

Promoting the Circular Economy Model in an Emerging City: Lessons Learned from the Da Nang-Yokohama Partnership on Solid Waste Management

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Abstract

By emphasizing the need for co-creative international cooperation, mutual learning and innovation between developed and emerging economies, this paper presents a case study on a city-to-city partnership between the cities of Da Nang, Viet Nam and Yokohama, Japan, focusing on development of collaborative actions on waste source segregation and recycling. It outlines a four-stage model for developing a circular economy; focusing on solid waste management and recycling policies along with economic development. It then discusses the case of Da Nang, which also faces typical challenges in transitional governance to develop waste management and recycling policies for a circular economy. At the same time, through the Yokohama case study, it highlights the motivations and drivers for promoting recycling as a policy that are in common with those of Da Nang. It discusses how the collaboration between Yokohama and Da Nang has encouraged a step-by-step improvement in overcoming challenges in transitional governance toward a circular economy. Lastly, it suggests a step-by-step approach for enhancing such cooperation through similar partnerships.

Key words: circular economy, Da Nang, international cooperation, policy, recycling, source separation, urban waste management, Yokohama

1. Introduction

Since 2015, international sustainability agreements with ambitious mid- and long-term objectives, such as the Paris Agreement, the Sustainable Development Goals (particularly SDG 12.3), and the Osaka Blue Ocean Vision, have been mainstreamed. To achieve these goals in global society, environmental impacts and unsustainable resource consumption must be drastically reduced. Realization of these ambitious goals, such as “net-zero” greenhouse gas emissions, halving food waste and its loss, and reducing new additions of plastic leakage into the ocean to zero by 2050, will not only require changes in consumer lifestyles, but also fundamental changes (transitions) in business models, infrastructure for service provision, and socioeconomic systems that support such businesses and infrastructure (Hotta *et al.*, 2021).

With the mainstreaming of its ambitious medium- and long-term goals, the field of sustainable development policy has shifted its emphasis from international agreements, negotiations and goal setting to implementing specific policies and model projects, as well as monitoring and evaluating their progress to achieve these goals (Hotta *et al.*, 2021).

On the other hand, emerging economies develop rapidly, and it is predicted that Association of South East Asia Nations (ASEAN) countries such as Indonesia, Vietnam and the Philippines will become the fourth, twelfth and ninth largest economies in terms of GDP, respectively, by 2050 (PwC, 2017). Rapidly growing urban lifestyles, impacts from the COVID pandemic and digitalization experienced by emerging Asian economies are producing significant changes in consumer behavior and lifestyles. (De' *et al.*, 2020; Gu *et al.*, 2021; Gary *et al.*, 2022; Liu *et al.*, 2021).

Given these circumstances, the actual realization and implementation of decarbonization and circular economy will be crucial for future sustainability. Future efforts to transition to a decarbonized, circular economy will rely heavily on the development of new business models, investments in infrastructure and changes in lifestyles. The significance of cities in emerging economies as locations for implementing these practices is growing. The role of international cooperation will no longer be a one-way transfer of technology and expertise from developed to developing countries.

This paper was prepared under the recognition that transitioning to a decarbonized, circular economy necessitates social experimentation, mutual learning between cities in developed and emerging countries, and “co-creative international cooperation,” which refers to a symbiotic process of mutual learning and innovation between the technical support provider and the recipient. We delve into a case study examining the insights gained from a city-to-city partnership between Da Nang, Vietnam and Yokohama, Japan. This partnership has aimed to promote a circular economy model focused on waste source segregation and recycling. In addition, we explore the distinct challenges faced by developing countries and the subsequent evolution of policy priorities. Concurrently, we evaluate the prerequisites and ongoing endeavors for establishing a sustainable waste management system and circular practices in Da Nang, the key city in central Vietnam. Drawing from these analyses, we suggest a step-by-step approach for further enhancing co-creative international cooperation through city-to-city partnerships based on these experiences.

