup> Ashish Soni and others, ‘Challenges and Opportunities of Utilizing Municipal Solid Waste as Alternative Building Materials for Sustainable Development Goals: A Review’, *Sustainable Chemistry and Pharmacy*, 27, April (2022), 100706 <https://doi.org/10.1016/j.scp.2022.100706>

environment. To illustrate, the practical programs regarding sustainable waste management in Lombok could be encouraged by motivating the locals with the economic benefits they may acquire from the plans.<sup>44</sup>

When it comes to the breakthrough to cope with the complexities of waste issues in Indonesia, waste bank may be one of the alternatives. Notably, the principal function of waste banks in gaining community participation in 3R (Reduce, Reuse, and Recycling) also enables the local community to achieve economic benefits. It is noteworthy to discuss what things become good practices of selected waste organizations in Lombok and lessons could be learned from the business in operating waste banks.<sup>45</sup>

Based on the findings of this study, the successful programs of waste banks by the selected organizations can be determined by the function in raising public participation and the achievement of sustainability aspects. To specify, the analysis of good practices of both Bintang Sejahtera and NTB Mandiri in operating the business of waste banks in Lombok can be analyzed with the following functions below. It can be stipulated that the waste management services in Lombok are based on the national law of the Republic of Indonesia regarding local governance. The law specifies the autonomous affairs of each city and regency in Indonesia which is underlined under Article 14 of Law Number 32 Year 2004 on Decentralization. With the correlation of waste management services, the local government of Lombok is primarily responsible for providing services of waste management independently.<sup>46</sup>

Notwithstanding, the performance of waste management services in Lombok is more likely to have considerable improvement. It is because the findings of the research found that several indicators reflect the poor management of handling waste by the local government of Lombok. For instance, the previous part analyses that there is a lack of waste facilities provided in each region of Lombok. Also, there is a lack of leadership roles to support the communities with the sustainable, practical programs of waste management. As a result, there is a worrying phenomenon seems still exist regarding the unsustainable manner of current communities' behavior in waste disposal in Lombok.<sup>47</sup>

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<sup>44</sup> Aoqi Xu and others, 'Investigation of Management of International Education Considering Sustainable Medical Tourism and Entrepreneurship', *Heliyon*, 9.1 (2023), e12691 <https://doi.org/10.1016/j.heliyon.2022.e12691>

<sup>45</sup> Maeen Md Khairul Akter and others, 'Textile-Apparel Manufacturing and Material Waste Management in the Circular Economy: A Conceptual Model to Achieve Sustainable Development Goal (SDG) 12 for Bangladesh', *Cleaner Environmental Systems*, 4.January (2022), 100070 <https://doi.org/10.1016/j.cesys.2022.100070>

<sup>46</sup> Diana V. Burbano and others, "'Rethink and Reset" Tourism in the Galapagos Islands: Stakeholders' Views on the Sustainability of Tourism Development', *Annals of Tourism Research Empirical Insights*, 3.2 (2022), 100057 <https://doi.org/10.1016/j.annale.2022.100057>

<sup>47</sup> Giovanna Bertella, 'Small Tourism Providers' Stories about Sustainability', *Annals of Tourism Research Empirical Insights*, 4.1 (2023), 100085 <https://doi.org/10.1016/j.annale.2022.100085>

For those reasons previously mentioned, the waste management services are frequently treated by informal sectors. In this case, some local organizations which concern in the environment and human resources including Bintang Sejahtera and NTB Mandiri initiated waste banks as the alternative solutions of the weak level of the local communities' awareness in managing waste issues. The existence of these local organizations at least can help the local government in reducing the amount of waste in landfills. It is evident from the data finding regarding daily waste collection in waste banks operated by both organizations. The amount of garbage collected on a regular basis is relatively high. Accordingly, the government function of waste bank system generated by these organizations can be seen through their purpose in taking over the government role in reducing the amount of waste volume in landfills.<sup>48</sup>

