JPPIPA 11(8) (2025)

Jurnal Penelitian Pendidikan IPA

http://jppipa.unram.ac.id/index.php/jppipa/index

Government 4.0 in Waste: Building a Clean Tech Ecosystem for a Sustainable Future

Dety Yunita Sulanjari[1], Djohar[1]

[1] Universitas Sawerigading, Makasar, Indonesia.

Received: May 18, 2025
Revised: July 16, 2025
Accepted: August 25, 2025
Published: August 31, 2025

Corresponding Author:
Dety Yunita Sulanjari
detty.ys25@gmail.com

DOI: 10.29303/jppipa.v11i8.12191

Abstract: This study evaluates the increase in waste in the city of Makassar. Makassar, as the economic heart and urban center of eastern Indonesia, faces an unavoidable reality: a massive increase in waste volume. Every day, thousands of tons of waste are generated from households, markets, offices, and shopping centers. This is a direct consequence of rapid population growth, urbanization, and changes in the consumerist lifestyles of its residents. In the past, waste was dominated by easily biodegradable organic materials. However, today, the waste pile is dominated by single-use plastics, food and beverage packaging, and various other inorganic waste that takes hundreds of years to decompose in nature. This study used mixed methods, using quantitative methods to calculate waste generation and understand public perceptions, and qualitative methods to analyze the condition of natural objects. The results highlight the important role of local governments in reducing the potential for waste pollution and raising public awareness. Strict implementation of waste management policies, the provision of dedicated waste bins, and ongoing educational campaigns are needed. Outreach, training, and collaboration with the private sector and NGOs can ensure proper waste management, thereby reducing the potential for environmental pollution and protecting public health.

Keywords: Waste; Waste management policies; Waste volume

Introduction

As one of the largest metropolitan cities in eastern Indonesia, Makassar faces complex challenges related to waste management. High population growth and economic activity are inherently correlated with increasing volumes of domestic and non-domestic waste (Blagoeva et al., 2023; Ampong et al., 2024). In this context, the role of local government is crucial and irreplaceable in ensuring effective, sustainable, and environmentally sound waste management (Salvador & Sancho, 2021). Without strong intervention and leadership from local government, the potential for waste accumulation, environmental pollution (Landells et al., 2025; Gebrekidan et al., 2024), and negative impacts on public health will pose a serious threat to the sustainability of Makassar. The local government serves not only as a regulator but also as a facilitator and the primary driving force in every aspect of waste management (Wikurendra et al., 2024; Abdulai et al., 2024). From the formulation of strategic policies to the implementation of operational programs in the field (Mousa et al., 2024; Tawse & Tabesh, 2021; Gandrita, 2023), the entire waste management chain is under the coordination and supervision of the city government (Rittl et al., 2025; Tan et al., 2021). This responsibility includes providing adequate infrastructure, developing efficient collection and transportation systems, and public education to encourage active community participation (Jelti et al., 2023; Krishnan et al., 2025). Therefore, the success of waste management in Makassar depends heavily on the commitment, capacity, and innovation demonstrated by the local

How to Cite:
Sulanjari, D. Y., & Djohar. (2025). Government 4.0 in Waste: Building a Clean Tech Ecosystem for a Sustainable Future. *Jurnal Penelitian Pendidikan IPA*, *11*(8), 230–236. https://doi.org/10.29303/jppipa.v11i8.12191

government in addressing this pressing environmental issue (Mutambik et al., 2023).

This waste problem has a series of serious negative impacts on Makassar (Maskun et al., 2020; Sipato et al., 2021): Polluted Environment: Pollution of land, water (especially rivers and canals) (Edo et al., 2024; Anh et al., 2023; Akhtar et al., 2021), and air due to illegal waste burning or methane gas from landfills; Poisoned Public Health: Waste becomes a breeding ground for diseases and vectors such as rats and flies, increasing the risk of diarrhea, dengue fever, and Acute Respiratory Infections (ARI); Flooding: Piles of waste that clog drains are a major cause of flooding during the rainy season, especially in densely populated areas; Economic Losses: High operational costs for waste transportation and management, as well as the potential loss of economic value from recycled materials; Poor City Image: Piles of waste in various corners of the city damage the aesthetics and reduce Makassar's attractiveness as a tourist or investment destination.

