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Fostering Community-Led Waste Management Through Dynamic Governance

A Case Study of Batam City

Lubna Salsabila [1], **Ria Ariany** [2], **Hendri Koeswara** [3]

[1, 2, 3]Doctoral Program of Policy Studies, Universitas Andalas, Padang, Indonesia

[1]Department of Public Administration, Universitas Putera Batam, Batam, Indonesia

lubna.salsa68@gmail.com

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Abstract: Effective city solid waste management has become a critical issue for communities globally due to the rapid pace of urbanization and increasing environmental concerns. The convergence of economic development and environmental preservation in Batam City, Indonesia, has underscored the necessity for inventive waste management approaches. This study examines the impact of dynamic governance and community empowerment in addressing the intricate waste issue in Batam City. The research uses a qualitative approach to investigate the underlying reasons for waste management difficulties. It investigates how adaptive governance might improve stakeholder cooperation and decision-making based on facts. Effective policy implementation relies on public interaction, yet meaningful participation remains difficult. Prior research suggests that individuals are more inclined to engage in matters that directly impact them, and ambiguous implementation protocols and a lack of confidence in political establishments frequently hinder community engagement in environmental policy. The waste management techniques in Batam City are conventional and inefficient due to limited government resources, highlighting the necessity for a more comprehensive strategy. The study's results indicate that implementing dynamic governance, which involves the flexibility to adapt and collaborate with stakeholders, can enhance waste management procedures. In addition, applying social capital theory can facilitate community empowerment, leading to a heightened sense of ownership and active engagement in waste management initiatives. Communities can enhance the effectiveness and durability of waste management systems by utilizing social networks, trust, and shared standards. This study emphasizes the significance of integrating inventive governance approaches with community-led efforts to tackle urban trash issues and advance sustainable development in Batam City.

Keywords: city solid waste management; solid waste management; dynamic governance.

1. Introduction

Given the rapid pace of urbanization and growing environmental concerns, effective management of city solid waste has emerged as a critical issue for cities worldwide. In the vast Indonesian archipelago, the urban area of Batam City occupies a key place where the trajectories of economic progress and ecological conservation intersect. Given the city's increasing urban sprawl and industrial development, effective waste stream management has become critical (Chanhthamixay et al., 2017; Stern, 2000). Given the critical need for innovative and long-term waste management techniques, this study investigates the concept of dynamic governance, in conjunction with community empowerment, as a means of addressing Batam City's complicated garbage problem.

According to Antoci (2007), public engagement in implementing public policy is a way for the community, including people and groups, to voice their views. On the other hand, involving the public in public affairs is regarded as an effort to provide knowledge and awareness to the public about the necessity of their participation in producing more efficient and effective policies (Muluk, 2007). According to Lukensmeyer, Goldman, and Stern (2011) research on the role of the public in the implementation of government policies, public involvement in the policy process can help the government overcome political problems, create accountability, and create a professional environment. Furthermore, Meredith and MacDonald (2017) stated that engagement in the policy process will help the people grasp the significance of their role in the constitution (Meredith & MacDonald, 2017).

However, previous research by many scholars demonstrates that public participation in the policy process is not always easy to achieve. This is because people only participate in problems that directly touch them. For example, Lencher and colleagues (2018) discovered that people typically participate in government initiatives that are directly related to their basic requirements, such as income and housing, but not in other issues (Lechner et al., 2018). Pandebesie et al. (2019) also discovered that community involvement in environmental policy is difficult to achieve since implementation procedures are frequently imprecise and do not encourage meaningful participation (Pandebesie et al., 2019).

According to Feng et al. (2020) and Yan and his colleagues (2020), this problem is caused by a lack of community involvement as a core part of the process of formulating and implementing environmental policies, which results in less realistic environmental policies (Feng et al., 2020). Yan and his colleagues (2020) noted that community involvement in environmental policy can result in more complete policies that can be implemented both conceptually and practically (Yan et al., 2020). Overall, community involvement in policy implementation, particularly in environmental policy, remains restricted. This is consistent with the findings of Das, who claimed that community participation in environmental policy implementation is often voluntary and usually involves communities that have suffered the negative consequences of deficient policy implementation. For example, communities in Indonesia afflicted by floods caused by poor waste management and irrigation problems are likely to engage in voluntary involvement (A. Das, 2015a, 2015b).

