Addressing Waste Growth Challenges through Collaborative Urban Governance and Local Democratic Engagement in Batam City's

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ABSTRACT - This abstract explores the challenges and opportunities in solid waste management through waste banks in Batam City, emphasizing the necessity for collaborative efforts among government, industry, and society. The discussion highlights current initiatives and the obstacles encountered in implementing effective waste management practices, particularly focusing on the fragmented nature of existing collaborations and the persistent community behaviors that hinder progress. Key challenges include low environmental awareness, limited community participation in waste sorting, inadequate infrastructure, and inconsistent enforcement of regulations. These issues underscore the need for intensified education, awareness-building, and incentivization to foster greater community engagement. The abstract proposes solutions through enhanced collaboration and joint commitment among stakeholders. It advocates for strengthened regulatory frameworks, improved coordination among government agencies, and greater corporate responsibility in prioritizing sustainability. These measures aim to establish a comprehensive waste management system that not only enhances environmental quality but also supports sustainable economic development in Batam City. Ultimately, by addressing these challenges and leveraging collaborative governance, Batam City can achieve a cleaner, healthier environment and sustainable growth for its residents.

Keywords: Government regulation; Local Democratic Engagement; Urban sustainability

Introduction

Environmental management challenges are critical in the pursuit of sustainable development. Achieving sustainability necessitates prudent and accountable environmental stewardship to preserve natural resources for future generations (Muluk, 2017). Effective environmental management encompasses the oversight and protection of natural resources, pollution regulation, biodiversity conservation, and climate change adaptation. The importance of these measures is evident in efforts to reduce the human ecological footprint, including the adverse effects of human activities on the environment (Stern, 2000). Key strategies involve the optimal use of natural resources, adoption of eco-friendly technologies, and implementation of safe and efficient waste management practices (Yates & Gutberlet, 2011). To achieve sustainable development goals, active involvement from various stakeholders—government, corporate sector, civil society, and academia—is essential.

Environmental management from a government perspective refers to the strategic strategy employed by the government to effectively oversee, preserve, and enhance the condition of the natural environment within a certain country or region. This encompasses a sequence of procedures, regulations, and tactics, such as the formulation of environmental policies, the monitoring and enforcement of environmental standards, the management of natural resources, the dissemination of public education, and the collaboration with other nations on environmental matters (Fangga & Mulasari, 2020). Governments have a crucial role in establishing environmental standards, guaranteeing adherence to these standards, and upholding the sustainable management of natural resources. The first stage in government environmental management is the formulation of

environmental policies, which encompass the establishment of environmental standards, emission targets, and the preservation of natural resources (Nurasa, 2013). In addition, it is the government's duty to oversee and implement environmental regulations in order to avoid infractions and remediate any environmental harm that has transpired (Batahari et al., 2020). In addition, the government assumes responsibility for the management of natural resources, the promotion of public awareness regarding environmental concerns, and active participation in international collaboration. The government is implementing a series of initiatives to attain the objective of sustainable environmental conservation, while also ensuring ecosystem equilibrium and enhancing the overall quality of life in society.

In this context, environmental justice principles are crucial, emphasizing the fair distribution of environmental burdens and benefits among all parties without discrimination (Baiocco & Paniccia, 2023). Environmental sustainability must be integral to all development decisions, ensuring that the impacts on all individuals, including future generations, are carefully considered. Environmental management concerns can manifest in various forms, such as air pollution from industrial activities, transportation systems, and waste incineration (Banga et al., 2022). Air pollution poses significant health risks, including respiratory disorders and cancer (Heriati et al., 2021). Effective waste management in urban settings is vital for maintaining a healthy and sustainable ecosystem (Harma & Dompak, 2020). Urban areas generate significant amounts of waste, including biodegradable and electronic waste. Challenges in urban waste management include inadequate infrastructure, such as a lack of proper final disposal sites (TPA) and waste processing facilities (Heidari et al., 2019). Consequently, much waste in metropolitan areas is improperly disposed of, leading to air, land, and water pollution. Additionally, there is often insufficient public awareness regarding waste segregation, which can result in ineffective waste management and environmental harm (Kurniawan et al., 2023). The lack of knowledge dissemination and promotion of effective waste management practices hampers the development of a sustainable waste management culture in urban areas.