Needed Solution: Shared Responsibility Solving the waste problem in Makassar requires a comprehensive and collaborative approach. This is not solely the responsibility of the city government, but also the responsibility of every individual, community, and the private sector. Efforts that need to be continuously promoted include: Raising Awareness and Education: Massive campaigns on the importance of the 3Rs (Reduce, Reuse, Recycle) and waste segregation at source; Developing Modern Infrastructure: Investing in sanitary landfills, recycling facilities, and waste-to-energy processing; Strict Law Enforcement: Implementing sanctions for waste regulation violators to create a deterrent effect; Innovation and Technology: Utilizing technology to monitor waste volume, optimize transportation routes, and process waste efficiently; Community Empowerment: Supporting and developing the role of waste banks and environmental activist groups. The waste problem in Makassar is a major challenge, but not without solutions. With a strong commitment from the government and active participation from all residents, Makassar has the potential to become a clean, healthy, and sustainable city.

This research focuses on the potential for waste pollution in Makassar with the aim of developing a sustainable strategy for managing mask waste. This strategy can serve as an educational tool for the public and provide input for the local government.

Method

This research used a quantitative and qualitative approach (mixed methods). Quantitative methods were used to calculate waste accumulation and understand public perceptions, while qualitative methods were used to analyze the condition of natural objects. Quantitative methods were used to calculate waste accumulation and understand public perceptions and roles. Qualitative methods are based on the philosophy of postpositivity, which is applied to natural objects. The researcher is the key instrument, data collection techniques are triangulated, data analysis is inductive, and research results emphasize meaning rather than generalization.

Population and Sample

The population of this research was the community, local government, and waste in the Makassar area. The sample size was 120 respondents.

Research Variables

The variables in this study are the role of local government in providing infrastructure and waste management, as well as public perceptions and attitudes toward waste management.

Research Data

The data used in this study are primary data with nominal and ordinal scales. This data was obtained through interviews with a number of questions related to the research topic.

Research Analysis Method

The analytical method in this study is descriptive statistical analysis, with data presented in tables to answer the hypotheses. The data analysis technique used to process the interview data is qualitative descriptive analysis, which is a data processing technique carried out by grouping information from the interview data. In-depth interview questions were asked to informants to obtain more details regarding the provision of infrastructure and the implementation of waste management. Assessments were given descriptively based on the interview results.

Results and Discussion

The Central Role of Regional Governments in Waste Management

Legally, the foundation for waste management in Indonesia is very strong, regulated by Law Number 18 of 2008 concerning Waste Management. This law mandates that waste management must be carried out systematically, comprehensively, and sustainably, encompassing waste reduction and waste management efforts. Furthermore, this law explicitly defines the duties and responsibilities of regional governments in managing waste within their respective jurisdictions. With a clear legal basis, regional governments then formulate national and provincial policies on waste

management. These policies aim to reduce and manage waste from its source, as emphasized by Tobin et al. (2022) and Hardi et al. (2024). Therefore, it is clear that the role of regional governments is vital and strategic in realizing effective and sustainable waste management in each region.

Table 1. Descriptive Statistics Results of the Role of Local Government

Variables	Indicator	Mean	Std. Deviation
The role of local government	Regency/city governments record waste collection from the environment.	2.90	0.49
	Regional governments summarize data on the generation of disposable face masks from households.	2.55	0.89
	Regional governments report waste accumulation from households and the environment to the Ministry of Environment and Forestry.	2.68	1.20
	Suboptimal implementation of local government waste management	3.66	0.60
	Lack of development of waste recycling facilities by local governments.	1.80	0.67
	Not yet collaborating with formal and informal community leaders to raise public awareness of waste management	3.90	0.40

It appears that the Makassar regional government's role in waste management at the household and neighborhood levels is still minimal. This is evident in the suboptimal management of waste by the local government, the lack of recycling facilities for household waste, and the lack of effective public awareness campaigns regarding waste management procedures. This situation demonstrates that the community still needs comprehensive education on proper waste management. Interviews with sub-district heads revealed a lack of active outreach and a lack of facilities, particularly garbage trucks, which often have to be rented when needed. Furthermore, there is a lack of training and personal protective equipment for garbage collectors. Waste sorting facilities at the Final Disposal Site (TPA) are also inadequate, relying on the community to sort waste before it enters the landfill (Widiyanto et al., 2023).

