

## Implementation Analysis of the Integrated Solid Waste Management (Iswm) Policy and Innovation in Enhancing Waste Management Performance in Sumbawa Regency

Rocky Zamabutar<sup>1</sup>, Sri Rahayu<sup>2\*</sup>

<sup>1</sup>Master's Program in Innovation Management, Graduate School,  
Sumbawa University of Technology, Sumbawa, Indonesia

<sup>2\*</sup>Innovation Management, Graduate School, Sumbawa University of  
Technology, Sumbawa, Indonesia

**Corresponding Author:** Sri Rahayu : [sri.rahayu@uts.ac.id](mailto:sri.rahayu@uts.ac.id)

---

### ARTICLE INFO

Keywords: Integrated Sustainable Waste Management (ISWM), Policy Implementation, Innovation Management, Waste Management Performance, Local Government.

*Received: 20, May*

*Revised: 15 June*

*Accepted: 10 July*

©2026 Zamabutar, Rahayu (s): This is an open-access article distributed under the terms of the [Creative Commons Atribusi 4.0 Internasional](https://creativecommons.org/licenses/by/4.0/).



### ABSTRACT

Municipal solid waste management remains a major challenge for local governments in developing countries, especially those with limited institutional and financial capacity. Although Indonesia has adopted the Integrated Sustainable Waste Management (ISWM) framework, its implementation varies across regions. This study analyzes ISWM policy implementation, identifies influencing factors, examines the role of innovation management, and evaluates its contribution to waste management performance in Sumbawa Regency, Indonesia. A qualitative single-case study approach was used, with data collected through interviews, observations, and document analysis, and analyzed using the Miles, Huberman, and Saldaña model. The study integrates Edwards III's policy implementation theory, the ISWM framework, Tidd and Bessant's innovation model, and Behn's performance framework. Findings show that ISWM implementation remains ineffective due to weak communication, limited resources, fragmented coordination, and low operational capacity. However, community-based innovation emerges as a key strategy to strengthen implementation through adaptive waste separation, incentive-based Waste Bank programs, and collaborative initiatives. Villages with stronger community participation and innovation capacity demonstrate better performance despite similar constraints. This study highlights that community-driven adaptive innovation plays a crucial role in improving policy implementation and advancing sustainable waste management in resource-limited local governments.

---

## INTRODUCTION

The waste crisis has become a strategic global issue within the sustainable development agenda. The United Nations Environment Programme reported that global municipal solid waste generation is projected to increase from approximately 2.1 billion tonnes in 2023 to 3.8 billion tonnes by 2050 unless substantial changes are introduced into existing waste management systems (UNEP, 2024). The consequences extend beyond environmental degradation, as improperly managed waste also contributes to climate change through methane emissions from the anaerobic decomposition of organic waste in landfills (Kaza et al., 2018; UNEP, 2024). Methane has a substantially higher global warming potential than carbon dioxide over the short term, making the waste sector an important component of global climate mitigation strategies (IPCC, 2022). Within the framework of the Sustainable Development Goals, Target 11.6 explicitly calls for cities to reduce their adverse per capita environmental impacts by 2030, with particular attention to air quality and the collection and environmentally sound management of municipal and other waste (United Nations, 2015).

In Indonesia, solid waste management remains an urgent development challenge. The Government of Indonesia responded to this issue through Law Number 18 of 2008 on Waste Management, which marked a paradigm shift from the conventional collect-transport-dispose or end-of-pipe approach toward a comprehensive waste management system based on reduction, reuse, and recycling principles integrated across upstream and downstream processes (Government of Indonesia, 2008). This regulatory transformation is consistent with the principles of a circular economy, which emphasize waste prevention, resource recovery, product-life extension, and the reintegration of materials into production and consumption systems (Kirchherr et al., 2017; Ghisellini et al., 2016). Nevertheless, national waste data indicate that Indonesia continues to generate tens of millions of tonnes of waste annually, while a substantial proportion remains inadequately managed. These conditions demonstrate that, although a relatively comprehensive regulatory framework has been established, its implementation at the local level remains suboptimal and requires more systematic and evidence-based investigation (Damanhuri et al., 2014; Zurbrügg et al., 2012).