Based on the research finding regarding socioeconomic contributions in operating waste bank, both Bintang Sejahtera and NTB Mandiri have provided the local communities with the services that attributed to creating community resilience. It is evident that lots of people receive economic benefits by storing waste into waste bank operated by these organizations. It influences the number of waste customers in both organizations to increase every year. Besides that, both organizations have prioritized the disability people to be trained as the employees in producing handicrafts from waste. Moreover, these organizations have been long-standing in carrying out socialization encouraging the locals in waste separation. They also run many activities in the form of education and training about waste management, composting, and handicraft training.<sup>49</sup>

Those kinds of activities run by the selected organizations are ultimately related to community empowerment. The concept of empowerment in the discourse of community development always associated with individual ideas including participation, networking and justice. According to Rappaport (1984), Empowerment is the concept that links individual strengths and competencies, natural helping systems, and proactive behavior to social policy and social change.<sup>50</sup> Generally, empowerment can put people in both in personal and social context to get access to power. From the concept of empowerment elaborated above, it can be said that the local community-driven organizations in waste banks in Lombok have been in a right track in utilizing resources which come from

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<sup>48</sup> Rohit Agrawal and others, 'Big Data Analytics and Sustainable Tourism: A Comprehensive Review and Network Based Analysis for Potential Future Research', *International Journal of Information Management Data Insights*, 2.2 (2022), 100122 <https://doi.org/10.1016/j.jjime.2022.100122>

<sup>49</sup> Anupam Khajuria and others, 'Accelerating Circular Economy Solutions to Achieve the 2030 Agenda for Sustainable Development Goals', *Circular Economy*, 1.1 (2022), 100001 <https://doi.org/10.1016/j.ccc.2022.100001>

<sup>50</sup> Zachary S. Brown and Nick Johnstone, 'Better the Devil You Throw: Experience and Support for Pay-as-You-Throw Waste Charges', *Environmental Science and Policy*, 38 (2014), 132–42 <https://doi.org/10.1016/j.envsci.2013.11.007>

things like waste and managing human resources to gain community welfare and capacity building.<sup>51</sup>

Additionally, there is a circular economy that is embedded in the system of waste banks operated by the two selected organizations in this research. It can be proved by the economic activities of the waste bank in recycling waste into valuable things such as handicrafts and compost.<sup>52</sup> World Economic Forum (2014) further sees the concept of the circular economy as something that is rapidly capturing attention as a way of decoupling growth from resource constraints. It can be explained that the business of waste banks operated by these local organizations opens ways to reconcile the viewpoint for growth and economic participation with that of environmental wisdom and equity.<sup>53</sup>

By referring to the research findings, from the activities using the system of the waste bank, Bintang Sejahtera and NTB Mandiri have preserved the environment. It is evident that lots of waste are managed sustainably. For example, the people who previously are not registered as the member of the waste bank, they usually dispose of their waste inappropriately such as throwing into the river. By using the waste bank system to improve the community motivation to eliminate waste properly, Bintang Sejahtera and NTB Mandiri have indeed reduced the environmental pollution which can damage the valuable ecosystem in Lombok. Another part that may be interesting from such a good practice of the operation of waste banks generated by NTB Mandiri and Bintang Sejahtera in Lombok is the principal to sustain the business by engaging with the entrepreneurs and tourism actors in Lombok. They work in partnership to deal with the management of waste appropriately. For example, waste resulted from hotels in Lombok will be managed by using the system of recycling generated by both organisations.<sup>54</sup>

Overall, the operation of waste bank driven by NTB Mandiri and Bintang Sejahtera seems not accommodate all segments over the regions in Lombok. However, their existence in managing waste by using waste bank system has been able to response the local needs, while at the same time the operation of waste banks has contributed to the environmental preservation. The model of sustainable waste management which should be able to fulfil three aspects of sustainability encompassing environmentally effective, economically affordable and socially

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<sup>51</sup> Jakub Kronenberg and others, 'Corrigendum to Wasting Collaboration Potential: A Study in Urban Green Space Governance in a Post-Transition Country Environmental Science & Policy Volume 62, August 2016, Pages 69-78 (S1462901115300216) (10.1016/j.Envsci.2015.06.018)', *Environmental Science and Policy*, 85 (2018), 193 <https://doi.org/10.1016/j.envsci.2018.05.010>

