

DISASTER MANAGEMENT APPROACH BASED ON HEXAHELIX-MODEL: COLLABORATION BETWEEN STAKEHOLDERS IN WASTE MANAGEMENT IN BALI

*I Putu Dharmanu Yudartha¹, Beta Nuke Devine²

*¹ Lecture Department of Public Administration – Udayana University, Indonesia

²Graduate Department of Public Administration – Udayana University, Indonesia

Email: p_dharmanu@unud.ac.id

*Corresponding Author, Received: April 15, 2023. Revised: May 18, 2023. Accepted: June 05, 2023



This is an open access article distributed under the Creative Commons 4.0 Share-Alike 4.0 International License. If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original. ©2022 by Journal Sjdgge

ABSTRACT: Disaster becomes a serious problem when the inability of various parties to anticipate it. Piles of garbage become one of the important factors that damage the tourism image in Bali. The issue also needs to involve multiple groups of stakeholders. This study aims to analyze collaboration between stakeholders in waste management in Bali based on the Hexa helix model. The method in this research is qualitative with an exploratory approach. The study results showed waste management as a form of disaster mitigation activity. Collaboration in waste management has made room for each component of the Hexa Helix model according to its field and capacity. What strengthens is customary rules as social capital regulating community behavior in waste management. As a recommendation, the Hexa helix model to be more effective and efficient in waste management is expected to be applied at the village level.

Keywords: Waste management, Hexa helix, Disaster management.

1. INTRODUCTION

Waste is no longer a regional issue but a national issue because the impact caused is often a national and even international concern. Indonesia's position can also be very vulnerable to environmental damage, one of which stems from the inability to manage waste properly. One area often highlighted is Bali's province, as one of the destinations for foreign tourists and has a famous tourist attraction at the international level. However, Bali still faces challenges in dealing with the waste problem. The high production of waste also seriously impacts Bali because the presence of waste is very damaging to the image of Bali tourism. The issue and problem of waste in Bali Province are often a serious concern. The existence of garbage and garbage shipments in tourist attractions such as beaches has negatively impacted the public. This condition greatly affects Bali tourism's image, where tourists often complain or feel uncomfortable about the presence of garbage. One type of waste that is a serious concern for environmentalists is plastic waste. Waste aesthetically will disturb tourists, but plastic waste has a much more serious impact because microplastics can contaminate fish that, if eaten by

humans, can cause health problems, including cancer [1].

The high production of waste also seriously impacts Bali because plastic waste damages the image of Bali tourism. It is reinforced by the publication of international television, which states that Indonesia. It is the second-largest waste contributor, especially plastic waste, with a volume of 187.2 million tons/year, with China in first place with 262.9 million tons/year and the next after our country, followed by the Philippines, Vietnam, and Sri Lanka. The existence of this amount can be assumed that Indonesia produces about 175 thousand tons/day or 0.7 kg/per person every day [2]. The data was also reinforced by a 2018 study titled Plastic Waste Associated with Disease Coral Reefs. Indonesia is one of the countries that spread the most plastic waste into the sea in the projected time between 2010-2025 [3].

In 2021, waste management in Bali needed serious attention because about 52 percent of waste, which is 2,200 tons per day, has not been handled properly. The waste was thrown away as much as 944 tons, 824 tons were still burned, and 452 were wasted in waterways [4]. Conditions are certainly very worrying, and especially there is a potential for disaster. If not managed properly,

increased waste will cause negative impacts such as environmental and air pollution, disrupting the sustainability of rice fields and rivers to the sea [5].

In addition, five key disaster waste characteristics have been developed: volume of waste, human health hazard, environmental health hazard, movement of waste, and waste handling difficulty [6]. Waste management solves problems such as natural disaster resilience in good waste confectionery, infrastructure, resources, and budget planning [7].

Waste management requires the support of various parties to have a positive and beneficial impact. So far, especially in Bali, the local government has considerable authority in overcoming the waste problem. On the other hand, people's behavior and awareness of waste are still low. Therefore, it is necessary to approach waste management so that the burden is not entirely on the local government. The involvement of various stakeholders is important for waste management to be more effective. The role of the community, mass media, NGOs, universities, private parties, and the government is an ideal choice. The involvement process is known in the Hexa helix model, which combines the aggregation of interests of individuals, parties, and organizations in waste management and overcomes the disaster of the waste.

The Hexahelix model depicts six key stakeholders in addressing complex social and environmental issues: government, industry, science, civil society, media, and consumers. These stakeholders are represented as interlinked hexagonal components, with each stakeholder influencing and being influenced by the others. The six parts of the Hexahelix model are:

1. Government: The government is responsible for creating policies and regulations that address complex social and environmental issues.
2. Industry: The industry is responsible for developing and implementing solutions to social and environmental issues.
3. Science: Science provides the knowledge and evidence needed to address complex issues.
4. Civil society: Civil society represents the interests of citizens and is responsible for advocating for policies and solutions that are in the public interest.
5. Media: The media is responsible for disseminating information and shaping public opinion on complex issues.
6. Consumers: Consumers are responsible for making choices that can influence industry and government policies.