Sumbawa Regency, located in West Nusa Tenggara Province, faces particularly serious waste management challenges. Geographically, the regency covers an area of approximately 6,643.98 km<sup>2</sup> and consists of 24 subdistricts, 157 villages, and 8 urban administrative villages. Its extensive territory and dispersed settlement pattern complicate the equitable provision of waste collection, transportation, processing, and disposal services. Such geographical constraints are particularly significant because the effectiveness of municipal waste management depends not only on technological capacity but also on settlement density, transportation distance, infrastructure accessibility, institutional coordination, and the availability of financial and human resources (Guerrero et al., 2013; Wilson et al., 2013). Local operational data for 2025 indicate that waste generation in Sumbawa Regency reached approximately 290.05 tonnes per day. However, only 8.96 tonnes per day, or 3.09%, were reportedly managed

appropriately, while approximately 281.09 tonnes per day, or 96.91%, remained inadequately managed. A substantial proportion of this waste was transported to the Raberas Final Processing Site or directly discharged into the surrounding environment, while disposal operations at the landfill continued to rely on open-dumping practices.

These conditions are further aggravated by structural capacity limitations. In 2026, the Government of Sumbawa Regency allocated IDR 9.27 billion for waste management from a total regional budget of approximately IDR 2.46 trillion, representing only 0.38% of the regional budget. This relatively small allocation reflects the limited fiscal priority assigned to the waste management sector. Waste collection services currently cover only 10 of the regency's 24 subdistricts, equivalent to 41.67% of the administrative area. Waste processing through Material Recovery Facilities accounts for only approximately 0.32%, while the available community-based infrastructure consists of 21 local waste-bank units, one central waste bank, and 13 reduce-reuse-recycle waste processing facilities, many of which have not yet operated optimally. Human resource capacity is similarly constrained, with only four personnel reportedly having received specialized training in solid waste management. Overall, the waste management performance assessment for Sumbawa Regency in 2025 produced a score of only 6.98, indicating a low level of institutional and operational performance.

Limited financing, inadequate infrastructure, weak institutional capacity, and insufficiently trained personnel are widely recognized as major barriers to sustainable waste management, particularly in local governments in developing countries (Guerrero et al., 2013; Marshall and Farahbakhsh, 2013). The presence of infrastructure alone does not guarantee effective waste management when facilities are not supported by appropriate operational funding, clear institutional responsibilities, community participation, reliable markets for recovered materials, and sustained monitoring and evaluation (Wilson et al., 2013; Aparcana, 2017). Consequently, the poor performance of waste banks and reduce-reuse-recycle facilities in Sumbawa Regency should not be interpreted solely as a technological problem but as an indication of broader weaknesses in governance, institutional coordination, financing, stakeholder engagement, and operational sustainability.

The urgency of the problem has increased following the issuance of the Minister of Environment/Head of the Environmental Control Agency Decree Number 1264 of 2026 concerning the imposition of administrative sanctions in the form of government coercion requiring the termination of open-dumping practices at the Raberas Final Processing Site. This policy is consistent with the Indonesian Government's broader commitment to terminate open dumping at final processing sites and replace it with environmentally controlled disposal and resource-recovery systems. The administrative sanction requires Sumbawa Regency to transform its waste management system within a limited period and reinforces the conclusion that fragmented, incremental, and temporary interventions are no longer sufficient to address a systemic waste management crisis. Effective compliance requires coordinated improvements in waste

reduction, source separation, collection coverage, transportation, recycling, organic waste processing, landfill rehabilitation, institutional governance, financing, and community participation.

