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Evaluating the Effectiveness of the Bandung–Kawasaki Sister City Program in Advancing Circular Economy and Empowering MSMEs in Urban Sustainability Contexts

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Abstract

This study analyzes the effectiveness of the Bandung–Kawasaki Sister City cooperation in promoting circular economy practices and empowering micro, small, and medium enterprises (MSMEs) in Bandung City, Indonesia. Previous studies have largely examined this partnership through the lens of city diplomacy and Sustainable Development Goals (SDGs) norm diffusion, while empirical evidence on its economic impacts at the local level remains limited. This research addresses that gap by focusing on the micro-economic outcomes of the Bandung–Kawasaki Green Project. Employing a qualitative instrumental case study approach, data were collected through in-depth interviews, document analysis, and field observations involving local government officials, academics, MSME actors, school communities, and international cooperation facilitators. The findings indicate that the program has produced early-stage economic impacts, mainly in the form of risk reduction, potential cost efficiency, and the creation of small-scale economic value through waste management practices. Circular economy principles were implemented through pilot projects targeting tofu producers, laundry businesses, and environmental education initiatives in primary schools. Despite these positive outcomes, the program's coverage remains limited, reaching only a small proportion of MSMEs. Key constraints include budget limitations, the absence of a structured monitoring and evaluation system, weak integration into local development planning, and limited local ownership. The study concludes that while the Bandung–Kawasaki Sister City cooperation demonstrates the potential of city diplomacy to support circular economy adoption and local

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economic empowerment, its long-term effectiveness depends on institutional integration, policy scalability, and sustained stakeholder collaboration.
Keywords: Sister City Cooperation; Circular Economy; MSMEs; City Diplomacy; Sustainable Development Goals; Local Economic Empowerment

1. Introduction

Sustainable development has become a fundamental framework in the formulation of global and national policies following the adoption of the 2030 Agenda by the United Nations (UN). This agenda outlines 17 Sustainable Development Goals (SDGs) that integrate economic, social, and environmental dimensions as the core foundation of long-term development (United Nations, 2015). Among these goals, SDG 8 on decent work and economic growth and SDG 12 on responsible consumption and production have become key references in the development of new, more inclusive, and sustainable economic approaches, including the circular economy.

The circular economy is an economic development model that emphasizes closed-loop production and consumption systems by minimizing waste, reusing resources, and creating added value from waste materials ((Kirchherr et al., 2017)This model contrasts with the dominant linear economic system, which tends to be exploitative and generates significant ecological burdens. In the context of developing countries such as Indonesia, the adoption of a circular economy presents a strategic opportunity to reduce environmental impacts while simultaneously promoting business efficiency, innovation, and local economic empowerment, particularly within the micro, small, and medium enterprise (MSME) sector ((Ellen MacArthur Foundation, 2019)In line with this approach, local governments in Indonesia have begun to explore various forms of international cooperation as a strategy to accelerate the transition toward sustainable development. One prominent form of such cooperation is Sister City collaboration, which refers to cross-national partnerships between cities aimed at fostering cooperation in cultural, educational, technological, and economic fields. As one of Indonesia's metropolitan cities, Bandung has established a Sister City partnership with Kawasaki City, Japan, since 2014. This cooperation is known as the Bandung–Kawasaki Green Project (BKG Project) (Yuliandri et al., 2025).

Kawasaki City is internationally recognized as a model city in environmentally friendly and circular economy–based waste management. It has successfully transformed its image from a heavily polluting industrial city into an efficient and sustainable green city ((Nakamura & Kagawa, 2016). Through this partnership, Bandung City has received support in the form of knowledge and technology transfer related to solid and liquid waste management, environmental education, and capacity building for both business actors and local government officials. The focus of this cooperation has gradually expanded to encompass environmental and local economic sectors, particularly through interventions targeting household industries and MSMEs that generate domestic waste, such as tofu production in Cibuntu and laundry businesses across Bandung. In addition, the education sector has become a key locus of implementation through the integration of environmental education and waste management practices in primary schools, such as SDN 079 Kopo Pajagalan (Asep & Christine, 2025). These micro-scale interventions indicate a strategic direction of the Sister City cooperation toward a development model that simultaneously integrates social, environmental, and economic dimensions.