2. Solid Waste Management and Recycling as a Policy: A Four-stage Model for Circular Economy Development

Mutual understanding is a crucial aspect of international cooperation (Fukuda-Parr *et al.*, 2002; JICA, 2003), which requires recognizing differences. For instance, while stakeholders may collaborate on urban waste management, their perspectives on the associated issues will vary based on their socioeconomic context and stage of policy development. This section examines the different development stages of urban solid waste management.

From a policy standpoint, the evolution of resource recovery and recycling in urban areas can be roughly categorized into four stages:

Stage 1: Market-dependent

Before recycling is promoted as public policy, resource recycling exists as an informal economic activity. During this stage, urban waste management and recycling are typically separate activities. Urban waste management primarily focuses on waste collection, transportation and

landfilling, especially in large cities. Efforts are directed towards improving collection rates within administrative districts and securing new disposal sites to ensure the remaining capacity of final disposal sites (Hotta, 2011; JICA Institute for International Cooperation, 2005).

On the other hand, as for resource recycling, in some cases organic wastes are composted with the involvement of the government (Sang-Arun, 2011). In most cases, however, the recovery and recycling of resources from waste are carried out as a valuable resource recovery activity. These activities consist of informal collection of valuable resources; waste picking activities at waste collection, transportation, accumulation, and disposal sites; small-scale sorting activities of valuable recyclables; and a network of resource recovery and conversion activities (Williams *et al.*, 2013; Wilson *et al.*, 2006). These activities are typically informal and small-scale on an individual basis. This phase pertains to the recycling of solid-waste-derived recyclable resources in numerous cities in developing countries.

Stage 2: Activities to Promote Separation and Recycling

Specifically, this stage involves collecting used paper and plastic waste separately, as well as promoting composting as a means of waste reduction. When market-based resource recycling is no longer sufficient to absorb a portion of recyclable resources due to rapid economic development, rapid growth in waste volume, and increased environmental awareness among residents, or when the adverse environmental and social impacts of informal recycling activities become prominent and visible to the society, recycling is usually promoted as a governmental policy intervention at the city level (Fujii, 2008). As a means of enhancing waste management, this phase involves promoting the collection of recyclable materials and hazardous wastes such as batteries and fluorescent lights separately from municipal waste (Chen *et al.*, 2017), aiming to reduce the amount of landfill disposal and pollution associated with waste management. This involves efforts to raise residents’ awareness of the waste problem and the necessity of source segregation (Rousta *et al.*, 2020; Cudjoe *et al.*, 2020). The introduction of take-back and recycling policies regarding specific recyclable resources and the licensing of recycling facilities begins (Shinkuma & Managi, 2010). At this stage, local governments consider resource recycling as part of their solid waste management administration.

Stage 3: National Policies to Promote Recycling

During this stage, the recycling of resources and development of businesses and industries involved in resource recycling are promoted as national initiatives. This stage involves developing recycling-related legislation and establishing a national recycling system, cost-sharing mechanisms and infrastructure development,

as seen in the Eco-Town program in Japan (Hotta, 2011; Hotta *et al.*, 2008). For example, Japan's Policy to Promote a Sound Material Cycle Society in the 2000s can be considered to have been at this stage (Hotta, 2013). Many developed European countries have also reached this stage.

Stage 4: Global Initiative on Climate Change, Plastic Pollution and Circular Economy

Transitioning to a circular economy and linking it with more global issues such as climate change and plastic pollution constitute the fourth stage. This stage aims to reduce consumption of natural resources by replacing them with renewable and recycled resources, and to develop businesses that are more decarbonized and circular (e.g., services and consumer goods that use fewer disposable containers). This is in response to Europe's advocacy for a circular economy and recent concerns about plastic pollution. It seems, however, that model projects have yet to be developed in developed countries, so demonstrating such models is essential (Hotta *et al.*, 2021).