An Integrated Sustainable Waste Management approach provides a relevant conceptual framework for addressing these interconnected challenges. ISWM views waste management not merely as a technical sequence of collection, transportation, treatment, and disposal, but as a multidimensional system involving stakeholders, physical waste-system components, and enabling dimensions such as governance, financial sustainability, institutional capacity, social inclusion, and environmental protection (Van de Klundert and Anschütz, 2001; Wilson et al., 2013). Under this approach, improvements in waste management performance depend on the integration of technical systems with institutional arrangements and stakeholder participation. An intervention that focuses exclusively on equipment or infrastructure is unlikely to be sustainable when it is not supported by appropriate regulations, financing mechanisms, professional capacity, public participation, and markets for recyclable materials (Marshall and Farahbakhsh, 2013; Batista et al., 2021).

Innovation is also increasingly recognized as an essential mechanism for improving waste management performance. Innovation may include technological improvements, digital monitoring systems, institutional restructuring, new financing mechanisms, community-based service models, public-private partnerships, incentive systems, and circular-economy business models (OECD, 2017; de Jesus and Mendonça, 2018). In the context of capacity-constrained local governments, innovation can help improve resource efficiency, expand service coverage, increase waste separation and recovery, strengthen accountability, and facilitate collaboration among government agencies, communities, businesses, and informal waste-sector actors. However, innovation is unlikely to generate meaningful performance improvements when it is implemented as an isolated project without being integrated into the broader policy and institutional system.

Accordingly, the central problem addressed by this study is not limited to the gap between formal policy and its implementation in practice. More fundamentally, it concerns the unclear causal relationships among the design of an Integrated Sustainable Waste Management system, the effectiveness of policy implementation, innovation, and local waste management performance. From a scientific perspective, the existing literature has not adequately explained why an ISWM system that has been formally designed and supported by regulatory instruments may still fail to produce significant performance improvements in regions characterized by limited fiscal, institutional, technological, and human resource capacity. Previous studies have generally examined waste management technologies, community participation, governance, policy implementation, or institutional capacity separately (Guerrero et al., 2013; Marshall and Farahbakhsh, 2013; Wilson et al., 2013). Consequently, an important research gap remains regarding how ISWM system design, policy implementation effectiveness, and innovation interact in shaping waste management performance at the local-government level.

This study therefore seeks to develop a more comprehensive explanation of waste management performance by positioning policy implementation and innovation within the ISWM framework. Such an approach is expected to provide both theoretical and practical contributions. Theoretically, the study may clarify the mechanisms through which integrated system design, implementation capacity, and innovation influence local waste management outcomes. Practically, the findings may provide an evidence-based foundation for formulating institutional reforms, financing priorities, technological interventions, community-participation strategies, and innovation policies required to transform waste management in Sumbawa Regency from an open-dumping-oriented system into an integrated, circular, and environmentally sustainable system.

## **LITERATURE REVIEW**

### **Public Policy Implementation Theory (George C. Edwards III)**

Policy implementation represents the most critical stage of the public policy cycle because it is at this stage that policy intentions are tested against practical realities. Edwards III (1980) argues that effective policy implementation depends on the interaction of four fundamental determinants: communication, resources, disposition, and bureaucratic structure. These variables operate simultaneously and collectively determine whether policy objectives can be successfully achieved.

Communication refers to the extent to which policy objectives, procedures, and responsibilities are clearly transmitted, consistently interpreted, and effectively understood by implementing agencies and stakeholders (Edwards III, 1980). Ineffective communication often results in policy ambiguity, inconsistent implementation, and coordination failures among implementing organizations (Sabatier & Mazmanian, 1980).

Resources encompass the availability of qualified human resources, financial capacity, technical facilities, information systems, authority, and organizational capabilities required to implement policy effectively (Edwards III, 1980). Numerous studies have demonstrated that insufficient financial resources, limited technical expertise, and inadequate institutional capacity constitute major barriers to successful policy implementation, particularly in developing countries (Grindle, 1980; Hill & Hupe, 2014).

Disposition refers to the attitudes, commitment, motivation, and willingness of policy implementers to carry out policy directives. Even when communication is effective and sufficient resources are available, implementation may fail if implementing actors lack commitment or interpret policy objectives differently from policymakers (Edwards III, 1980; Winter, 2003).