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According to Ms. Fiziartita, Head of the Environmental Pollution Rehabilitation and Prevention Division of the Bandung City Environmental Agency, the Bandung–Kawasaki Sister City program consists of two main components: domestic waste management and river management. The waste management cooperation covers various aspects, including the development of appropriate waste-processing technologies, waste separation at the source, and the implementation of small- and large-scale waste treatment systems. Meanwhile, the river management cooperation focuses on river revitalization, including efforts to improve water quality and manage wastewater.

Despite its considerable potential, the effectiveness of this program in promoting local economic empowerment and facilitating a transition toward a circular economy remains subject to debate. Several challenges—such as budget constraints, limited monitoring and evaluation (M&E) mechanisms, low participation among MSME actors, and the lack of integration into the regional medium-term development plan (RPJMD)—have hindered the expansion of its impact (Widyarini, 2025; Mugia, 2025). These conditions highlight the need for a comprehensive academic assessment to evaluate whether the Bandung–Kawasaki Sister City cooperation has truly been effective in generating sustainable and systemic local economic transformation. Previous studies on the Bandung–Kawasaki Sister City cooperation have largely framed the collaboration within the context of city diplomacy, sustainable development norm adoption, and the SDGs as an international regime. However, these studies have not sufficiently examined how such cooperation translates into concrete economic impacts at the community and MSME levels. Consequently, a research gap remains regarding the extent to which Sister City cooperation can generate sustainable micro-economic benefits, particularly within a community-based circular economy framework.(Shabrina & Eristya, 2025)

This study seeks to address this gap by focusing on the economic dimension of the Sister City cooperation between Bandung City and Kawasaki City. The primary objective of this research is to analyze the effectiveness of the cooperation program in promoting circular economy implementation and MSME empowerment as part of the strategy to achieve the SDGs. Employing a qualitative case study approach and triangulating data from regional planning agencies, academics, schools, business actors, and the foreign cooperation division of Bandung City, this study is expected to contribute both theoretically and practically to the development of green economy–based city cooperation models in Indonesia.

2. Research methods

This study employs a qualitative research approach using an instrumental case study design. This approach was selected because it allows the researcher to explore in depth and within context how the Bandung–Kawasaki Sister City cooperation is implemented in local economic practices, particularly in promoting circular economy principles and empowering micro, small, and medium enterprises (MSMEs). According to (Yin, 2018)qualitative case studies are appropriate for examining contemporary phenomena within real-life contexts when the boundaries between the phenomenon and its context are not clearly defined. In this study, the Sister City cooperation program represents a complex phenomenon involving

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multiple actors, institutions, and sectors within the framework of sustainable economic development.

The research was conducted in Bandung City, West Java, Indonesia, as the primary location for the implementation of the Sister City program with Kawasaki City, Japan. This site was selected due to Bandung's role as a hub for various international cooperation initiatives, particularly in the fields of environmental management and circular economy.
The research participants consisted of stakeholders who were directly or indirectly involved in the implementation of the program,