The figure below illustrates the four stages described above. Importantly, a careful examination of feasibility and social impacts is required for shifting from informal resource recovery into policy-induced formalization of resource recovery. Rapid urbanization and economic development are occurring in developing countries, leading to higher incomes and consumption, which in turn increase waste volumes. Conversely, an increase in average income, i.e., the relative decline in income derived from informal resource recovery activities, causes informal resource recovery activities to stagnate (Amin, 2002). Therefore, participation of the public sector, including local governments, in recycling activities, described as the 2nd stage; or large-scale industrialization of recycling business by the private sector through national policy, described as the 3rd stage, are pursued. Consequently, the role of recycling performed by the informal sector is replaced systematically as governmental policy intervention at administrative expense. Therefore, it is necessary to consider the option

of collaborating with the informal sector (Williams *et al.*, 2013). At the same time, when there are concerns about environmental impact, pollution and human rights, it would be recommendable to consider the relationship between economic growth, policy intervention and market-dependent recycling.

Many developing countries are still stuck in a transitional phase between the first and second phases, unable fully to advance to the second phase. On the other hand, the expertise and experience in recycling, 3R policies and waste stabilization and reduction via incineration acquired in the 1990s and 2000s in developed countries such as Japan is primarily associated with the transition from the second to the third stage. Notably, this phase cannot be reached without a cost-sharing mechanism, as improving urban waste management and promoting recycling of resources incurs increased costs. For example, Japan's subsidy scheme of grants-in-aid for establishing a sound material-cycle society covers the initial costs incurred by local governments for installing waste management and recycling facilities, such as material recovery facilities, waste-to-energy facilities, organic waste recycling programmes, final waste disposal sites and projects for improving key technologies in existing facilities (MOEJ, 2014). The subsidy rate is usually one-third for the costs of installing normal facility and technology and one-half for the costs of local governments' pioneering projects. In addition, most of the recycling mechanisms for used product items such as plastic packaging and electronic waste in Organisation for Economic Cooperation and Development (OECD) countries like Japan or EU countries are operated under a policy approach with extended producer responsibility (EPR), which shifts financial and physical responsibility for managing end-of-life products from local governments to producers of the targeted products (OECD, 2016). Consequently, it is highly probable that the experience and technology currently possessed by local governments and companies in developed countries such as Japan, which are based on the current cost-sharing mechanism, may not be relevant for transitioning from the 1st to the 2nd stage in developing economies and would only be useful

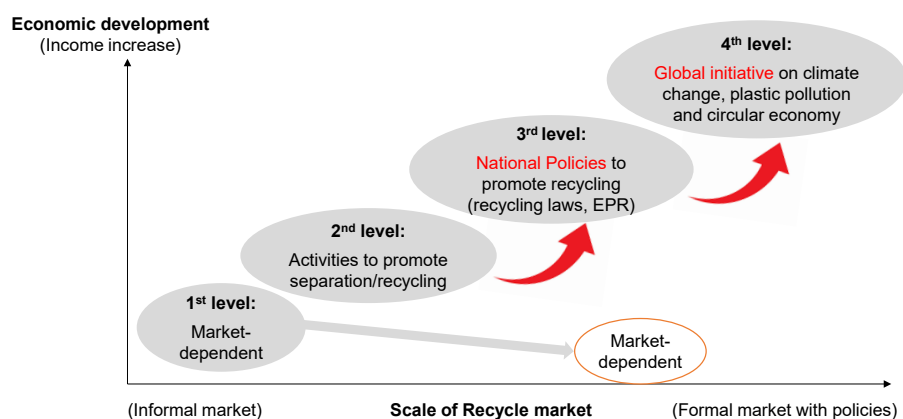


Fig. 1 Four-stage model for circular economy development (source: developed by the authors).

in the upcoming challenges of transitioning from the 2nd to the 3rd stages for developing economies. Thus, a step-wise strategy is required for international cooperation, as discussed in Section 5. It should also be noted that developing countries may have different experiences from developed countries due to the rapid development of new business models (such as sharing) for the fourth stage of recycling. In addition, the fourth stage is increasingly becoming a key challenge for the transition of both developed and developing countries to circular economy.

3. Experience in Promoting Recycling and Waste Reduction within a City in a Developed Economy: Case Study of Yokohama

Given the above, how did Yokohama's G30 plan, which resulted in international cooperation with Da Nang, begin? And what significance do Yokohama's initiatives have for the issues described above that developing countries face?