Addressing these challenges requires collaborative urban governance, involving the active participation and cooperation of multiple stakeholders. In Batam City’s industrial sector, fostering partnerships among government entities, businesses, and local communities can lead to more effective environmental management practices. Local democratic engagement further enhances these efforts by ensuring that community voices and concerns are incorporated into decision-making processes.

Local politics in Batam City play a significant role in the implementation and success of environmental management strategies. Political will and leadership are crucial for promoting sustainable policies and mobilizing resources for environmental initiatives. The involvement of local politicians and policymakers is essential for creating regulations and incentives that encourage industries to adopt greener technologies and practices (Hartaman et al., 2023; Meckling & Nahm, 2019). Moreover, addressing waste growth challenges requires both technical solutions and a shift in public attitudes and behaviors. Local democratic engagement can facilitate community-based initiatives that raise awareness and educate the public about waste segregation and recycling. By empowering citizens to participate in environmental governance, Batam City can develop a more resilient and sustainable urban environment.

This research aims to explore how collaborative urban governance and local political engagement can address waste growth challenges and improve environmental management in Batam

City's industrial sector. Through a holistic approach, the study seeks to align stakeholders' efforts toward sustainable development and enhance the quality of life for current and future generations.

Method

This study utilizes a qualitative methodology to investigate the intricacies of collaborative urban governance and local democratic participation in enhancing environmental management within the industrial sector of Batam City. A qualitative technique is used due to its capacity to offer thorough and comprehensive insights into the meanings, understandings, concepts, traits, symptoms, symbols, and descriptions of phenomena associated with the study's subject (Miles et al., 2014). The study will employ qualitative research methods to investigate the perspectives, beliefs, and encounters of diverse stakeholders, such as local government officials, industry representatives, local communities, and other pertinent organizations. This approach is very suitable for revealing the intricate dynamics of collaborative urban governance and its influence on tackling the difficulties of waste growth and improving environmental management in the industrial sector of Batam City. The study will employ multiple qualitative data collection methods. First, conducting semi-structured interviews with important stakeholders will yield comprehensive and extensive insights into their perspectives on collaborative urban governance, local political involvement, and environmental management techniques. The purpose of these interviews is to determine the factors that either facilitate or impede the implementation of collaborative governance in environmental management. Further, engaging in participant observation involves directly observing stakeholder meetings, community events, and other pertinent activities to get firsthand understanding of the relationships, communication techniques, and decision-making procedures among various stakeholders. This approach will facilitate the accurate representation of the current and intricate dynamics of relationships between different institutions. Document analysis involves examining policy documents, reports, regulations, and other relevant literature to gain a thorough understanding of the formal structures and policies that regulate environmental management and collaborative governance in Batam City. Additionally, document analysis will aid in placing the findings into the wider social, cultural, political, and economic context. This qualitative research will provide a comprehensive understanding of the social, cultural, political, and economic factors that impact collaborative urban governance in Batam City. The research seeks to achieve a comprehensive understanding of how collaboration among different stakeholders may effectively address waste growth concerns and enhance environmental management in the industrial sector by using insights from several qualitative data collection methods.

Result and Discussion

Batam City is situated in the Singapore Strait, within the Riau Islands Province. This city attained autonomous status in 1999, when it was founded alongside seven other districts/cities in the Riau Islands Province, in accordance with Law Number 53. The administrative jurisdiction of Batam City spans an area of 1,575 square kilometers, encompassing Batam Island, Rempang Island, Galang Island, and several nearby islands. The 2021-2024 Batam City Regional Spatial Planning Plan, as outlined in Regional Regulation Number 3 of 2021, encompasses a total area of about 103,374 hectares of land, 6,901 hectares of reclaimed water, and 1,941 hectares of water bodies. According to Regional Regulation Number 2 of 2005, the administrative area of Batam City has been expanded.