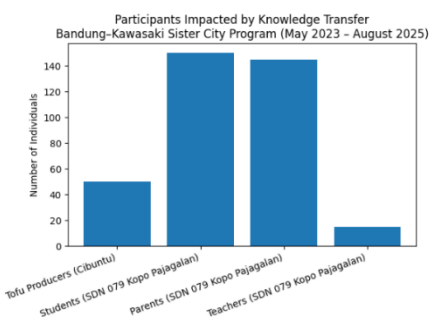
3. Results and Discussion

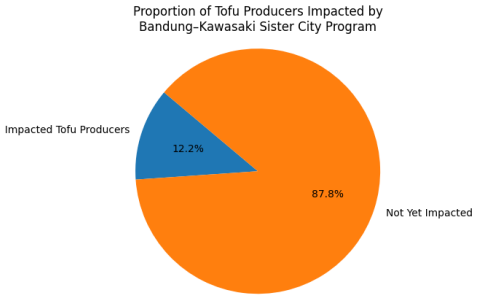
Results

Implementation of the Sister City Program in the Local Economic Sector

Based on interviews with representatives of the Regional Development Planning Agency (Bapperida), academics, cooperation facilitators, and the Head of the Environmental Pollution Rehabilitation and Prevention Division of the Bandung City Environmental Agency (DLH), it was found that the implementation of the Bandung–Kawasaki Sister City program is currently focused on knowledge transfer related to domestic and small-scale industrial waste management. The primary target sectors include tofu production and laundry businesses, which are considered major contributors to liquid waste in Bandung City. In addition, knowledge transfer activities have also been conducted for primary school students at SDN 079 Kopo Pajagalan.
The activities implemented under the program include technical training for business actors, the provision of simple wastewater treatment installations (IPAL), and community education through schools. The main pilot locations are concentrated in the Cibuntu tofu production cluster and several laundry business sites across Bandung City.
These findings are consistent with the principles of the circular economy, in which waste is processed and reused as value-added products, such as liquid fertilizer or recycled water. Such practices directly reduce environmental pollution while simultaneously improving the operational cost efficiency of business actors.
However, the scale of program implementation remains limited to pilot projects and has not yet expanded systematically to other areas. This indicates that the program is still in the early stage of innovation diffusion and has not yet achieved widespread adoption among MSMEs in Bandung.
As illustrated in the figure below, the chart presents the number of community members who have been impacted by the Sister City program between May 2023 and August 2025.

Based on the implementation data of the Bandung–Kawasaki Sister City program, it is evident that knowledge transfer and environmentally friendly technologies have reached several key target groups. The bar chart indicates that 50 tofu producers in the Cibuntu area have been





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involved in the program, out of an estimated total of 409 tofu producers operating in the cluster. This means that only approximately 12.2% of tofu producers have directly benefited from training and technical assistance related to liquid waste management

. Table 1. Coverage of the Bandung–Kawasaki Sister City Program

Target Group	Number Involved	Total Population	Percentage
Tofu Producers	50	409	12.2%
Primary School Students	137	–	–
Parents	90	–	–
Facilitators	15	–	–

In addition to the tofu MSME sector, interventions were also implemented in the education sector. At SDN 079 Kopo Pajagalan, a total of 150 students and 145 parents participated in environmental education activities, particularly those related to used cooking oil management and household waste management. Furthermore, 15 teachers at the school were actively involved as agents of change in the development of an environmentally based healthy school program. These efforts indicate a relatively comprehensive approach to building cross-generational awareness, involving students, parents, and educators. Meanwhile, the pie chart illustrating the proportion of tofu producers affected by the program shows that the majority of business actors—approximately 87.8% (359 producers)—have not yet been reached by the intervention. This finding underscores that, despite the program's implementation, its impact remains limited to a small segment of the target population. Beyond the groups captured in the charts, laundry business operators have also received initial socialization activities related to waste management. However, the exact number of participants in these activities was not formally recorded. Moreover, interventions in the laundry sector remain at an early socialization stage, and therefore, tangible behavioral changes in waste management practices cannot yet be observed in a significant manner.

Overall, the data indicate that the Sister City program has successfully initiated behavioral change within school communities and among a portion of MSME actors. Nevertheless, broader efforts are required to reach the majority of tofu producers and laundry businesses. Consequently, a collective impact on waste pollution reduction in Bandung City is likely to materialize only if program coverage is expanded and accompanied by more intensive and sustained assistance.

Micro-Economic Impacts on MSMEs and Communities

The economic effectiveness of the program is reflected in two main aspects:

a. Cost Efficiency and Risk Reduction

Business actors in the tofu and laundry sectors who participated in the program reported reduced risks of environmental pollution, environmental penalties, and social pressure as a result of adopting waste treatment technologies. In addition, the potential reuse of waste materials into products such as fertilizer or soap has opened new economic opportunities.

"The impact is noticeable, especially because of the technical education. We now understand how the wastewater treatment system works and are aware of the risks if waste is not properly treated." (Interviewee: Laundry MSME representative)

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b. School Community–Based Empowerment

At SDN 079 Kopo Pajagalan, the BKG (Bandung–Kawasaki Green Project) successfully fostered behavioral change among school communities and parents. One tangible outcome of the program was the practice of collecting used cooking oil by students' parents, which was subsequently sold to a waste bank. The proceeds from these sales were used to support household needs or to contribute to students' school savings.