In 2003, the city of Yokohama launched a "G30" campaign, with the goal of reducing waste by 30 percent by 2010 compared to FY2001. The city allocated 2.7–2.8 billion Japanese yen (JPY) (27–28 million USD) for waste management from 2006 to 2008 (total expenditures: 4.2–4.6 billion JPY; total revenue: 1.2–1.5 billion JPY). This included awareness-raising as well as separation and collection. G30 was motivated by (1) a rising volume of waste due to population growth, (2) landfill scarcity, (3) incinerator replacement requirements, (4) growing environmental consciousness, and (5) an active city mayor.

The G30 campaign's core objective was to boost waste reduction by enhancing source separation, increasing the number of items from seven to 15 and the number of categories from five to 10. Containers and packaging, as well as used paper, are examples of source separation and collection categories. Different households' garbage was separated at collection points and collected on various days. Citizens needed to categorize 15 items for collection. On specific days, different types of waste were collected.

Over 11,000 public meetings were held with 4,700 city officials and environmental coordinators, and a mascot design contest was held to ensure public participation. In addition to various media tools, a celebrity campaign featuring the Crazy Ken Band was used. Initially, model projects were implemented to teach communities how to sort waste more precisely.

A system of non-punitive fines was implemented to correct improper waste separation. Leftover school lunches were recycled into compost and pig feed, and businesses were encouraged to reduce their commercial waste emissions.

The campaign successfully reduced waste from 1.61 million tonnes to 1.06 million tonnes by the end of the

2005 fiscal year, achieving the 30 percent reduction goal five years ahead of schedule. In 2010, waste volumes decreased by approximately 42 percent. This resulted in the closure of two incinerators, resulting in a 600 million JPY reduction in expenditures and a 3 billion JPY savings in incineration maintenance. Intensive source separation and recycling added 2.4 billion JPY to the total cost, bringing it to between 4.1 and 4.6 billion JPY.

By closing down old incinerators, an additional 110 billion JPY was saved. Waste generation decreased to 950,000 tonnes in 2008, and CO₂ emissions from waste decreased by 213,000 tonnes from the year 2000 level. In 2009, 78.3 percent of greenhouse gas emissions resulted from the incineration of municipal solid waste, and 21.7 percent from that of industrial solid waste. Additionally, the production of virgin materials decreased, contributing to climate benefits.

As discussed by Hotta and Aoki-Suzuki from their case study of Yokohama (Hotta & Aoki-Suzuki, 2014), This case suggests that the primary motivations and drivers for promoting recycling as a policy are as follows: 1) lack of capacity at final treatment sites promoting recycling; 2) existence of national regulations and preferences of local communities for promoting recycling and 3) direct personal contact by local government promoting active participation of citizens in recycling. Yokohama City's case demonstrates that multiple awareness-raising campaigns aimed at reaching out to citizens have been the key to encouraging citizen participation and collaboration.

4. Promotion of Waste Recycling in Da Nang, Viet Nam and Collaboration between Da Nang and Yokohama

Da Nang is an important city in central Vietnam with a population of 1.24 million people. Taking advantage of its proximity to the World Heritage-listed cities of Hue and Hoi An, the city has attracted IT and service industries and is undergoing rapid growth. Accordingly, the annual generation of solid waste increased dramatically from 197,000 tons in 2007 to 278,000 tons in 2014. With the growth of the city's economy, population and tourism, the volume of waste disposed has increased, with 2019 estimates placing waste generation at 418,000 tons (IGES estimate).

The majority of the waste collected by Urban Environment Company (URENCO), which is responsible for waste collection and disposal, is disposed of in landfills, while a small portion is recycled. Khanh Son, the only landfill in Da Nang, was expected to be full by 2020, but Da Nang City's desperate efforts have prevented it from reaching full capacity. On the other hand, the situation has not improved, and reducing waste emissions by encouraging sorting and recycling remains an urgent matter.