Waste management has become a severe issue, and it remains one of the government's major targets with no remedy in sight (Wirawan et al., 2018). The waste problem has piqued the interest of professionals throughout the previous two decades. Walls presented waste management research in early 2004, indicating that the waste problem was caused by city governments' failure to handle city waste efficiently, as well as increasing awareness of proper waste handling as well as effective waste storage practices in separate waste bins for each household (Walls, 2005). Walls

(2005) adds that the inability and lack of basic facilities for regular waste collection at the source level results in dumping on open land, drainage, roads, and nearby water bodies, creating an unsafe environment in the surrounding area, particularly in developing countries like Indonesia (Walls, 2005). In other words, trash management, according to Walls (2005), is a difficult undertaking that frequently employs traditional methods due to restricted access to efficiency.

Furthermore, Milea (2009) emphasizes that community conduct frequently influences participation in underdeveloped nations. People's beliefs and attitudes toward participation can influence their motivation to join in the development process (Milea, 2009). Jerath (2021) voiced a similar sentiment, stating that if the prevalent perception is that public engagement is ineffectual or useless, people may be less encouraged to participate actively (Jerath, 2021). A lack of trust and confidence in political institutions in the community might constitute an impediment to public participation (Simandjorang et al., 2022).

According to Yogiswatin (2016), one of the main causes of difficulties with Indonesia's waste management system is a lack of integration between the government, business sector, and society. This finding is consistent with Wahyuni and his colleagues' (2011) research on trash management in Malang City, Indonesia. According to Wahyuni et al. (2011), dealing with trash concerns is tough due to limited government finances and collaboration space. Malang City continues to use the traditional waste management model, namely "collect, move, and throw away," which is contrary to national policy. Furthermore, Wahyuni et al. (2011) discovered that people's attitudes around garbage are important. Most people believe that paying sanitation fees to garbage employees has fulfilled their obligations and do not see the need to participate more actively in waste management. The community's lack of understanding of waste management and risks also adds to their non-participation. Community opposition arose since they were not involved in the planning stage (Rahman, 2013).

The 3R (Reduce, Reuse, and Recycle) program is one of the government's waste-reduction initiatives (Putra et al., 2019). Despite programs such as garbage banks and the "Go Green" campaign, community participation in waste management remains the biggest impediment to dealing with waste problems (Mukherjee Basu & Punjabi, 2020). Previous research by Bing et al. (2016) and Permana et al. (2015) showed that community participation is the key difficulty in trash management (Bing et al., 2016; Permana et al., 2015). This appears to be a problem in a number of Indonesian cities, which runs counter to Law Number 18 of 2008, which emphasizes operational technical changes in waste management with an emphasis on waste reduction and control. This law should enable the government, private sector, and society to work together to minimize and regulate waste through recycling and other efficient and sustainable innovations (Magriaty et al., 2020; Renaldi & Frinaldi, 2022). However, problems such as a lack of government commitment and support in implementing the waste management program outlined in Law No. 18 of 2008, as well as the public's belief that garbage is the government's responsibility rather than theirs, contribute to a lack of awareness of this rule. Due to a lack of government financing, there are also insufficient waste management facilities and community engagement efforts. Similarly, coordination across public entities necessitates enough resources (Purnaweni, 2017). All of these variables are interconnected, demonstrating that fundamental reforms are required to tackle Indonesia's waste problem.