The fourth determinant is bureaucratic structure, which includes standard operating procedures (SOPs), organizational arrangements, coordination mechanisms, and inter-agency collaboration. A fragmented bureaucratic structure frequently generates overlapping responsibilities, weak coordination, administrative inefficiency, and implementation delays (Edwards III, 1980; Hill & Hupe, 2014). Consequently, policy implementation should be viewed as a

dynamic governance process involving multiple actors, institutions, and organizational interactions rather than merely the execution of formal regulations.

### **Integrated Sustainable Waste Management (ISWM) Theory**

Integrated Sustainable Waste Management (ISWM) is a comprehensive conceptual framework developed to promote sustainable municipal solid waste management by integrating technical, environmental, institutional, financial, and social dimensions. The framework was initially developed by WASTE Advisers and subsequently adopted and refined by international organizations, including the United Nations Environment Programme (UNEP), UN-Habitat, and the World Bank (Van de Klundert & Anschütz, 2001; Wilson et al., 2013).

Unlike conventional waste management approaches that primarily emphasize waste collection and disposal, ISWM considers waste management as an integrated system consisting of three interrelated physical components: waste generation reduction and source separation, collection and transportation, and waste treatment, recycling, resource recovery, and environmentally sound final disposal (Wilson et al., 2015). These operational components are supported by governance dimensions, including policy and regulatory frameworks, institutional arrangements, financing mechanisms, stakeholder participation, private-sector involvement, and environmental sustainability (Marshall & Farahbakhsh, 2013).

Wilson et al. (2013) further argue that ISWM is founded upon three interdependent dimensions: stakeholders, system elements, and sustainability aspects. Stakeholders include governments, communities, private enterprises, informal waste collectors, and non-governmental organizations that jointly influence waste management outcomes. System elements encompass waste prevention, collection, transportation, treatment, recycling, recovery, and disposal. Sustainability aspects emphasize environmental protection, financial viability, institutional capacity, social inclusion, and public health.

The ISWM framework is closely aligned with the principles of the circular economy, which prioritize waste prevention, material recovery, resource efficiency, and the reintegration of secondary materials into production systems (Ghisellini et al., 2016; Kirchherr et al., 2017). Consequently, ISWM is widely recognized as one of the most comprehensive frameworks for evaluating waste management performance because it simultaneously considers technical efficiency, institutional governance, environmental sustainability, and stakeholder participation.

### **Innovation Management Theory**

Innovation management refers to the systematic process through which organizations generate, select, implement, and continuously improve new ideas to create value and enhance organizational performance. Tidd and Bessant (2009) conceptualize innovation as a dynamic process consisting of four interconnected stages: search, select, implement, and learn. The search stage involves identifying opportunities, emerging challenges, technological developments, and environmental changes. The select stage focuses on evaluating alternative responses and determining strategic priorities. The implementation stage

transforms selected ideas into operational practices, while the learning stage facilitates organizational reflection, knowledge creation, and continuous improvement.

Innovation extends beyond technological advancement and includes organizational, managerial, institutional, and policy innovations that improve organizational effectiveness and adaptability (OECD, 2018). According to the Oslo Manual (OECD & Eurostat, 2018), innovation encompasses new or significantly improved products, processes, organizational methods, and business practices that create economic or social value.

Within the public sector, innovation is increasingly recognized as a key driver of public value creation, improved service delivery, and institutional effectiveness (Hartley, 2005). Public-sector innovation generally includes service innovation, process innovation, organizational or institutional innovation, governance innovation, and policy innovation (Mulgan & Albury, 2003; De Vries, Bekkers, & Tummers, 2016). In environmental governance, innovation may involve digital technologies, community-based waste management models, public-private partnerships, smart monitoring systems, circular economy initiatives, and collaborative governance mechanisms that improve operational efficiency, environmental quality, and citizen participation (Aparcana, 2017; UNEP, 2024).