The Hexahelix model highlights the importance of collaboration between these six stakeholders in addressing complex social and environmental issues. It suggests that solutions to these issues are more likely to be successful when all six stakeholders are engaged and working together rather than in isolation.

To strengthen the study in this paper, the author compares several studies. It analyzes the research gap and provides novelty value in research. First, the study entitled capacity building for post-disaster construction and demolition waste management (A Case of Sri Lanka). This paper presents a theoretical framework for capacity building in national post-disaster construction and demolition (C&D) waste management to address the identified capacity gaps in managing disaster waste resulting from natural hazards [8]. Compared to research conducted by researchers, there is an opportunity to analyze waste management through a different approach, namely the Hexa helix model. Second, the study entitled Disaster Waste Management in Malaysia: Significant Issues, Policies, and Strategies in 2016 [9]. The paper explores issues, policies, and strategies for anticipating the waste disaster in Malaysia. The results showed that many policies made in waste management in Malaysia did not work well in implementation. In addition, waste disasters are not a serious problem in Malaysia. Compared with research conducted by researchers, it has the opportunity to prove related to the issue of waste management, especially in the province of Bali. It is a novelty value, whereas one of the international standard tourist attractions, the perspective of the government, stakeholders, and the community in looking at the issue of waste.

Based on the empirical gap and research gap presented, the author is interested in analyzing disaster management with the Hexa helix model in the form of stakeholder collaboration related to waste management in Bali. The problem is the research on managing disasters through the Hexa Helix model in the form of stakeholder collaboration about waste management in Bali.

2. METHOD

This paper aims to analyze disaster management in the Hexa Helix model in Bali's stakeholder collaboration related to waste management. This research uses a qualitative approach by collecting primary data and secondary data. Preliminary data is obtained through interview results, and secondary data is obtained from literature studies, news, and other documents.

3. RESULTS AND DISCUSSION

One of the important components of disaster management is mitigation. Mitigation means an effort or step taken to reduce the risk of disaster [9]. The process can also minimize negative impacts, especially regarding waste. So waste management becomes a form of disaster mitigation, meaning that the potential and negative effects caused by waste must be managed appropriately and will provide positive assistance to the community. For example, we recycle waste, process organic waste into fertilizer, and do other activities.

Waste management from the perspective of disaster management is interesting, especially in Bali. Bali has long promoted local wisdom in disaster mitigation, management, and rehabilitation. The local wisdom in question is the existence of indigenous villages in Bali, which have long been in collaboration with the government of Bali. The position of indigenous villages is an added value in strengthening disaster management in Bali. It is increasingly seen with *perarem* or customary rules that can be applied to the community. It is related to waste management, and many indigenous villages have already set breaks or traditional authorities. The goal is that residents or customary cramps are more obedient, no longer throw garbage into rivers and fields, and are given sanctions. In addition, the village government formed a team of three hygiene cadres in each Banjar [10]. One indigenous village that established *perarem* (customary laws) is the indigenous village of Celuk, Gianyar Regency. Through the customary rules number 6 of 2021 concerning source-based waste management. The customary laws prohibit throwing garbage into rivers, lakes, and seas. In addition, it prohibits single-use plastics, and citizens must be involved in managing organic and inorganic waste. If there is a violation, a fine of 30 kilograms of rice or cash out of 300.000 rupiahs is sanctioned.

The role of indigenous villages in management is in line with Bali Provincial Regulation No. 4 of 2019 concerning indigenous Villages, which have been regulated concerning customary village cooperation with villages or villages, namely: Business development owned by Indigenous Villages and Villages or Villages to achieve greater economic benefits; Community activities, services, development, and empowerment of indigenous Villages and Villages; population; order; and Other fields, as long as it does not conflict with the traditional values, religion, traditions, culture and local wisdom of Bali. The abovementioned regulations show that source-based waste management is very relevant to community activities, services, and community

empowerment in waste management. In addition, a Waste Bank in the village is a form of managing waste to benefit the community economically. On the other hand, environmental cleanliness aligns with traditional, religious, and cultural values. There is a ban on using plastic in uniform activities and a recommendation to dispose of waste.