Batam City, well-known for its reputation as a key industrial and economic center, has seen unprecedented population growth and expanding spending patterns (Mahirah et al., 2022). As a result, the generation of waste materials has increased significantly

(Salsabila et al., 2021). Current hierarchical management models struggle to effectively address growing concerns (Rasyid et al., 2022). Batam City's dynamic governance application can potentially change waste management procedures. This strategy is notable for its capacity to adapt to changing conditions, stimulate collaboration among many stakeholders, and make data-driven decisions. This research will focus on how dynamic governance and community empowerment can effectively address the challenges of city solid waste management in Batam City, Indonesia, considering the current issues of limited public participation and insufficient integration between the government, private sector, and society.

2. Methods

This research initiative aims to perform an in-depth investigation and analysis of the underlying factors underpinning the waste management system in Batam City. This investigation was prompted by the requirement to adequately manage the external costs linked with urbanization and development processes. The research design for this study uses a combination of different methods. Field observations are the first step in the research process. These observations are made to determine the emergence of occurrences or problems within the framework of society. The observation was conducted from December 2023 to January 2024. From preliminary research during the field observations, it is found that there is a concern from local government and public concern about waste issues in Batam City. Qualitative methodology, particularly a descriptive approach, is utilized to acquire a comprehensive understanding of the current patterns and trends in waste management. Utilizing VOSviewer analysis, researchers have been able to investigate and evaluate scientific literature and other types of bibliometric data to recognize patterns, correlations, and trends throughout the data. Following that, the outcomes of VOSviewer are utilized to make assumptions regarding patterns and models of community behavior and involvement in waste management in the city of Batam. The literature selected was carried out throughout four phases. First, keywords determined were selected according to research interest and by following the SPIDER framework—introduced by Cook, Smith, and Both (2012). The keywords/search strings that are selected or used are as follows: ("waste management") AND ("Dynamic Governance") AND ("Community Participation") and (TITLE-ABS-KEY ("WASTE MANAGEMENT") AND TITTLE-ABS-KEY ("DYNAMIC GOVERNANCE") AND TITLE-ABS-KEY ("COMMUNITY PARTICIPATION")) AND PUBYEAR > 1998 AND PUBYEAR <2023. A search in the Scopus Database gave a total of 250 studies written in English with limitations between 1999 and 2022, which matched the keywords selected. Further, the articles were filtered by title, abstract, and keywords, resulting in 150 articles. A total of 100 articles were discarded as they did not meet the inclusion criteria, which the research aims to explain in the research's aim to explain the various importance of public participation in the dynamic governance of waste management implementation. The selected articles were then compiled and analyzed to answer the research questions.

3. Results and Discussion

This study takes a systematic approach to analyzing literature published between 2002 and 2022. VOSviewer software was used to determine the most important ideas based on indicators from earlier studies. The results of this study show a statistically significant relationship between municipal waste management and waste management, as well as involvement levels, particularly at the regional level. This study looks at the elements that determine involvement in public events. This study investigates the impact of community awareness, conduct, community will, community

attitudes, and government approach (support) on participation (Figure 1). This study employs the idea of connectivity to examine the link between these variables. The data indicate that these factors are interconnected and considerably impact involvement. The informal sector, commercial sector, and public-private partnerships all impact a program's long-term viability. These elements are key in determining the program's long-term viability.