This finding demonstrates that the economic value of waste can be directly realized by local communities, particularly when supported by environmental education and a structured collection system. Such outcomes reinforce the program's relevance to SDG 8 (Decent Work and Economic Growth) and SDG 12 (Responsible Consumption and Production), which emphasize economic inclusion and sustainable resource management

Challenges and Barriers to Program Implementation

Although the program demonstrates considerable potential, several structural and operational barriers have limited its effectiveness:

- **Budget Constraints and Limited Local Human Resources**: Program implementation has not been expanded across all areas due to budget limitations and a shortage of trained technical personnel.

"The equipment from Japan is already available, but it cannot be used because there is no trained operator."
(Ira, International Cooperation Division)

- **Lack of a Monitoring and Evaluation (M&E) System**: There are no clearly defined economic or environmental performance indicators. Program evaluation is conducted informally, and progress documentation has not been digitized. This condition contradicts governance principles within the collaborative governance framework (Ansell & Gash, 2008).
- **Lack of Integration into RPJMD or Sectoral Strategic Plans**: The cooperation program is not explicitly incorporated into the strategic planning documents of the Environmental Agency, MSME Agency, or Education Agency. As a result, the program is vulnerable to discontinuation following changes in political leadership.
- **Limited Local Ownership**: Many business actors and community members still perceive the program as an initiative driven by external actors or "Japanese donors," rather than as an internally driven local need. This perception undermines program sustainability once external technical assistance concludes.

Taken together, these barriers indicate that program success depends not only on knowledge transfer but also on cross-sectoral policy integration, sustained budgetary support, and the strengthening of local ownership. Without more structural policy interventions, the program risks remaining at the pilot stage without achieving broader economic impacts.

Discussion

This study demonstrates that the Bandung–Kawasaki Sister City cooperation has initiated the adoption of circular economy practices and generated early-stage micro-economic impacts within selected local communities and MSMEs in Bandung City. However,

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the findings also reveal that these impacts remain limited in scale and have not yet evolved into systemic or city-wide economic transformation. From the perspective of circular economy theory, the implementation of waste management practices in tofu production clusters, laundry businesses, and school communities reflects an initial transition from a linear to a more circular economic model. Consistent with Kirchherr et al. (2017), the early phase of circular economy adoption at the MSME level tends to emphasize waste reduction, reuse, and risk mitigation rather than immediate profit maximization. In this study, economic benefits were primarily observed in the form of reduced environmental risks, potential cost savings, and the creation of small-scale economic value from waste, rather than direct income growth. This finding aligns with previous research suggesting that in developing country contexts, circular economy initiatives often begin as efficiency- and compliance-driven interventions before generating measurable market-based returns.(Ulung et al., 2025)

From a local economic empowerment perspective, the program contributed positively to capacity building among MSME actors and community members. Training on wastewater treatment systems (IPAL), environmental education, and waste reuse practices enhanced participants' technical knowledge and awareness of environmental and economic risks. As argued by (Chambers, 1995) empowerment should be understood not only in terms of income generation but also as the expansion of capabilities and reduced vulnerability. In this sense, the Bandung–Kawasaki program can be interpreted as strengthening the foundational capacities of MSMEs and households, even though its economic impacts remain modest. The education-based interventions further illustrate the role of community-level empowerment in advancing circular economy principles. The involvement of students, parents, and teachers in used cooking oil collection and waste management activities indicates the emergence of cross-generational behavioral change. Such outcomes support the argument that community-based environmental education can function as an entry point for broader socio-economic transformation, particularly when linked to structured collection systems and local economic incentives. This finding reinforces the relevance of the program to SDG 8 (Decent Work and Economic Growth) and SDG 12 (Responsible Consumption and Production).

Despite these positive outcomes, the study identifies several governance-related challenges that constrain the program's effectiveness and scalability. Drawing on collaborative governance theory ((Ansell & Gash, 2008)), the absence of a formal monitoring and evaluation framework, weak integration into local development planning documents, and limited local ownership indicate an underdeveloped collaborative governance structure. While international knowledge transfer has been successfully initiated, joint decision-making, shared accountability, and institutionalized coordination across local agencies remain insufficient.