The waste management process by the Environment and Forestry Agency (DLHK) involves transporting other household waste to the landfill for final processing (Qomariyah & Hamid, 2023; Simangunsong & Fajarwati, 2018; Ferdinan et al., 2022), indicating that the hypothesis in this study, which states that the role of local government negatively influences the potential for waste pollution, is accepted. Increasing the role of local government in managing household waste is expected to reduce the potential for pollution (Lane et al., 2024; Willis et al., 2022). From the community's perspective, there are indications that attitudes are influenced by the minimal role of local government in socialization and supporting facilities for waste management. Interviews with community leaders, such as the sub-district head, sub-district secretary, and head of the waste bank, indicate their support for collaborating with the local government in socializing waste management. The head of the Makassar waste bank is also ready to support waste collection programs and community outreach.

Thus, the role of local government has a positive influence on community attitudes toward waste management, in line with the hypothesis in this study. Committed community leaders can be agents of change in increasing awareness and taking concrete action in managing disposable mask waste. Waste management in Makassar City is a complex challenge that requires an active and comprehensive role from the local government. As a metropolitan city with high population growth and economic activity, Makassar generates a significant volume of waste daily. In this context, the local government plays a central role, not only as a regulator, but also as a facilitator, infrastructure provider, and educator.

Legal Basis and Responsibilities

Legally, waste management in Indonesia is firmly regulated by Law Number 18 of 2008 concerning Waste Management. This law explicitly mandates that waste management must be implemented systematically, comprehensively, and sustainably, encompassing waste reduction and waste management efforts. Furthermore, this law establishes the duties and responsibilities of local governments in managing waste within their respective jurisdictions (Ivanova & Lisina, 2023; Jerin et al., 2022). Based on this legal basis, the Makassar local government formulates local policies tailored to the city's conditions, as reflected in national and provincial policies regarding waste management at source, as emphasized by Jati (2013). Therefore, it is clear that the role of local government is vital and strategic in realizing effective waste management in Makassar.

Aspects of the Role of Local Government

The role of local government in waste management in Makassar can be described through several key aspects:

Policy and Regulation Formulation

The local government is responsible for formulating and enforcing Regional Regulations (Perda) and technical policies related to waste management. This includes rules regarding waste fees, waste sorting systems at source, and sanctions for violators (Hartl & Hofmann, 2024). These regulations serve as the legal framework that binds all stakeholders to participate in responsible waste management.

Provision of Infrastructure and Facilities

Providing and maintaining adequate waste management infrastructure is a primary responsibility of local government (Maharani et al., 2019). This includes: Final Disposal Sites (TPA): Local governments are responsible for managing TPAs, including efforts to upgrade methods from open dumping to sanitary landfills or other more environmentally friendly technologies to extend the TPA's lifespan; Waste Transport Fleet: Procurement and maintenance of garbage trucks and heavy equipment for TPA operations; Temporary Shelters (TPS): Providing adequate and well-maintained TPS at various strategic locations; Recycling and Processing Facilities: Supporting or building recycling, composting, or other waste processing facilities to reduce the volume of waste ending up in landfills (Ayilara et al., 2020).

Waste Collection and Transportation Services

Local governments, through relevant agencies, ensure that waste collection and transportation operations from residential areas, markets, and other public areas run efficiently and on schedule. This involves managing routes, schedules, and staffing.

Education, Outreach, and Community Empowerment

One crucial role is changing the public's paradigm and behavior towards waste. Local governments must actively undertake: Awareness Campaigns: Educating the public about the importance of reducing, sorting, and recycling waste (the 3Rs). Waste Bank Empowerment: Encouraging the establishment and activation of waste banks at the sub-district/neighborhood/community level as a forum for community participation in sorting and managing economically valuable waste (Muljaningsih et al., 2022; Ayilara et al., 2020). Training: Provide training to the community on techniques for processing organic waste into compost or utilizing inorganic waste.

Supervision and Law Enforcement

Local governments also act as supervisors to ensure all parties comply with applicable regulations (Berkel et al., 2022). This includes taking action against indiscriminate waste disposal or other violations to create a deterrent and discipline effect (Debrah et al., 2021; Abubakar et al., 2022).

Innovation and Collaboration

Local governments need to continuously seek innovations in waste management, such as implementing waste-to-energy technology or partnering with the private sector to invest in modern waste processing facilities. Collaboration with research institutions, universities, and NGOs is also crucial for developing more effective solutions (Harangozó & Zilahy, 2015; Abiddin et al., 2022).