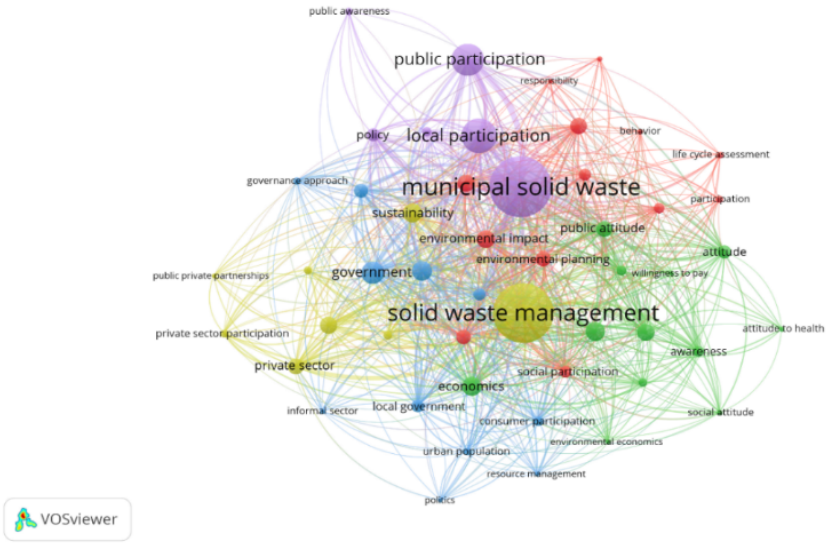

Figure 1. Network Visualization Based on VOSviewer Analysis

According to the four analysis groups produced by the VOSviewer software analysis, most of the literature reviewed discusses the community's attitudes, behavior, awareness, and willingness to pay as a form of community participation, particularly at the regional level, and how these factors relate to SWM policy. This happened in Cluster 1. Cluster 2 studies focused mostly on government programs to improve participatory decision-making processes to solve city waste management issues. The primary purpose of this project is to protect public health while minimizing the environmental impact of garbage disposal. In this setting, dynamic governance emerges as an essential idea, emphasizing the necessity for adaptable and flexible governing structures capable of responding to urban waste management's changing needs and complexities. Dynamic governance entails constant learning, stakeholder interaction, and the integration of multiple knowledge systems to develop more resilient and sustainable waste management strategies. This approach is consistent with the findings from Cluster 2, which emphasize the importance of participatory procedures and local governments' adaptable capacities. This study intends to expand the existing literature on solid waste management by examining past studies in Cluster 3. As can be seen, these studies strongly emphasize the role of Public-Private Partnerships (PPPs) and private-sector involvement in fostering sustainable solid waste management methods. The current study aims to advance this understanding and investigate such a strategy's potential benefits and drawbacks. Dynamic governance is especially important in this context since it encourages collaboration between the public and private sectors, allowing them to co-create new solutions to both urgent and long-term waste management concerns.

Cluster 4 literature focuses mostly on government resource management tactics, particularly at the municipal level. The government's approach is to treat residents like consumers. This study will provide a review of the existing research on Cluster 4, with an emphasis on the government's resource management approach and its societal

ramifications. In this environment, dynamic governance is relevant, as it pushes municipalities to implement more inclusive and participatory resource management strategies, increasing the effectiveness and legitimacy of their policies. Incorporating the concept of dynamic governance across all clusters creates a holistic framework for understanding and improving solid waste management methods. It emphasizes the need for adaptation, stakeholder participation, and innovative public-private partnerships to achieve sustainable and resilient waste management systems.

Development is a dynamic and gradual phenomenon wherein a nation advances through a predetermined sequence of phases to enhance many aspects of its existence, including its economic, social, political, cultural, and demographic dimensions (Adlin, 2021; Turner & Hulme, 1997). The notion of sustainable development is designed to safeguard the capacity of future generations to experience the same level of well-being as present generations (United Nations Department of Economic and Social Affairs, 2020). The government's approach to development is of great significance, as development can be seen as a double-edged sword (Turner & Hulme, 1997). An inadequate development plan has the potential to yield outcomes that are contrary to the principles of sustainable development. The duty of establishing sustainable development rests upon all individuals and across generations (Meredith & MacDonald, 2017). The government must possess the authority and oversight to regulate and manage the utilization and advancement of all resources possessed by the State (Aguja, 2016). By implementing a well-designed institutional framework in the form of policies, establishing effective collaboration agreements with private sectors, and actively engaging the public (Aguja, 2016; Magriaty et al., 2020), it is feasible for a state to attain its sustainable development goals (Purnomo et al., 2019). One of the negative externalities resulting from implementing the development program is the generation of solid trash. Solid waste management is a multifaceted issue that poses a significant challenge for most governments in developing nations. Both people and groups bear equal responsibilities regarding solid waste management. Calculating the economic losses resulting from inadequate solid waste management poses significant challenges for governments (S. Das et al., 2019). Solid waste management has a significant impact on all facets of government, including its overall management, national policies, and local governance.