This extension has resulted in an increase in the number of sub-districts from 8 to 12, and the number of sub-districts has increased from 51 to 64.

Table 1. Batam City Area Based on District

No	Subdistrict	Number of Subdistricts	Area (Ha)		
			Land	Sea	Total
1	Batam Kota	6	3.854	789	4.643
2	Batu Ampar	4	1.096	8.276	9.372
3	Batu Aji	4	4.182	2.037	6.219
4	Bengkong	4	1.371	589	1.960
5	Belakang Padang	6	6.855	66.490	73.345
6	Bulang	6	15.893	26.550	42.443
7	Lubuk Baja	5	1.116	3.714	4.830
8	Galang	8	35.331	211.816	247.147
9	Sei Beduk	4	10.597	1.484	12.081
10	Nongsa	4	10.837	28.011	38.848
11	Sekupang	7	6.853	3.863	10.716
12	Sagulung	7	5.495	925	6.420
Total		**64**	**103.480**	**354.544**	**458.024**

Source: Batam City RPJMD 2021-2026

The total surface of Batam City's subdistricts is 458,024 hectares, consisting of 103,480 hectares of land and 354,544 hectares of sea. The spatial allocation of these regions provides valuable insights into the imperative need for environmental management and cooperative urban governance to achieve sustainable development in the area. Subdistricts such as Batam Kota, Batu Ampar, and Lubuk Baja, which are presumably more developed and industrialized, have relatively lower land sizes in proportion to their total significance. Efficient waste management and pollution control techniques are essential in these heavily populated areas to avoid environmental deterioration (Khan et al., 2022; Nanda & Berruti, 2021). An effective waste management system is crucial, particularly in densely inhabited and industrialized subdistricts. Proper waste management requires the presence of suitable trash disposal locations, waste processing facilities, and public awareness initiatives on waste segregation. Subdistricts characterized by expansive territories and substantial industrial operations, such as Bulang and Galang, necessitate considerable focus on the establishment of infrastructure that facilitates both economic endeavors and environmental sustainability.

Waste Managenent as Local Government Issues

The initiation of the national strategy on formal spatial planning commenced with the enactment of Law Number 24 of 1992, which was subsequently revised by Law Number 26 of 2007. The objective of this strategy is to enhance the quality of national spatial planning by promoting safety, comfort, productivity, and sustainability. The process of preparing spatial planning, which involves data processing and analysis, utilizes environmental support and capacity analysis approaches through KLHS. KLHS, also known as Strategic Environmental Assessment (SEA), is a crucial instrument for enhancing the precision and effectiveness of spatial planning by improving the planning framework.

The industrial sector in Batam City is divided into two primary categories: heavy industry and light industry. The heavy industrial sector includes shipbuilding, fabrication, steel production, metalworking, and other related industries. On the other hand, the light industrial sector encompasses manufacturing, electronics, textiles, plastics, and other similar industries. Batam City is notably recognized as Indonesia's primary hub for shipbuilding production. Key industrial areas in Batam City include Wiraraja Industrial Park, Batamindo Industrial Park, Panbil Industrial Estate, Bintang Industrial Park II, Latrade Industrial Park, Puri Industrial Park 2000, Tunas Industrial Park, Union Industrial Park, Kabil Integrated Industrial Park, West Point Batam Industrial Park, Executive Industrial Park I and II, Sarana Industrial Park, Sekupang Makmur Abadi Industrial Area, Cammo Industrial Park, and Citra Buana Industrial Park I, II, and III, among others.

According to Law Number 32 of 2009 on Environmental Protection and Management, local governments are required to develop a Strategic Environmental Study (KLHS) to integrate sustainable development principles into regional planning. Batam Island, part of the Batam, Bintan, and Karimun National Strategic Area (KSN BBK) and the Border National Strategic Area (KSN), is a central hub for commerce, industry, services, domestic tourism, and socio-economic activities. The Vision and Mission of Batam City, as outlined in the 2016-2021 Regional Medium-Term Development Plan (RPJMD), aim to establish Batam as a globally competitive, technologically advanced, economically prosperous, and socially esteemed city. The Batam City Spatial Planning Policy 2018-2038 further proposes that Batam be designated as a focal point for urban activity with a hierarchical structure consisting of a city center, sub-city centers, and environmental centers. This approach seeks to ensure a harmonious balance between development and environmental preservation.