Against this backdrop, the cities of Yokohama and Da Nang established the “Da Nang Urban Development Forum” in December 2014, holding regular discussions since then on the direction of environmental improvement, including waste management.

In 2017, the Japan International Cooperation Agency (JICA) Grassroots Technical Cooperation Project entitled: “Model Project for Promotion of Household Waste Separation - Horizontal Development of Yokohama G30/3R Dream (Slim)” (Phase I) was launched based on the Da Nang City Waste Management Master Plan. The Institute for Global Environmental Strategies (IGES) has been involved in the overall management and advising of this project and has played a role as the project’s leader.

Through a series of 3R (reduce, reuse, recycle) awareness and behavior-change campaigns, the project has supported citizen participation and knowledge dissemination at the district and community levels. In particular, the project focuses on the flow of valuable resources (unwanted materials with monetary value), supports the promotion of household waste separation with the objective of extracting recyclable resources that become valuable through the waste collection and treatment process for recycling and reducing the amount of waste ultimately discarded. Specifically, guidelines were developed for the separation of valuable and recyclable resources such as bottles, cans, paper, PET bottles and plastics in Hai Chau, the administrative and commercial hub of the city, and in Thanh Khe, an adjacent district that has been developed but still retains its traditional local character. In addition, in collaboration with Da Nang City, district people’s committees, women’s unions and other communities, bags were created to store and collect recyclable materials sorted by households, thereby encouraging resident participation. In 2022, the city successfully organized approximately 350 launching ceremonies to initiate and facilitate the implementation of waste separation plans at various levels, along with 499 technical training sessions, 60 competitions, several recycling festivals and 861 social media campaigns. These efforts attracted the attention of various organizations and communities, with over 145,490 participants actively engaging in waste sorting activities at the source. These initiatives fostered community involvement across various sectors, including residents, businesses, service establishments, industrial clusters, tourism facilities, schools and religious institutions throughout the city (Department of Natural Resources and Environment (DONRE), 2023).

Moreover, the community and key project members in Da Nang were invited to Yokohama City for a training session based on the city’s experience working with citizens and the private sector on 3R campaigns such as the Yokohama G30 Plan (formerly the Yokohama City Basic Plan for General Waste Disposal) and the 3R Dream Plan. Yokohama City and IGES, in collaboration with Da

Nang City, have also jointly conducted activities to clarify waste flows and related challenges. It has been reported that over 80% of residents in the targeted districts of Hai Chau and Thanh Khe actively participated in the project. Within six months of project implementation, 199 collection activities took place in the model district of Hai Chau, resulting in the collection of 2 tons of used paper, 1.3 tons of waste plastic, and 26,000 aluminum cans.

Based on the promising results from the piloting activities in Hai Chau and Thanh Khe districts, Da Nang City approved and published a “Plan for Segregation of Solid Waste at the Source in Da Nang City by 2025” in April 2019. The city aimed to increase its recycling rate, estimated to be around 2 percent before the implementation of the JICA project in 2017, to at least 12 percent by 2020 and 15 percent by 2025. According to DONRE, with support from the JICA Project, the city has collected over 1,717 tons of waste classified as reusable and recyclable, surpassing the amount collected in 2021. In addition, approximately 330,922 tons of hazardous waste, mainly batteries and light bulbs, have been separated and collected. Solid construction waste and bulky, large-sized waste items have totaled about 5,082 tons. According to data compiled and provided by districts’ People’s Committees (excluding Son Tra District due to lack of specific data), as of 2022, approximately 86.6% of households; 100% of schools; 58.6% of production, business, and service establishments in the area; and 100% of healthcare facilities had implemented source separation of municipal solid waste (URENCO, 2024). This achievement stands as the highest compared to those of other cities and provinces in Vietnam.

This approach is noteworthy because it clarifies and separates valuable resources contained in “household waste,” thereby increasing the amount that flows to junk shops and other collectors of valuable resources, and decreasing the amount subject to final disposal. We were also able to identify informal recycling routes through this activity. In developing nations, it is not always immediately feasible for governments to establish and operate formal recycling routes. Therefore, it is anticipated that identifying and appropriately coordinating these informal, community-based recycling routes may enhance 3R activities. In addition, the proceeds from the sale of valuable materials in each community are used to fund educational materials for disadvantaged families in each community.