### **Public Sector Organizational Performance Theory**

Organizational performance represents the extent to which an organization achieves its strategic objectives through the effective and efficient utilization of available resources. In the public sector, performance measurement serves multiple purposes beyond accountability, including improving managerial decision-making, organizational learning, policy evaluation, transparency, and public trust (Behn, 2003).

Behn (2003) identifies several fundamental purposes of public-sector performance measurement, including evaluating organizational achievements, controlling organizational activities, budgeting, motivating employees, promoting learning, improving operational effectiveness, and enhancing accountability. These functions collectively contribute to continuous organizational improvement and better public service delivery.

Building upon performance management literature, organizational performance in the public sector is commonly assessed through four interrelated dimensions: effectiveness, efficiency, service quality, and public value (Kaplan & Norton, 1996; Moore, 1995; Pollitt & Bouckaert, 2017). Effectiveness reflects the degree to which organizational objectives and policy targets are achieved. Efficiency concerns the optimal utilization of financial, human, and technological resources to maximize outputs. Service quality represents the responsiveness, accessibility, reliability, and satisfaction experienced by citizens, while public value refers to the broader economic, social, and environmental benefits generated through public-sector interventions (Moore, 1995).

Within the context of this study, waste management performance is conceptualized as the ultimate outcome of policy implementation and innovation under the Integrated Sustainable Waste Management framework. Performance

is reflected through improvements in waste reduction, collection coverage, recycling rates, resource recovery, operational efficiency, environmental quality, institutional effectiveness, and community participation. Consequently, waste management performance constitutes the final manifestation of how successfully public policies, governance systems, and innovation initiatives interact to achieve sustainable environmental management objectives (Wilson et al., 2015; Marshall & Farahbakhsh, 2013).

## **RESEARCH METHODOLOGY**

This study was conducted in Sumbawa Regency, Indonesia, focusing on the municipal solid waste service area managed by the Environmental Agency (Dinas Lingkungan Hidup), particularly in the three urban villages of Brang Biji, Uma Sima, and Pekat. These locations were purposively selected to represent different conditions of waste management policy implementation: (1) areas that still rely on the conventional collect-transport-dispose system without waste treatment interventions, (2) areas equipped with inactive Waste Banks or 3R Transfer Stations (TPS3R), and (3) areas where waste management facilities have not yet operated optimally. The research was carried out from May to June 2026 using a qualitative approach with a holistic single-case study design. This approach was selected because it enables an in-depth understanding of complex and context-specific policy implementation processes within real-life settings (Creswell, 2014; Yin, 2014). Data were collected from primary sources through semi-structured in-depth interviews with purposively selected key informants, participatory field observations, and from secondary sources including policy documents, performance reports, waste management statistics, and relevant regulations. Informants comprised officials of the Environmental Agency, technical personnel from the Waste Management Unit, managers of landfills, Waste Banks and TPS3R facilities, as well as community leaders and environmental activists. Data collection continued until information saturation was achieved (Patton, 2015).

The researcher served as the primary research instrument, supported by interview guides, observation checklists, document review forms, field notes, and audio-visual recording devices. Data were analyzed using the interactive model proposed by Miles, Huberman, and Saldaña (2014), involving data condensation, data display, and conclusion drawing and verification. The coding process followed open, axial, and selective coding procedures and was facilitated using NVivo software to enhance systematic data organization and thematic analysis. To ensure the trustworthiness of the findings, this study adopted the quality criteria proposed by Lincoln and Guba (1985), including credibility, transferability, dependability, and confirmability. Credibility was strengthened through source, method, and theory triangulation, member checking, and peer debriefing, while transferability was supported through rich contextual descriptions. Dependability was ensured by maintaining a comprehensive audit trail, and confirmability was achieved through confirmability audits and continuous researcher reflexivity to minimize subjective bias throughout the research process.