Dynamic governance is a prominent governance concept in recent years. The era's rapid and dynamic advances have eventually created the government's main goal to realize effectiveness and efficiency in the government administration process not only based on the government's competence in the process of designing, implementing, and evaluating (controlling) a policy (Widowati et al., 2023). Because of the multiplicity of difficulties that exist today, the notions of Good Governance and Good Policies are no longer adequate to address the issues that occur.

Dynamic Governance Theory, often known as Adaptive Governance or Collaborative Governance, is a current framework for decision-making and problem-solving (Colm et al., 2020). This is extremely important in tackling complicated and ever-changing problems, such as solid waste management in urban areas like Batam City. The fundamental ideas of Dynamic Governance Theory revolve around stressing adaptability, flexibility, and collaboration among multiple stakeholders (Wasistiono & Anggraini, 2019). In essence, dynamic governance derives from the term dynamism, which refers to situations or settings that necessitate continual improvement and always necessitate new ideas and perspectives with quick and adaptable adaptations. This concept highlights the existence of continuous change operations that are fast but effective, innovative, and ongoing. Dynamic circumstances refer to all types of activities involving consistent and constant institutional processes in terms of adaptations and

improvements to the socio-economic demands that exist in society, as perceived by institutions or government agencies. A dynamic government process will impact the economic development process in society, as well as indirectly influence social conduct in society in response to current laws and regulations. According to Neo and Chen (2007), this government capability or concept can serve as the cornerstone for development and improved community welfare.

The consideration of households is an additional aspect that must be taken into account in the context of public solid waste management (Dhokhikah et al., 2015; Dhokhikah & Trihadiningrum, 2012). According to Peeters et al. (2015), housing is identified as a significant contributor to the production of plastic garbage. Peeters et al. (2015) argue that incorporating housing within the government's agenda is crucial for optimizing the recycling program's efficacy in trash reduction. Permana et al. (2015) suggested a high association between the presence of public waste reduction and garbage separation practices and the perception of community cleanliness. Permana et al. (2015) argue that the public has the potential to actively participate and promote sustainable solid waste management (SWM) practices by leveraging favorable environmental perceptions and achieving success at the local level.

Mukherjee Basu and Punjabi (2020) did a qualitative study examining the evolution of public participation in Mumbai, India. The findings of their research revealed that rubbish collection at the local level was characterized by irregularity and poor conditions. This was attributed to a lack of participation, not just on the side of officials but also within the broader society. In 1997, a series of meetings were convened between officials and local citizens in response to a multitude of complaints arising from the implementation of the new 'restrictive personnel policy' in 1995. According to the research findings, the inhabitants in the area began actively engaging in volunteerism by forming a 'Street Committee.' This committee took on the responsibility of raising public awareness and fostering community participation in efforts to uphold cleanliness within the locality. This course of action has garnered attention from other sectors, particularly non-governmental organizations (NGOs) and diverse entities. The program, formally known as Advanced Locally Management (ALM), achieved significant success till the year 2002. A new issue emerged with the nationwide implementation of the program, as criticism was raised over the notable prejudice present within the elite and middle-income classes. This bias has resulted in a shift in the concentration of ALM (Asset and Liability Management) due to the influence exerted by certain interest groups (Mukherjee Basu & Punjabi, 2020).

Additionally, there is a need for public awareness and participation, as well as the involvement of the commercial sector and non-governmental organizations (NGOs) (Ahmed & Ali, 2006). The alternative government has emphasized the necessity of public-private-community cooperation instead of the conventional public and private sector partnership (Subhan, 2016). The writers elucidated the significance of incorporating the community into the collaborative efforts and implementation of programs. The authors explicitly delineate the perceived obstacles between the public sector, community, and commercial sector in enhancing solid waste management (SWM) practices. The study's findings indicate that a major obstacle was the towns' inability to engage in innovative practices and foster collaboration. This was mostly attributed to constraints such as insufficient physical resources and financial allocations dedicated to innovation initiatives. Furthermore, it is worth noting that only a select number of cities acknowledge the significance of collaborating with residents and non-governmental organizations (NGOs). Furthermore, the engagement in lobbying efforts with cities is significantly limited due to inadequate skills, limited access, and insufficient financial resources. Certain cities perceive the participation of

non-governmental organizations (NGOs) and community-based organizations (CBOs) as hindrances and financially burdensome (Ahmed & Ali, 2006; Jamal & Ajmal, 2020).