Conclusion

Local governments need to strengthen their role in waste management through several key strategies. First, the provision of adequate facilities and effective outreach must be significantly improved. This means not only building infrastructure, but also ensuring that the public understands and utilizes it effectively. Furthermore, close collaboration with communities, the private sector, and non-governmental organizations (NGOs) is crucial to ensure smooth waste management and reduce the risk of environmental pollution. Local governments must also implement stricter and more detailed policies regarding waste management, supported by ongoing education about the importance of proper waste disposal and the negative impacts of indiscriminate dumping. With intensive and targeted outreach, it is hoped that public awareness and compliance with proper waste disposal will increase. Training and community empowerment in waste management, as well as synergy with the private sector and NGOs, will further strengthen these efforts. Ultimately, as facilitators and supervisors, local governments have a central role in ensuring effective waste management practices are implemented, reducing negative impacts on the environment and overall public health.

Acknowledgments

Thanks to all parties who have supported the implementation of this research. I hope this research can be useful.

Author Contributions

Conceptualization; methodology.; validation; formal analysis; investigation; resources; F. Y.; data curation: writing—original draft preparation; writing—review and editing.; visualization: A. B. All authors have read and agreed to the published version of the manuscript.

Funding
Researchers independently funded this research.

Conflicts of Interest
The authors declare no conflict of interest.

References

Abdulai, I. A., Fuseini, M. N., & File, D. J. M.-B. (2024). Making cities clean with collaborative governance of solid waste infrastructure in Ghana. *Cleaner Waste Systems*, *8*, 100150. https://doi.org/10.1016/j.clwas.2024.100150

Abiddin, N. Z., Ibrahim, I., & Abdul Aziz, S. A. (2022). Non-Governmental Organisations (NGOs) and Their Part towards Sustainable Community Development. *Sustainability*, *14*(8), 4386. https://doi.org/10.3390/su14084386

Abubakar, I. R., Maniruzzaman, K. M., Dano, U. L., AlShihri, F. S., AlShammari, M. S., Ahmed, S. M. S., Al-Gehlani, W. A. G., & Alrawaf, T. I. (2022). Environmental Sustainability Impacts of Solid Waste Management Practices in the Global South. *International Journal of Environmental Research and Public Health*, *19*(19), 12717. https://doi.org/10.3390/ijerph191912717

Akhtar, N., Syakir Ishak, M. I., Bhawani, S. A., & Umar, K. (2021). Various Natural and Anthropogenic Factors Responsible for Water Quality Degradation: A Review. *Water*, *13*(19), 2660. https://doi.org/10.3390/w13192660

Ampong, R. O., Miezah, K., Banunle, A., Amuah, E. E. Y., & Amoah, E. G. (2024). Comparative analysis of the effectiveness and efficiency of formal and informal waste collectors in urban waste management system. *Heliyon*, *10*(20), e39017. https://doi.org/10.1016/j.heliyon.2024.e39017

Anh, N. T., Can, L. D., Nhan, N. T., Schmalz, B., & Luu, T. L. (2023). Influences of key factors on river water quality in urban and rural areas: A review. *Case Studies in Chemical and Environmental Engineering*, *8*, 100424. https://doi.org/10.1016/j.cscee.2023.100424

Ayilara, M., Olanrewaju, O., Babalola, O., & Odeyemi, O. (2020). Waste Management through Composting: Challenges and Potentials. *Sustainability*, *12*(11), 4456. https://doi.org/10.3390/su12114456

Berkel, H., Estmann, C., & Rand, J. (2022). Local governance quality and law compliance: The case of Mozambican firms. *World Development*, *157*, 105942. https://doi.org/10.1016/j.worlddev.2022.105942

Blagoeva, N., Georgieva, V., & Dimova, D. (2023). Relationship between GDP and Municipal Waste: Regional Disparities and Implication for Waste Management Policies. *Sustainability*, *15*(21), 15193. https://doi.org/10.3390/su152115193

Debrah, J. K., Vidal, D. G., & Dinis, M. A. P. (2021). Raising Awareness on Solid Waste Management through Formal Education for Sustainability: A Developing Countries Evidence Review. *Recycling*, *6*(1), 6. https://doi.org/10.3390/recycling6010006