<sup>52</sup> Mahesh Patankar, Anand Patwardhan, and Geert Verbong, 'A Promising Niche: Waste to Energy Project in the Indian Dairy Sector', *Environmental Science and Policy*, 13.4 (2010), 282-90 <https://doi.org/10.1016/j.envsci.2010.04.003>

<sup>53</sup> Pascale Hofmann, 'Wasted Waste-Disappearing Reuse at the Peri-Urban Interface', *Environmental Science and Policy*, 31.2006 (2013), 13-22 <<https://doi.org/10.1016/j.envsci.2013.03.011>>.

<sup>54</sup> Bruna Grizzetti and others, 'The Contribution of Food Waste to Global and European Nitrogen Pollution', *Environmental Science and Policy*, 33 (2013), 186-95 <https://doi.org/10.1016/j.envsci.2013.05.013>

acceptable proposed by Nilsson-Djerf and McDougall (2000) may be seen in the business of waste banks driven by the selected local community organizations in Lombok.<sup>55</sup>

It is undeniable that the selected organizations have been succeeding in running their roles economically, socially and environmentally acceptable for the local communities in Lombok. Several aspects can be learnt from the operation of waste banks driven by the selected local community organizations in Lombok. First, the waste banks operated by Bintang Sejahtera and NTB Mandiri accept the marketable waste. From this point of view, the waste banks should accommodate every type of waste, for example, wet waste to be handled by using the waste bank system.<sup>56</sup>

Second, regarding the financial performance of waste banks, it seems that these organizations should improve the market price of waste which based on the value of waste itself. It may be useful to raise the participation of locals to join as the customers of waste banks. Lastly, it is noteworthy for these local community-driven organizations to strengthen the role of local community leaders to coordinate with their residents in delivering programs regarding the waste concern. It may be helpful for the activities regarding current provided by these organizations to be operated effectively and efficiently.<sup>57</sup>

#### 4. Conclusion

Based on the elaboration towards the research findings and the analysis of this study, several factors influence the local community participation in sustainable waste management in Lombok, Indonesia. First, it is notable that the socioeconomic characteristics of the communities including age, gender, level of education and status of work can be considered as the influencing factor of the participation in sustainable waste management in Lombok. However, it is not that significant in changing communities' current behavior in disposing of waste and household separation. Second, some factors including the lack of waste facilities, the lack of sustainable programs and leadership roles contribute to the substantial effect on the participation of local communities in sustainable waste management in Lombok. Regarding the aspect of Waste Bank, there are few things become something important to be learned from the operation of waste banks driven by the two selected organizations, nameley Bintang Sejahtera and NTB Mandri. In

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<sup>55</sup> Dennis Victor and P. Agamuthu, 'Strategic Environmental Assessment Policy Integration Model for Solid Waste Management in Malaysia', *Environmental Science and Policy*, 33 (2013), 233–45 <https://doi.org/10.1016/j.envsci.2013.06.008>

<sup>56</sup> M. Agovino, M. Casaccia, and A. Crociata, 'The Impact of European Regional Development Fund on Separate Waste Collection: Evidence from Italian Regions', *Environmental Science and Policy*, 61, July 1975 (2016), 97–107 <https://doi.org/10.1016/j.envsci.2016.04.001>

<sup>57</sup> A. C. Skeldon and others, 'Agent-Based Modelling to Predict Policy Outcomes: A Food Waste Recycling Example', *Environmental Science and Policy*, 87, June (2018), 85–91 <https://doi.org/10.1016/j.envsci.2018.05.011>

general, these organizations have achieved the sustainability aspects that can be seen from the functions of waste bank covering the environment, economy and society. It can be said that besides the principal function of operating waste banks is to increase the public participation in waste management. These organizations have been successfully running the business to provide the local communities with the socioeconomic benefits, while at the same time, they have preserved environment from the waste pollution. Even so, there is a need to improve the financial performance and the more collaboration with relevant stakeholders.

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