The research paper also highlights three primary conclusions about the potential for connecting individuals to solid waste management (SWM) service delivery. Initially, with the active participation of individuals in the program, many novel concepts about service provision were generated, thereby bolstering the exhibition of collaborative efforts. Furthermore, a noteworthy program accomplishment can be attained when a shared perspective exists among city authorities, elected representatives, and citizens. Furthermore, it is necessary to possess substantial knowledge in effectively supporting collaboration among various industries. The authors additionally note that community participation frequently depends on non-structural and indeterminate aspects, such as the support provided by NGOs/CBOs. Additionally, the authors emphasize that the successful implementation of improved solid waste management in the city is contingent upon the active participation of citizens, strong dedication from politicians and an effective collaboration strategy among all relevant stakeholders (Ahmed & Ali, 2006).

Based on the aforementioned literature, it is evident that the implementation of effective regulations and the enhancement of solid waste management standards alone would not suffice, as the active engagement of the public is needed. The active participation of local communities and citizens is crucial in the implementation and enhancement of solid waste management (SWM) initiatives, as evaluated by local government authorities. Several key components, such as effective communication, strong commitment from the political sector, a comprehensive understanding of the problem, and active involvement of the public, are essential in developing a cost-efficient solid waste management (SWM) model. In order to address the complicated problem arising from solid waste management (SWM), it is important to develop revised plans that encompass all pertinent elements and are tailored to the prevailing conditions.

The concept of community empowerment, derived from various theories and perspectives, is a complex idea representing progress in increasing individuals' and communities' ability, authority, and self-governance to take control of their existence. These address problems affect them, and participate actively in procedures. Making decisions (Saprudin et al., 2022). Community empowerment can be understood using the Social Capital Theory (Hapsari et al., 2019). According to the preceding viewpoint, developing community empowerment is assisted by developing social networks, trust, and shared norms within a specific community (Van Deth, 2003). The prevalence of social relationships among residents encourages collaboration, resource pooling, and joint efforts to tackle common issues, including waste management challenges. Increased engagement, knowledge acquisition, and active participation in the formulation of waste management policies and initiatives not only foster a sense of investment and personal accountability (Rahmatunnisa, 2018), but also make valuable contributions toward achieving more efficient and long-term waste management resolution. In the context of Batam City, it is critical to investigate the possible influence of community empowerment on waste management activities, with a particular emphasis on Social Capital Theory. This theoretical framework demonstrates that community empowerment can be a powerful catalyst for building a sense of ownership among community members in waste management activities. As a result, this empowerment has the potential to have a good environmental impact while also increasing social cohesion in society.

According to the framework of Social Capital Theory, community empowerment is a diverse process that focuses on creating and enhancing social ties and assets within a given community (Lochner, 1999). Trust, reciprocity, and shared ideals characterize the social relationships apparent in Batam City society. This link provides a solid framework for community members to work together to address numerous difficulties, including waste management. In practice, community empowerment through social capital acquisition shows that its inhabitants have the ability and desire to work together toward common goals, such as good solid waste management. These individuals effectively use their social networks to foster resource mobilization, collective knowledge accumulation, and active participation in collaborative efforts with the ultimate goal of improving waste disposal and recycling methodologies.