Edo, G. I., Itoje-akpokiniovo, L. O., Obasohan, P., Ikpekoro, V. O., Samuel, P. O., Jikah, A. N., Nosu, L. C., Ekokotu, H. A., Ugbune, U., Oghroro, E. E. A., Emakpor, O. L., Ainyanbhor, I. E., Mohammed, W. A.-S., Akpoghelie, P. O., Owheruo, J. O., & Agbo, J. J. (2024). Impact of environmental pollution from human activities on water, air quality and climate change. *Ecological Frontiers*, *44*(5), 874–889. https://doi.org/10.1016/j.ecofro.2024.02.014

Ferdinan, Utomo, S. W., Soesilo, T. E. B., & Herdiansyah, H. (2022). Household Waste Control Index towards Sustainable Waste Management: A Study in Bekasi City, Indonesia. *Sustainability*, *14*(21), 14403. https://doi.org/10.3390/su142114403

Gandrita, D. M. (2023). Improving Strategic Planning: The Crucial Role of Enhancing Relationships between Management Levels. *Administrative Sciences*, *13*(10), 211. https://doi.org/10.3390/admsci13100211

Gebrekidan, T. K., Weldemariam, N. G., Hidru, H. D., Gebremedhin, G. G., & Weldemariam, A. K. (2024). Impact of improper municipal solid waste management on fostering One Health approach in Ethiopia — challenges and opportunities: A systematic review. *Science in One Health*, *3*, 100081. https://doi.org/10.1016/j.soh.2024.100081

Harangozó, G., & Zilahy, G. (2015). Cooperation between business and non-governmental organizations to promote sustainable development. *Journal of Cleaner Production*, *89*, 18–31. https://doi.org/10.1016/j.jclepro.2014.10.092

Hardi, K. A., Senastri, Dr. N. M. J., & Wiryani, Dr. M. (2024). Environmental Law Enforcement Regulations Regarding Producer Obligations in Waste Management in Indonesia. *Journal of Law Theory and Law Enforcement*, 44–58. https://doi.org/10.56943/jlte.v3i1.497

Hartl, B., & Hofmann, E. (2024). To sort or not to sort? – Consumers' waste behavior in public. *Journal of Cleaner Production*, *475*, 143677. https://doi.org/10.1016/j.jclepro.2024.143677

Ivanova, S., & Lisina, N. (2023). Municipal and Industrial Urban Waste: Legal Aspects of Safe Management. *Laws*, *12*(3), 48. https://doi.org/10.3390/laws12030048

Jelti, F., Allouhi, A., & Tabet Aoul, K. A. (2023). Transition Paths towards a Sustainable Transportation System: A Literature Review. *Sustainability*, *15*(21), 15457. https://doi.org/10.3390/su152115457

Jerin, D. T., Sara, H. H., Radia, M. A., Hema, P. S., Hasan, S., Urme, S. A., Audia, C., Hasan, Md. T., & Quayyum, Z. (2022). An overview of progress towards implementation of solid waste management policies in Dhaka, Bangladesh. *Heliyon*, *8*(2), e08918. https://doi.org/10.1016/j.heliyon.2022.e08918

Krishnan, V. S., Solieman, H., Moslem, S., & Pilla, F. (2025). Inclusive sustainable transportation planning: A qualitative analysis involving diverse stakeholders perspectives. *Case Studies on Transport Policy*, *19*, 101393. https://doi.org/10.1016/j.cstp.2025.101393

Landells, E., Muurlink, O., Karunasena, G. G., Oakden, S., & Naweed, A. (2025). Stepping up to the plate: Leadership and local government waste managers opinions of household food waste interventions. *Waste Management*, *198*, 161–173. https://doi.org/10.1016/j.wasman.2025.02.054

Lane, R., Kronsell, A., Reynolds, D., Raven, R., & Lindsay, J. (2024). Role of local governments and households in low-waste city transitions. *Environmental Innovation and Societal Transitions*, *52*, 100879. https://doi.org/10.1016/j.eist.2024.100879

Maharani, A., Dewilda, Y., Darnas, Y., & Dewata, I. (2019). Community-based solid waste management planning in the Administrative Village of Surau Gadang, Padang City. *IOP Conference Series: Earth and Environmental Science*, *314*(1), 012017. https://doi.org/10.1088/1755-1315/314/1/012017