Apart from strong regulation of indigenous villages, other aspects also strongly influence, namely human resources, funding, facilities and infrastructure, and methods [11]. The human resource element, indigenous villagers, has strong togetherness characteristics through cooperation. It becomes an inherent value that must always be maintained. Concerning funding, regional regulations provided fiscal space for indigenous villages through indigenous village funds in 2019. The funds provided by the Provincial Government of Bali into a traditional village become its strength. Forces that can encourage the role of indigenous villages are synergized in supporting policies at the level of disaster in the context of waste management. Then the aspect of facilities and infrastructure becomes a supporting aspect that often requires cooperation with other parties because the limitations of facilities and infrastructure in waste management often become problems at the customary village level.

The principle of disaster management in Bali Province should be more inherent in the bottom-up approach because indigenous villages and indigenous peoples become a force or added value that has long existed and synergizes with the government at the local to national levels. Bali's adaptive ability in dealing with natural disasters such as the eruption of Mount Agung to the disaster of terrorism cannot be separated from the participation of indigenous villages. However, over time, the top-down approach in disaster management eroded the bottom-up approach. Especially in waste management, provincial and local governments have produced many regulations. However, the waste problem remains a crucial issue at all times and can potentially cause disasters when mismanaged.

In addition to the role of indigenous villages in the concept of disaster management, another aspect that is also important is disaster communication. Today's dynamics in disaster communication have developed, focusing no longer solely on television, radio, and print media but on social media. The role of social media, such as Twitter, has a significant impact on conveying information to the public. For example, in the eruption of Mount Agung in Bali in 2017, Twitter became one of the means or mediums of communication in the similarity of information dissemination, and there are also differences regarding the type of information coming from

outside the disaster site and at the disaster site [9]. It is an example of disaster communication related to piles of garbage in the river that can cause flooding and air pollution from the presence of garbage piles and other health and environmental disorders—the potential and negative impact of waste that becomes a serious concern. Waste is material due to human activities that cannot be reused if not recycled. The emergence of waste that continues to cause a rundown environment can cause disease. When waste is disposed of in the river, it impacts damage to river ecosystems and marine ecosystems. Education and communication occur the potential for waste disasters. It needs to be delivered correctly and precisely. For example, if there is a pile of garbage, the public, through social media, can publish it to be directly responded to by the authorized officer. In addition to social media, the role of mass media at the Bali area level is the next choice in improving communication related to potential waste disasters.

The next component has a role in waste management in the University. The role of universities or higher education becomes crucial in supporting waste management as a form of disaster mitigation. The University has the capacity and quality of adequate facilities and infrastructure in

waste management. The academic ability of the lecturers possessed can be transmitted to the community in managing waste appropriately. Service programs and research provide opportunities to support waste management, such as waste recycling or other activities. Collaboration with various parties is important in streamlining waste management as a form of disaster management.

The next stakeholder is a private party or business actor. One of the companies that synergize in waste management is the Danone company. Danone Company (Aqua) initiated with PT. Reciki uses a circular economy model. Zero waste to landfill means that the waste collected in this facility will be managed and fully reused so that nothing is wasted or ends up at the Final Processing Place [6]. Waste management in TPST is an Integrated Waste Management Site with 120 tons per day. Danone-Aqua's company's participation in recycling plastic bottle waste is a form of commitment. It is one form of collaboration in waste management, where local governments provide land and regulations. Overall Hexa helix models in waste management can be seen in the image below:



Fig 1. Hexa Helix Model Analysis in Bali

The Hexa helix model in the context of waste management in Bali became the basis of collaboration in disaster management. The local government, especially the province of Bali in the

Hexa helix model, has issued regional regulation of Bali Province Number 5 of 2011 concerning Waste Management and Regulation of the Governor of Bali Number 47 of 2019 concerning

source-based waste management. In 2021, the role of private companies was Danone which is involved in waste management. It is also done by several companies, hotels, and restaurants in Bali, even on a small scale. The role of the University, especially Udayana University, has conducted research and community service in the context of waste management. These research results become a reference for local governments in issuing local regulations, and the publications produced will later be reported or submitted to the public. The community will get education about the threat of waste to environmental damage, flood disasters, and other problems. In addition, the information conveyed by social media and mass media sourced from research results at universities can provide a new understanding of waste's negative impacts and benefits if processed appropriately. It can slowly provide insight and change people's behavior towards waste, such as throwing garbage in its place, reducing the use of plastic waste, and other activities. In the end, the role of indigenous villages is further strengthened through *perarem* or customary laws to the community to regulate behavior in disposing of waste and managing household waste. Indigenous village rules certainly have stronger values because there are social sanctions for violating communities. Of course, this can significantly regulate people's behavior toward waste management.