## RESEARCH RESULTS

The findings indicate that waste management in Sumbawa Regency remains structurally weak despite the existence of national regulations promoting the implementation of Integrated Sustainable Waste Management (ISWM). Based on field observations and interviews, waste reduction and source separation practices have not been systematically implemented, with only a few community initiatives operating in specific locations. Waste collection and transportation services are still functioning; however, they face several constraints, including aging vehicle fleets, limited operational budgets, and the absence of transparent collection schedules. At the downstream level, the Raberas landfill continues to operate using an open dumping system, while most TPS3R facilities and Waste Banks operate below capacity or are inactive. These conditions indicate that the ISWM framework has not yet been implemented in an integrated operational system supported by effective governance, adequate infrastructure, and sustainable financing.

Analysis using Edwards III's policy implementation framework reveals that all four dimensions of implementation face significant challenges. In terms of communication, coordination among government agencies, field officers, and the community remains inconsistent, resulting in low public awareness and understanding of waste separation and management practices. From the resource perspective, limited budgets, a shortage of trained personnel, suboptimal transportation fleets, and inadequate processing facilities constitute major barriers to policy implementation. Furthermore, bureaucratic fragmentation and the absence of comprehensive standard operating procedures weaken coordination among implementing institutions. Although the government demonstrates awareness of waste-related issues, implementation at the operational level remains routine and reactive, lacking adaptive and innovative approaches.

A key finding of this study is the emergence of community-based innovation as a compensatory mechanism for institutional limitations. Formal innovation from the Environmental Agency remains limited and tends to be reactive; however, local communities have developed adaptive innovations that enhance waste management performance. In Brang Biji Village, for example, community organizations successfully initiated incentive-based Waste Bank programs and collaborative waste separation campaigns that have increased public participation compared to conventional government programs. These innovations have evolved through continuous experimentation, adaptation to local contexts, and collective learning, aligning with the innovation management cycle proposed by Tidd and Bessant, namely searching, selecting, implementing, and learning. This finding suggests that community-based innovation can serve as an alternative solution to improve policy implementation effectiveness amid limited government capacity.

Overall, waste management performance in Sumbawa Regency remains relatively low in terms of effectiveness, efficiency, service quality, and public value. Only a small proportion of waste is properly managed, while environmental impacts such as open dumping, illegal disposal, water pollution,

and environmental degradation continue to occur. However, comparative analysis across research locations shows that performance differences are not solely determined by the availability of financial and physical resources. Villages with strong community commitment and high innovation capacity tend to achieve better waste management outcomes despite facing similar structural constraints. These findings emphasize that the successful implementation of ISWM depends not only on regulations and resources but also on effective policy implementation, collaborative governance, and adaptive, community-driven innovation.

## **DISCUSSION**

The findings of this study demonstrate that the limited performance of waste management in Sumbawa Regency cannot be explained solely by inadequate financial and physical resources but rather by the interaction between weak policy implementation and the absence of systematic innovation within the Integrated Sustainable Waste Management (ISWM) framework. Consistent with Edwards III (1980), ineffective communication, insufficient resources, weak implementer commitment, and fragmented bureaucratic structures significantly constrain policy implementation. However, this study extends Edwards III's framework by revealing that adaptive community-based innovation can partially compensate for institutional deficiencies, thereby improving implementation outcomes even under severe resource constraints. This finding supports the argument of Wilson et al. (2013) and Marshall and Farahbakhsh (2013) that effective ISWM requires not only technical infrastructure but also strong governance, stakeholder collaboration, and active public participation. Furthermore, the emergence of locally driven innovations, such as incentive-based Waste Banks and community-led waste separation initiatives, confirms the innovation management cycle proposed by Tidd and Bessant (2009), whereby continuous searching, selecting, implementing, and learning generate context-specific solutions to complex public-sector problems. These findings also reinforce the collaborative governance perspective of Ansell and Gash (2008), which emphasizes that sustainable public service outcomes are more likely to be achieved when government institutions and community actors jointly participate in policy implementation. Therefore, this study contributes to the existing literature by proposing that, in regions with limited institutional capacity, community-driven adaptive innovation functions not merely as a supporting element but as a strategic compensatory mechanism that strengthens ISWM implementation and ultimately improves waste management performance.