In line with these objectives, the Batam City Government, in collaboration with the Environmental Service, is conducting a "Strategic Environmental Study for the Detailed Spatial Plan (RDTR) for 5 Districts on Batam Island" to effectively address environmental management demands. This study is crucial for incorporating the principles of sustainable development into the city's strategic planning, particularly in the context of rapid industrial growth and urbanization. The integration of collaborative urban governance and local political engagement is essential to addressing the environmental challenges posed by the industrial sector in Batam City. Collaborative efforts involving government entities, businesses, local communities, and other stakeholders are vital for effective environmental management (Clement et al., 2022; Goel, 2021; Journeault et al., 2021; Kazancoglu et al., 2021). These efforts are further enhanced by active local political engagement, which ensures that the voices and concerns of the community are reflected in the decision-making process. The primary factor contributing to the trash issue in Batam City is the rapid population expansion and densely populated areas, coupled with a significant proportion of the population living below the poverty threshold. This also impacts public consciousness regarding the significance of efficient waste management. Based on conducted study, it is shown that there are multiple driving forces, or main triggers, contributing to the waste problem in Batam City. The primary aspect under consideration is the substantial population growth in Batam City, which has an indirect impact on the quantity of waste generated per capita. According to the acquired data, it is evident that the rise in trash production is strongly correlated with the population in Batam City (Figiure 1).

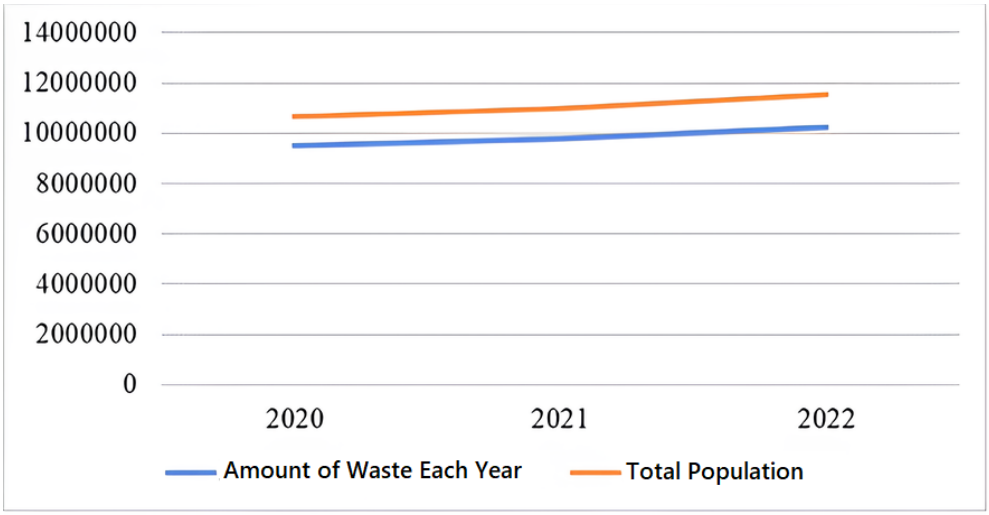

Figure 1. Comparison of Increase in the Amount of Waste and Population
Source : BPS Batam City (2023) & Department of the Environment (2024)

Another significant catalyst is the consumerist lifestyle adopted by the residents of Batam City. It is widely recognized that this place is renowned for its gastronomic delights, and its consumer culture is consistently growing. Individuals' consumption habits impact their role in generating a growing range of garbage, including plastic waste. This phenomenon is further exacerbated by the swift advancement of delivery sales facilitated by applications, resulting in a substantial annual escalation in the accumulation of plastic, styrofoam, and cardboard trash. Moreover, this aligns with study data indicating a rise in trash production across all sub-districts from 2021 to 2022. This signifies the expansion or alterations in consumption and activity patterns within each sub-district. Furthermore, it is noteworthy that several sub-districts witnessed a substantial surge in trash production. For instance, Sei Beduk saw an increase from 14,680,240 kg in 2021 to 17,895,770 kg in 2022, while Nongsa experienced a rise from 10,888,870 kg to 12,478,650 kg (Fig 2).