In light of that, what are the similarities and differences between the background and motivation of Da Nang and Yokohama? The lack of final disposal sites and the high cost of installing waste-to-energy facilities were the driving forces behind the promotion of recycling in Yokohama. Similarly, Da Nang faces a lack of final disposal sites.

Second, what about national regulations and encouraging local government initiatives? In Vietnam, the

Table 1 Comparison of motivations behind the waste recycling and reduction campaigns and international cooperation between Yokohama and Da Nang.

	Yokohama City	Da Nang City
1) Lack of capacity at the final treatment site incentivizes recycling.	Yes. -Strong motivation to close old incinerators.	Yes. -Lack of landfill capacity
2) Existence of national regulations and preference of local communities for promoting recycling	Yes. -National Policy to Promote Sound Material Cycle Society -Existence of recycling legislation -High awareness of importance of recycling	Emerging -Revised Environmental Protection Act 2020 will require source separation, but Da Nang's activities started before the act's revision -High awareness of cleanliness of the city as a popular tourist destination
3) Direct personal contact by local government promoting citizens' active participation in recycling.	Yes -Numerous awareness raising and training campaigns by governmental officials to involve citizens	Yes -Involvement of community organizations for source separation and awareness raising campaigns
4) Strength of the city	Experience of G30 and continuous improvement in their recycling campaign and activities	Commitment and wide participation of various stakeholders in the city Willingness to make the city a model city for Vietnam's 3R activities

revised Environmental Protection Law, which went into effect in 2020, mandates the separation of recyclable materials, food waste and other general waste, implementing a pay-as-you-go system for waste disposal. The central government has designated Da Nang as a model city for implementation. Consequently, it can be stated that the motivation for coordination in promoting national regulations with local government initiatives in Yokohama is comparable. However, despite citizens' expectations for recycling services, a challenge exists in that the majority of recyclables are collected and processed by junk shops. In contrast, citizens have begun to participate in pilot projects such as producing soap from used cooking oil and composting food waste in restaurant districts. Efforts are being made in collaboration with women's unions and district people's committees to promote recycling through direct and personal contact with local governments (organizations equivalent to district assemblies). Through weekend recycling promotion activities, group collection and community cleanups, awareness campaigns similar to those conducted by the city of Yokohama have also been carried out. Table 1 below summarizes and compares the similarities and differences in dynamism and motivation behind the efforts made by Yokohama and Da Nang.

It is evident that Da Nang remains in a transitional phase, commonly referred to as a "turning point," as illustrated in Fig. 1, situated between the 1st and 2nd stages of waste management. Therefore, effective interventions led by Da Nang are necessary for facilitating a paradigm shift from a market-dependent (citizen's voluntary) recyclable collection system to a mandated one driven by the municipal government and citizens. To achieve this shift, the city must address the remaining challenges and limitations of the current waste separation system, which include:

- Solid waste separation at the source in Da Nang still being limited to the reuse and recycling group (plastic, paper, metal), which have high market demand, with no implementation for food waste in compliance with the new Law on Environmental Protection 2020.
- A pressing need to expand official recyclable collection routes and options beyond junk shops and

community-based initiatives. This could involve establishing a separation and collection system in collaboration with Urban Environmental Company (URENCO) or the private sector/community, offering incentives such as subsidies from the municipality. Another option would be to ensure the efficient flow of recycling both within and outside of Da Nang City, focusing on recyclable materials.

- A lack of adequate investment in providing integrated infrastructure for recyclable waste collection systems, recycling technologies and appropriate solid waste treatment solutions, leading to heavy reliance on landfills. Therefore, a decision on implementing integrated source separation for food waste and other recyclable/resource wastes, as mandated by the Revised Environmental Protection Act 2020, should be urgently accelerated by 2024.