## **CONCLUSIONS AND RECOMMENDATIONS**

### **Conclusions**

This study concludes that the implementation of Integrated Sustainable Waste Management (ISWM) in Sumbawa Regency has not yet achieved its intended objectives due to systemic weaknesses in policy implementation, institutional capacity, and governance. The findings indicate that deficiencies in communication, resources, implementer commitment, and bureaucratic coordination significantly hinder the effectiveness of waste management policies,

resulting in low levels of waste reduction, limited recycling activities, and continued reliance on open dumping practices. Nevertheless, the study identifies community-based innovation as a critical compensatory mechanism that enhances policy implementation under conditions of limited government capacity. Local initiatives, particularly those driven by community organizations, demonstrate that adaptive innovation, collaborative participation, and continuous learning can substantially improve waste management outcomes despite structural constraints. These findings contribute to the literature by extending the Integrated Sustainable Waste Management and policy implementation frameworks, demonstrating that community-driven innovation should be recognized not merely as a complementary activity but as a strategic component of sustainable waste governance in capacity-constrained local governments.

### **Recommendations**

Based on these findings, local governments should strengthen the implementation of Integrated Sustainable Waste Management by improving institutional coordination, increasing financial investment in the waste management sector, enhancing human resource capacity, and developing comprehensive standard operating procedures that integrate upstream, midstream, and downstream waste management activities. Greater emphasis should also be placed on strengthening community participation through the institutionalization of successful community-based innovations, including Waste Banks, incentive-based waste separation programs, and collaborative environmental initiatives. Future policies should promote multi-stakeholder collaboration involving government agencies, local communities, the private sector, and academic institutions to establish a more resilient and sustainable waste management system. Furthermore, future research is encouraged to adopt comparative and mixed-method approaches across multiple regions to examine the scalability of community-driven innovations and to quantify their long-term impacts on waste management performance, environmental sustainability, and public value creation.

### **ACKNOWLEDGEMENTS**

The authors would like to express their sincere gratitude to the Environmental Agency (Dinas Lingkungan Hidup) of Sumbawa Regency for providing access to research data, institutional support, and valuable information throughout the study. The authors also extend their appreciation to all research participants, including government officials, technical staff, waste management practitioners, community leaders, and local environmental organizations, for their willingness to share their experiences and insights. Special thanks are given to all colleagues and reviewers whose constructive comments and suggestions have significantly improved the quality of this manuscript. Finally, the authors gratefully acknowledge the support of their respective institutions for facilitating the successful completion of this research.

## DAFTAR PUSTAKA

- Ansell, C., & Gash, A. (2008). Collaborative governance in theory and practice. *Journal of Public Administration Research and Theory*, 18(4), 543–571. <https://doi.org/10.1093/jopart/mum032>
- Aparcana, S. (2017). Approaches to formalization of the informal waste sector into municipal solid waste management systems in low- and middle-income countries: Review of barriers and success factors. *Waste Management*, 61, 593–607. <https://doi.org/10.1016/j.wasman.2016.12.028>
- Behn, R. D. (2003). Why measure performance? Different purposes require different measures. *Public Administration Review*, 63(5), 586–606. <https://doi.org/10.1111/1540-6210.00322>
- Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Sage Publications.
- De Vries, H., Bekkers, V., & Tummers, L. (2016). Innovation in the public sector: A systematic review and future research agenda. *Public Administration*, 94(1), 146–166. <https://doi.org/10.1111/padm.12209>
- Edwards III, G. C. (1980). *Implementing public policy*. Congressional Quarterly Press.
- Ghisellini, P., Cialani, C., & Ulgiati, S. (2016). A review on circular economy: The expected transition to a balanced interplay of environmental and economic systems. *Journal of Cleaner Production*, 114, 11–32. <https://doi.org/10.1016/j.jclepro.2015.09.007>
- Government of Indonesia. (2008). *Law of the Republic of Indonesia Number 18 of 2008 concerning Waste Management*. Government of Indonesia.
- Grindle, M. S. (1980). *Politics and policy implementation in the Third World*. Princeton University Press.
- Guerrero, L. A., Maas, G., & Hogland, W. (2013). Solid waste management challenges for cities in developing countries. *Waste Management*, 33(1), 220–232. <https://doi.org/10.1016/j.wasman.2012.09.008>
- Hartley, J. (2005). Innovation in governance and public services: Past and present. *Public Money & Management*, 25(1), 27–34. <https://doi.org/10.1111/j.1467-9302.2005.00447.x>
- Hill, M., & Hupe, P. (2014). *Implementing public policy: An introduction to the study of operational governance* (3rd ed.). Sage Publications.