The role of civil society in Bali is also involved, namely *Griya Luhu*. *Griya Luhu* is a start-up in the field of *ecopreneurs* that aims to change public behavior and awareness of sustainable waste management using digital technology. *Griya Luhu* is part of civil society that has encouraged the integration of digital technology and community empowerment to

improve waste sorting at the source (home). The services provided by *Griya Luhu* use a mobile application to provide education to the public in sorting, processing, and reducing plastic waste at the household level. *Griya Luhu* has also collaborated with universities, especially Udayana University, in community service and involving village governments in Bali. The collaboration between students and lecturers, the community, *Griya Luhu*, and the government in Bali has reflected a form of collaborative governance that is in harmony with scientific development at the university level. In addition, it is also based on issues or problems that exist, especially at the community level related to waste management. Of course, this needs to be publicized through the involvement of mass media and social media in providing information and inspiration for the wider community in waste management in Bali.

The challenge ahead is to maintain and increase the scope of collaboration in the *Hexa helix* model, especially in waste management. Indeed, until now, the problem of waste in Bali remains an issue that is often disturbing and has the potential to cause disasters if not anticipated. The *Hexa-Helix Model* must be the basis or minimum reference of the closest government, namely the village government. The village government can potentially implement it increasingly significantly based on its facilities, infrastructure, and resources in the last ten years. For example, the existence of village funds given to the village government by the central government is an opportunity to streamline waste management through the *Hexa Helix* model at the village level.

4. CONCLUSION

Waste management is closely related to disaster mitigation, a component of disaster management. The province of Bali has an interesting side compared to other regions in managing waste. One of the stakeholders in the *Hexa Helix* model, namely indigenous villages through customary rules (*perarem*) that regulate waste management, is one of the advantages in the future. It is also a supporting aspect of social capital in implementing waste management in Bali. The challenge is encouraging and improving *Hexa Helix*-based waste management scope, no longer top-down but through a bottom-up approach. It means that waste management must start from the village government level. It is certainly more efficient and effective waste

management because the burden in waste management is no longer fully the domain of the government at the district or city level and the provincial level.

5. ACKNOWLEDGEMENTS

The researcher expressed his gratitude to the Rector of Udayana University and the Institute for Research and Community Service of Udayana University for granting funding for this research. We thank informants in this study, especially from local governments in Bali. We would also like to thank members of the research teams for helping to find and process data in the field.

6. REFERENCES

- [1] Charlotte, B. (2012). Solid waste management: A systems approach. In University of Canterbury. Civil and Natural Resources Engineering (Vol. 21, Issue 11 A).
- [2] Fitriyah, A. T., Nasution, D. S., & Putri, R. A. (2022). Pengelolaan sampah menjadi barang bernilai jual di lombok nusa tenggara barat. *Journal If Social Outreach*, 1(1), 14–22.
- [3] Juniartini, N. L. P. (2020). Pengelolaan Sampah Dari Lingkup Terkecil dan Pemberdayaan Masyarakat sebagai Bentuk Tindakan Peduli Lingkungan. *Jurnal Bali Membangun Bali*, 1(April), 27–40.
- [4] Karunasena, G., & Amaratunga, D. (2016). Capacity building for post disaster construction and demolition waste management. *Disaster Prevention and Management*, 25(2), 137–153.
- [5] Kubontubuh, E. D. (2018). Bali Bebas Sampah Plastik (menuju “Clean and Green Island”). *Jurnal Bali Membangun Bali*, 2(1), 41–46. <https://doi.org/10.51172/jbmb.v2i1.38>
- [6] Maryono, M., Seruningtyas, K., Roynaldi, A. D., Sudarno, & Hadiyanto. (2019). Basic Framework of Regional Model for Disaster Waste Estimation and Distribution by Using Spatial Approach in Central Java-Indonesia. IOP Conference Series: Earth and Environmental Science, 396(1). <https://doi.org/10.1088/1755-1315/396/1/012019>
- [7] Purnama, S. G. (2017). Modul Manajemen Bencana. In Fakultas Kedokteran Universitas Udayana.
- [8] Putri, I. A. T. E., Mardani, N., & Pujaastawa, I. (2012). Studi Sistem Pengelolaan Sampah Berbasis Komunitas Adat Di Desa Adat Seminyak Kecamatan Kuta Kabupaten Badung. *Ecotrophic: Journal of Environmental Science*, 5(1), 7–12.
- [9] Sari, M. M., Kusumasari, B., & Hadi, M. P. (2021). Twitter untuk Komunikasi Tanggap Darurat Erupsi Gunung Agung 2017. *Jurnal Ilmu Komunikasi*, 18(2), 201–218.
- [10] Suci, E. F., & Ferza, R. (2020). Dinamika , Problematika , Dan Implikasi Kebijakan Dan Kota Bekasi). *JURNAL Kebijakan Pembangunan*, 15(1), 11–24.
- [11] Yusof, N. S., Zawawi, E. M. A., & Ismail, Z. (2016). Disaster Waste Management in Malaysia: Significant Issues, Policies & Strategies. *MATEC Web of Conferences*, 66. <https://doi.org/10.1051/mateconf/20166600051>