It makes sense in the context of Batam City for localities with greater autonomy to adopt various initiatives to encourage sustainable waste management practices. Establishing local recycling programs, creating awareness campaigns to educate individuals about the significance of reducing and recycling garbage, and coordinating cleanup initiatives to keep the environment clean are examples of these initiatives. The aforementioned acts help produce a cleaner and more sustainable urban environment and impact individuals' empowerment to participate actively in decision-making processes linked to waste management laws and practices. Furthermore, it is critical to note that the achievement of this empowerment entails more than only environmental benefits. The occurrences can potentially boost social cohesion, community resilience, and overall welfare. The aforementioned phenomena generate a sense of communal ownership, supporting the conviction that positive development may be achieved via joint efforts.

Research shows that the local government's inability to effectively establish a contractual framework to ascertain the extent of private sector involvement has the potential to render endeavors to enhance solid waste management (SWM) ineffectual. The consideration of both the private sector and government involvement is crucial since the quality of the contract structure might impact community participation in the program. The government must exercise stringent measures to prevent the private sector from attaining a superior position or exerting excessive influence over the government. It is imperative to undertake this course of action since the interplay between the private sector and the government is poised to influence the dynamics between the government and society at large. The research has also found how public participation affects the Solid Waste Management in Batam City (Figure 2).

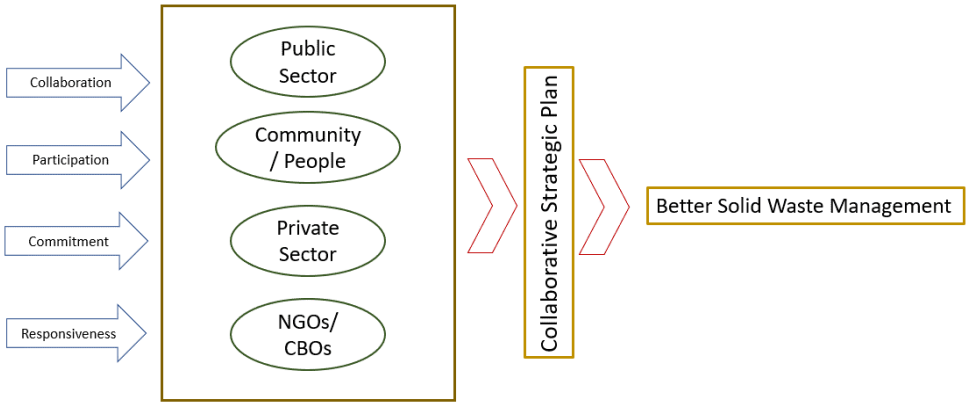

Figure 2. How Public Participation Affecting the SWM

The research found that public awareness and participation and the involvement of the commercial sector and non-governmental organizations are critical. At the

same time, the other government has emphasized the importance of public-private-community collaboration rather than traditional public-private sector collaboration. The writers emphasized the significance of involving the community in collaboration and program implementation. They explicitly describe the perceived hurdles to better SWM implementation in the public, community, and private sectors. According to the findings, the most important hurdle was cities' inability to innovate and envision collaboration due to restricted room and resources for innovation. Second, only a few towns see the value of collaborating with residents and non-governmental organizations. Third, due to a lack of expertise, access, and funding, city advocacy is rarely carried out. Some towns regard the involvement of NGOs/CBOs as a barrier and a costly expense.

Three primary possibilities exist for connecting individuals to SWM (Solid Waste Management) service delivery. The active participation of individuals in the program led to the generation of numerous novel concepts about service provision within the cooperation framework, hence facilitating the display of effective partnerships. Furthermore, a notable program accomplishment can be attained when there is a shared perspective among city authorities, elected representatives, and citizens. Thirdly, it is imperative to possess adequate experience facilitating collaboration among multiple industries (Furqoni et al., 2019; Subhan, 2016). The authors additionally assert that community participation frequently depends on non-structural and indefinite factors, such as the support provided by NGOs/CBOs. Furthermore, the authors emphasized that the successful implementation of improved solid waste management (SWM) in cities requires the active participation of citizens, strong dedication from politicians, and an effective collaborative strategy among all parties involved.