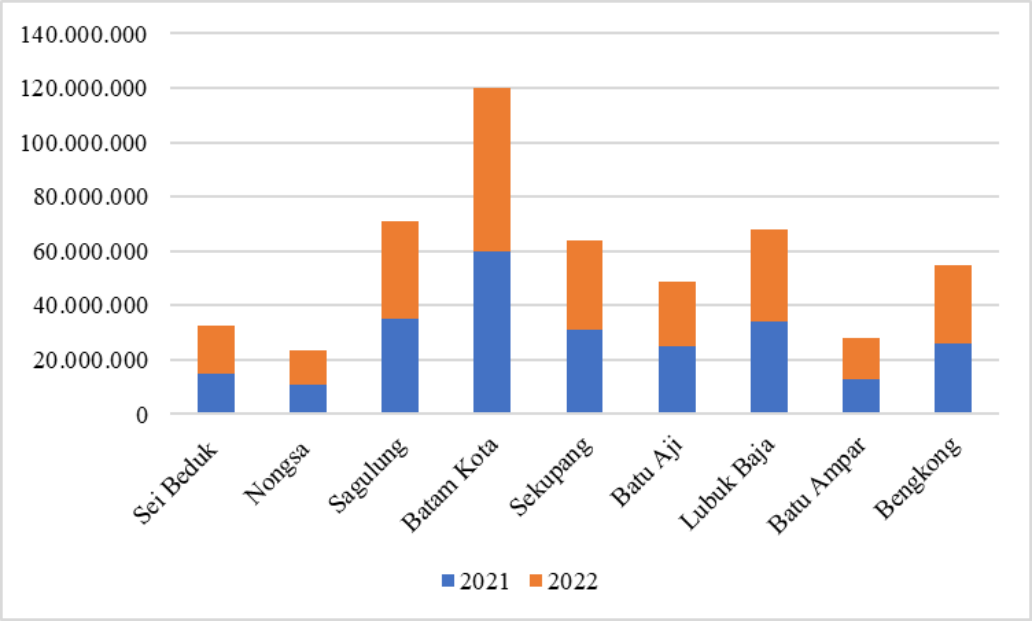

Figure 2. Data on Household Waste Entering Punggur Landfill (kg)
Source : Department of the Environment (2024)

Public participation in waste management in Batam City has not yet reached an optimal level. The Batam City Government operates a Waste Bank program that involves the community, but this program has not effectively reduced and managed domestic waste. The Waste Banks in several locations primarily accept recyclable waste such as metal, plastic bottles, and paper, while the management of organic waste has not been the focus. This presents a dilemma for the Environmental Department. The Head of Environmental Management at the Batam City, Environmental Department highlighted this issue, stating that "*There is a dilemma in waste management, particularly concerning community behavior. For instance, people often dump waste along the roadside. If we clean it up, they might think, 'Oh, someone will clean it later,' which perpetuates the habit. However, if we don't clean it, we will be reprimanded by the Mayor, and our performance will be scrutinized. It's a tricky situation in dealing with community behavior*". The involvement of the community is crucial for effective waste management, but achieving this requires overcoming significant behavioral challenges. The Waste Bank program in Batam City, although a step in the right direction, has not fully addressed the management of organic waste, which remains a significant issue. This aligns with the earlier discussion on the importance of sustainable waste management practices and the need for comprehensive infrastructure and public awareness programs.