From a city diplomacy perspective, the Bandung–Kawasaki cooperation illustrates both the potential and the limitations of Sister City partnerships. As noted by (Acuto, 2013)city diplomacy can serve as a platform for addressing global challenges such as sustainability and climate change. However, this study shows that without strong local institutional anchoring, international partnerships risk remaining symbolic or confined to pilot projects. The limited

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program coverage—particularly among tofu producers and laundry businesses—highlights the gap between diplomatic commitments and localized economic outcomes.

Overall, the discussion suggests that the Bandung–Kawasaki Sister City program has functioned effectively as a pilot mechanism for introducing circular economy practices and raising environmental-economic awareness. Nevertheless, achieving broader and more sustainable economic impacts will require a transition from project-based interventions toward policy-integrated, scalable, and locally owned implementation models. Strengthening governance mechanisms, expanding stakeholder participation, and aligning the program with local development priorities are essential steps to transform early-stage impacts into long-term economic and environmental benefits.

4. Conclusion

This study aims to analyze the effectiveness of the Bandung–Kawasaki Sister City cooperation in promoting the implementation of a circular economy and local economic empowerment, particularly within the MSME sector in Bandung City. Based on the research findings and discussion, it can be concluded that the Bandung–Kawasaki Sister City cooperation has generated early-stage micro-economic impacts, but has not yet achieved a systemic scale.

At the implementation level, the cooperation program remains largely dominated by knowledge transfer activities, environmental education, and pilot waste management projects targeting the tofu industry, laundry businesses, and school communities. The application of circular economy principles is evident through wastewater treatment initiatives, the reuse of household waste, and behavioral changes in resource management practices. However, the overall program coverage remains limited, as reflected in the relatively small proportion of MSMEs directly involved compared to the total population of business actors.

In terms of economic impact, the benefits experienced by MSME actors and communities have not yet taken the form of significant income increases. Instead, the impacts are more closely associated with reduced environmental risks, potential cost savings, and the emergence of additional economic value derived from waste. These findings suggest that, at the local level, the circular economy initially functions as a mechanism for risk mitigation and operational efficiency before evolving into a new source of economic growth. The study also finds that the program's effectiveness is constrained by several structural and institutional factors, including budget limitations, the absence of a measurable monitoring and evaluation system, weak integration into local development planning documents, and limited local ownership.

As a result, program sustainability remains highly dependent on individual initiatives and external support, making it vulnerable to stagnation at the pilot project stage. From a theoretical perspective, these findings reinforce the argument that city diplomacy and Sister City cooperation can serve as strategic instruments for advancing the Sustainable Development Goals, particularly SDG 8, SDG 11, and SDG 12. However, without robust collaborative governance and integrated local policy support, such

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cooperation risks remaining normative and symbolic, rather than producing sustainable local economic transformation**.**

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5. Recommendations

Based on the conclusions above, this study proposes the following recommendations:

1. Policy Recommendations

The Bandung City Government should explicitly integrate the Bandung–Kawasaki Sister City cooperation program into regional development planning documents, such as the Regional Medium-Term Development Plan (RPJMD) and the strategic plans of relevant local government agencies. Such integration is essential to ensure program continuity across political leadership periods and to secure adequate budgetary and institutional support.

2. Strengthening Program Implementation

Program coverage should be expanded through an MSME cluster-based approach, particularly in industrial centers with similar waste characteristics. This approach would enable more efficient replication of circular economy technologies and practices, while also amplifying collective economic impacts at the local level.

3. Development of a Monitoring and Evaluation System

Local governments, in collaboration with academic partners, are encouraged to establish measurable program performance indicators encompassing both environmental and economic dimensions. Indicators such as the number of participating MSMEs, reductions in pollution loads, production cost efficiency, and the economic value of waste should be monitored regularly to objectively assess program effectiveness.

4. Enhancing Local Ownership and Stakeholder Participation

It is crucial to strengthen the role of MSME actors, local communities, and schools as primary actors in the program, rather than merely as beneficiaries. This can be achieved through sustained mentoring, green economic incentives, and the involvement of the private sector and local media to broaden program impact and visibility.

5. Recommendations for Future Research

Future studies are encouraged to employ quantitative or mixed-methods approaches to more precisely measure economic impacts, including cost–benefit analysis and the valuation of waste-derived economic benefits. In addition, comparative studies involving Sister City cooperation in other cities could provide broader insights into the success factors and limitations of similar programs.

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