Dynamic governance offers a comprehensive method to effectively tackle the urgent challenges pertaining to solid waste management in Batam City. The aforementioned dynamic architecture facilitates rapid adjustment to the ever-changing landscape of waste management concerns. The promotion of collaboration among many stakeholders, including government agencies, private sectors, and the local community, facilitates a coordinated endeavor to effectively manage garbage. Dynamic governance lays a significant emphasis on fostering innovation, thereby facilitating the integration of state-of-the-art technology and practices that have the potential to increase waste reduction and recycling efforts. By utilizing data-driven decision-making, policymakers have the ability to make well-informed choices and modifications grounded in real-time information, resulting in enhanced efficacy of waste management systems. Significantly, dynamic governance effectively involves the community (Anam et al., 2024), so establishing people and local businesses as crucial stakeholders in the process. This method fosters the development of social capital and community empowerment, aiming to foster a collective feeling of responsibility and encourage public engagement in waste management projects. Local actions, such as the implementation of recycling programs, organization of clean-up campaigns, and dissemination of awareness drives, emerge as vital elements of the answer. In conclusion, dynamic governance presents a comprehensive and flexible approach to the solid waste management challenges faced by Batam City. This approach promotes sustainable practices and effectively tackles the intricate nature of urban waste management in a fast-evolving global context.

4. Conclusion

This study employs a systematic approach to analyze literature spanning from 2002 to 2022, focusing on various facets of solid waste management (SWM) and community participation across different clusters identified by VOSviewer analysis. The findings

underscore the significant interplay between community attitudes, behaviors, awareness, and governmental support in shaping effective SWM policies, particularly at the regional and city levels.

The results indicate that the involvement of the public in the execution of policies, such as through community participation, plays a crucial role in effectively resolving the challenges posed by waste management. Nevertheless, the study also highlights other obstacles to public participation, including individuals' inclination to prioritize matters that directly impact them, ambiguous protocols for execution, and limited comprehension of waste management. Furthermore, the longevity of the waste problem can be attributed to other factors, including the level of government commitment, the prevailing assumption that trash management is exclusively the government's responsibility, and the constraints imposed by limited resources.

The introduction of dynamic governance is posited as a prospective resolution to the intricate issues encountered in waste management. Dynamic governance, which is distinguished by its capacity to adapt, be flexible, and foster collaboration among many stakeholders, presents a promising framework for tackling the ever-changing challenges in the field of solid waste management.

The concept of community empowerment, which is grounded on the philosophy of social capital, plays a crucial role in the realm of waste management. The promotion of collaboration, resource mobilization, and knowledge accumulation can be facilitated by the empowerment of communities through social networks, trust, and shared norms. This, in turn, can lead to more efficient and sustainable waste management practices. The active participation of community members in waste reduction and recycling efforts not only contributes to the preservation of the environment but also fosters social cohesion and improves the overall well-being of the community. The significance of robust collaboration among the public, corporate sector, and non-governmental groups is underscored in order to attain efficient waste management. This highlights the necessity of implementing carefully designed contractual frameworks in order to achieve a balance between private-sector engagement, mitigate the risk of undue influence, and facilitate meaningful government and community participation.

Dynamic governance is pivotal across the reviewed literature clusters, advocating for adaptable and collaborative governance structures essential for developing resilient and sustainable solid waste management (SWM) strategies. However, the study identifies several challenges related to dynamic governance. Implementing dynamic governance requires flexibility to respond to evolving SWM challenges and stakeholder needs, yet governmental and institutional rigidity may impede effective adaptation. Effective dynamic governance also relies on robust stakeholder engagement among governmental, private, and community sectors, which can be complex and resource-intensive. Moreover, adequate resources, both financial and human, are crucial for sustaining collaborative decision-making processes long-term, posing potential constraints on scalability. Addressing these challenges involves investing in capacity building, fostering policy innovation that integrates dynamic governance principles, and exploring multi-level governance frameworks to enhance coordination among stakeholders. These efforts aim to enhance the effectiveness of dynamic governance in promoting sustainable SWM practices, supporting environmental stewardship, and advancing community well-being.

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