Effective waste management necessitates not only the provision of facilities and services but also a shift in public attitudes and behaviors (Acharya et al., 2024; Vanapalli et al., 2021). The dilemma faced by the Environmental Department in dealing with community behavior highlights the complexities of fostering a sustainable waste management culture. Collaborative efforts involving government entities, businesses, and local communities are essential to promote better waste management practices. The statement above underscores the importance of local political engagement in addressing environmental challenges. Political will and leadership are crucial in implementing policies that encourage community participation and sustainable practices. The Batam City Government's ongoing efforts to conduct a Strategic Environmental Study for detailed spatial planning demonstrate a commitment to integrating sustainable development principles into regional planning

Collaborative Urban Governance and Local Democratic Engagement in Addressing Waste Growth Challenges

Efficient waste management in Batam City presents a formidable challenge that necessitates collaboration among multiple stakeholders, including the government, local community, and corporate sector. Ensuring effective cooperation among these entities is crucial for achieving sustainable and efficient waste management. The waste bank program serves as a platform to enhance interactions among stakeholders, fostering collective efforts toward the shared objectives of reducing waste generation and promoting environmental sustainability.

According to the Minister of Environment and Forestry Regulation No. 75 of 2019, producers can collaborate with officially registered waste banks to establish facilities for waste collection, recycling, and reuse. Implementing a circular economy approach in Batam City offers the potential to enhance collaboration among the government, business sector, and citizens in addressing waste issues. The circular economy emphasizes the reduction, reuse, and transformation of materials, converting waste into valuable resources (Joensuu et al., 2020; Liu & Ramakrishna, 2020; Velenturf & Purnell, 2021). Governments can lead these efforts by enacting supportive legislation, providing

incentives to promote the adoption of sustainable practices by companies, and funding the establishment of waste sorting and recycling infrastructure. Businesses can drive innovation by implementing strategies in product design, packaging, and manufacturing processes to minimize waste and establish closed-loop systems. Additionally, they have the opportunity to collaborate with startups and local enterprises specializing in recycling and waste management.

The effective management of solid waste in Batam City requires robust collaboration among the government, community, and commercial sector. The waste bank program can strengthen interactions among these stakeholders to work towards reducing waste generation and promoting environmental sustainability. The Batam City Environmental Service implements regulations and policies that promote sustainable waste management, including operating guidelines for waste banks, incentives to encourage community engagement, and criteria for waste management.

The government is responsible for providing essential infrastructure, such as waste processing facilities, recycling centers, and efficiently operated landfills. Furthermore, the government supports programs like SILH, which oversee and document the effectiveness of waste management practices. Educational and awareness initiatives aim to enhance community engagement in the waste bank program. Environmental awareness campaigns, workshops, and community events educate residents on the importance of efficient waste management. Communities, in the other hand, particularly housewives, play a crucial role in sorting and collecting waste at the household level. The success of the waste bank program relies on active community participation in segregating organic and inorganic waste. Community efforts, such as those led by citizen organizations or neighborhood associations (RT/RW), often coordinate waste collection and manage local waste banks. Active community participation ensures the efficient and sustainable operation of the waste bank program.

Conclusion

Effective solid waste management in Batam City through waste banks hinges on robust collaboration between government, industry, and society to achieve sustainable success. While collaborative initiatives are beginning to take shape, their implementation faces several challenges that must be addressed. Current cooperation tends to be fragmented, often limited to specific companies providing waste bins and supporting select programs. To achieve broader impact, more integrated collaboration is necessary across diverse stakeholders. Key obstacles include entrenched community behaviors that resist effective waste management practices. Low environmental awareness and insufficient community participation in waste bank programs are significant hurdles. Addressing these challenges requires intensified efforts in education, awareness-building, and incentivizing community involvement in waste sorting and management.

Furthermore, limited financial resources, inadequate infrastructure, and inconsistent enforcement of regulations pose additional challenges. Industry must also prioritize sustainability over mere profitability by actively supporting environmental initiatives and integrating sustainable practices into corporate strategies. To overcome these barriers, concerted commitment and enhanced collaborative efforts among all stakeholders are essential. The government should strengthen regulatory frameworks, provide adequate incentives, and improve coordination among relevant agencies. Industry can contribute by offering technical expertise, financial support, and engaging in sustainable corporate social responsibility initiatives. By fostering well-coordinated joint efforts,

Batam City can establish an efficient and sustainable waste management system. This will not only foster a cleaner and healthier environment but also promote sustainable economic growth for the residents of Batam City.

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