- Intergovernmental Panel on Climate Change. (2022). *Climate change 2022: Mitigation of climate change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press.
- Kaplan, R. S., & Norton, D. P. (1996). *The balanced scorecard: Translating strategy into action*. Harvard Business School Press.
- Kaza, S., Yao, L., Bhada-Tata, P., & Van Woerden, F. (2018). *What a waste 2.0: A global snapshot of solid waste management to 2050*. World Bank.
- Kirchherr, J., Reike, D., & Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation and Recycling*, 127, 221–232. <https://doi.org/10.1016/j.resconrec.2017.09.005>
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Sage Publications.
- Marshall, R. E., & Farahbakhsh, K. (2013). Systems approaches to integrated solid waste management in developing countries. *Waste Management*, 33(4), 988–1003. <https://doi.org/10.1016/j.wasman.2012.12.023>
- Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). *Qualitative data analysis: A methods sourcebook* (3rd ed.). Sage Publications.
- Moore, M. H. (1995). *Creating public value: Strategic management in government*. Harvard University Press.
- Mulgan, G., & Albury, D. (2003). *Innovation in the public sector*. Cabinet Office Strategy Unit.
- OECD. (2017). *The OECD innovation strategy 2015: An agenda for policy action*. OECD Publishing.
- Organisation for Economic Co-operation and Development, & Eurostat. (2018). *Oslo manual 2018: Guidelines for collecting, reporting and using data on innovation* (4th ed.). OECD Publishing. <https://doi.org/10.1787/9789264304604-en>
- Patton, M. Q. (2015). *Qualitative research & evaluation methods* (4th ed.). Sage Publications.
- Pollitt, C., & Bouckaert, G. (2017). *Public management reform: A comparative analysis – Into the age of austerity* (4th ed.). Oxford University Press.
- Sabatier, P. A., & Mazmanian, D. A. (1980). The implementation of public policy: A framework of analysis. *Policy Studies Journal*, 8(4), 538–560.
- Tidd, J., & Bessant, J. (2009). *Managing innovation: Integrating technological, market and organizational change* (4th ed.). John Wiley & Sons.
- United Nations. (2015). *Transforming our world: The 2030 Agenda for Sustainable Development*. United Nations.
- United Nations Environment Programme. (2024). *Global waste management outlook 2024: Beyond an age of waste – Turning rubbish into a resource*. United Nations Environment Programme.
- Van de Klundert, A., & Anschütz, J. (2001). *Integrated sustainable waste management: The concept – Tools for decision-makers*. WASTE.
- Van Meter, D. S., & Van Horn, C. E. (1975). The policy implementation process: A conceptual framework. *Administration & Society*, 6(4), 445–488. <https://doi.org/10.1177/009539977500600404>

- Wilson, D. C., Rodic, L., Modak, P., Soos, R., Carpintero, A., Velis, C., Iyer, M., & Simonett, O. (2015). *Global waste management outlook*. United Nations Environment Programme.
- Wilson, D. C., Velis, C., & Cheeseman, C. (2013). Role of informal sector recycling in waste management in developing countries. *Habitat International*, 30(4), 797–808.
- Winter, S. C. (2003). Implementation perspectives: Status and reconsideration. In B. G. Peters & J. Pierre (Eds.), *Handbook of public administration* (pp. 212–222). Sage Publications.
- Yin, R. K. (2014). *Case study research: Design and methods* (5th ed.). Sage Publications.