Maskun, Amirullah, N. A., Rachman, W. A., Kurniasi, N. F., & Assidiq, H. (2020). A thousand of waste problems in Makassar: The fire in landfill case. *IOP Conference Series: Earth and Environmental Science*, *575*(1), 012238. https://doi.org/10.1088/1755-1315/575/1/012238

Mousa, K. M., Ali, K. A. A., & Gurler, S. (2024). Strategic Planning and Organizational Performance: An Empirical Study on the Manufacturing Sector. *Sustainability*, *16*(15), 6690. https://doi.org/10.3390/su16156690

Muljaningsih, S., Indrawati, N. K., & Asrofi, D. A. N. (2022). Waste Management Policy: A Study of Malang Waste Bank in Implementing The Green Economy Concept. *IOP Conference Series: Earth and Environmental Science*, *1098*(1), 012036. https://doi.org/10.1088/1755-1315/1098/1/012036

Mutambik, I., Almuqrin, A., Alharbi, F., & Abusharhah, M. (2023). How to Encourage Public Engagement in Smart City Development—Learning from Saudi Arabia. *Land*, *12*(10), 1851. https://doi.org/10.3390/land12101851

Qomariyah, P., & Hamid, E. S. (2023). Community-based waste management: Best practice for waste management in Panggungharjo Village, Sewon District, Bantul Regency. *IOP Conference Series: Earth and Environmental Science*, *1180*(1), 012009. https://doi.org/10.1088/1755-1315/1180/1/012009

Rittl, L. G. F., Zaman, A., & De Oliveira, F. H. (2025). Digital Transformation in Waste Management: Disruptive Innovation and Digital Governance for Zero-Waste Cities in the Global South as Keys to Future Sustainable Development. *Sustainability*, *17*(4), 1608. https://doi.org/10.3390/su17041608

Salvador, M., & Sancho, D. (2021). The Role of Local Government in the Drive for Sustainable Development Public Policies. An Analytical Framework Based on Institutional Capacities. *Sustainability*, *13*(11), 5978. https://doi.org/10.3390/su13115978

Simangunsong, F., & Fajarwati, A. (2018). Strategy of Local Government in Household Waste Management in Jatinangor District Sumedang Regency West Java Province. *Open Journal of Social Sciences*, *06*(09), 63–87. https://doi.org/10.4236/jss.2018.69005

Sipato, W. Dg., Darlin, E. D., Mustari, K., & Kaimuddin. (2021). Policy analysis of the adaptation of Makassar city's government for climate change and global warming. *IOP Conference Series: Earth and Environmental Science*, *807*(2), 022037. https://doi.org/10.1088/1755-1315/807/2/022037

Tan, Z., Ren, Y., Han, J., & Chen, S. (2021). Evolving pattern and improvement path of China's solid waste management policies. *Chinese Journal of Population, Resources and Environment*, *19*(4), 358–368. https://doi.org/10.1016/j.cjpre.2022.01.009

Tawse, A., & Tabesh, P. (2021). Strategy implementation: A review and an introductory framework. *European Management Journal*, *39*(1), 22–33. https://doi.org/10.1016/j.emj.2020.09.005

Tobin, S., & Zaman, A. (2022). Regional Cooperation in Waste Management: Examining Australia's Experience with Inter-municipal Cooperative Partnerships. *Sustainability*, *14*(3), 1578. https://doi.org/10.3390/su14031578

Widiyanto, B., Aji Fathurakhaman, M., & Munadi. (2023). Calculation of Waste Generation and Composition in Tegal City as an Effort to Increase Waste Reduction. *IOP Conference Series: Earth and*

Environmental Science, *1147*(1), 012022. https://doi.org/10.1088/1755-1315/1147/1/012022

Wikurendra, E. A., Csonka, A., Nagy, I., & Nurika, G. (2024). Urbanization and Benefit of Integration Circular Economy into Waste Management in Indonesia: A Review. *Circular Economy and Sustainability*, *4*(2), 1219–1248. https://doi.org/10.1007/s43615-024-00346-w

Willis, K., Hardesty, B. D., Vince, J., & Wilcox, C. (2022). Local waste management successfully reduces coastal plastic pollution. *One Earth*, *5*(6), 666–676. https://doi.org/10.1016/j.oneear.2022.05.008