Consequently, Yokohama's cooperation aims not to impose its own model or approach, but rather to offer technical advice for enhancing the performance and efficiency of Da Nang City's current source separation system for municipal solid waste. The subsequent sections outline a model for the most effective form of intercity cooperation in this regard.

5. Step-by-step Strategy for Effective City-to-City Collaboration in the Development of the Circular Economy

What steps should be taken for international cooperation between cities? Particularly, in order for inter-city cooperation to be effective, it must be sustained over an extended period of time, and it is essential to consider what positive effects can be anticipated for the city. To this end, it is useful to divide international cooperation into the four steps below and consider the nature of the desired outcomes, as shown in Fig. 2.

Step 1: Building Trust with Targeted Cities and Relevant Central Government Agencies through Assistance in Formulating National or Municipal Strategies and Plans

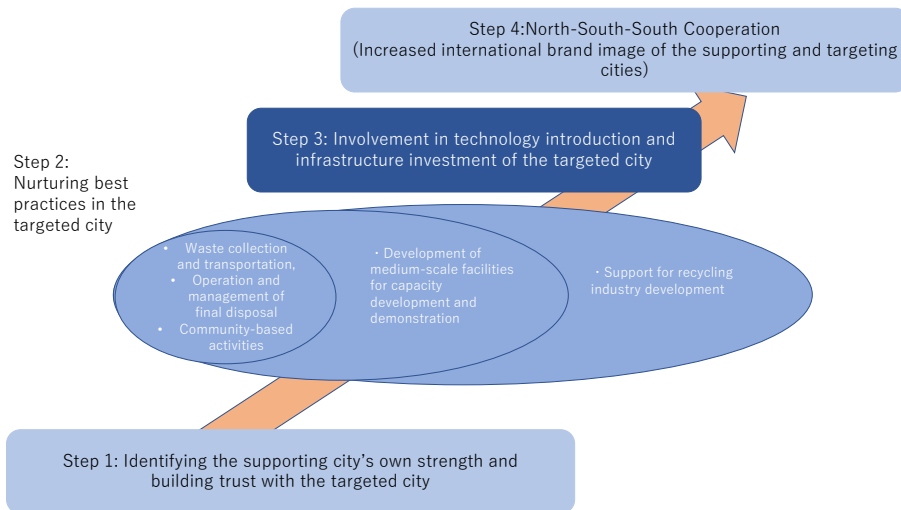


Fig. 2 Four-step strategy for city-to-city cooperation in the area of waste management and circular economy (source: developed by the authors).

The determining factor is whether or not prospective donor cities willing to provide support can identify their own strengths, such as the capacity to offer administrative expertise to a potential partner city. These strengths can include the development of “hardware” such as waste treatment and recycling facilities, and “software” such as consensus building with stakeholders, participation of residents in sorting, and information disclosure by the local government. In some instances, the knowledge and expertise of cities offering international support does not correspond to the actual situation in the partner cities.

In such circumstances, it is conceivable that local governments in the recipient country and those in the donor country could learn from one another and, in the long run, strive for North-South-South or South-South cooperation by transferring their experience to other local governments facing comparable challenges. To accomplish this, it is necessary first to gain a comprehensive understanding of the partner municipality's strengths. This includes proper waste management systems, fundamental activity information and baseline surveys. Regarding the transfer of administrative know-how, it is crucial to approach this from the upstream policy stage, including strategy and planning, institutional design and capacity building for administrative staff to build trust among cities and establish a mechanism for forming a commitment in the administration of the partner city. At this stage, it would also be advantageous to utilize the expertise of professionals and businesses. Effective international cooperation cannot exist outside of the strategies and plans of the central government of the target country and the partner municipality.

In the first stage of the four-stage model described above, recipient local governments could receive support for the development of strategies and plans for the proper disposal of waste (efficient collection and transportation of waste, sanitary management of final disposal sites, etc.).

Alternatively, in the second stage, strategies and plans may be considered from the perspective of incorporating recycling policies into waste policies. It is important to note that the target audience is not limited to administrative agencies, but also includes a wide variety of residents and the recycling industry. In the third stage, support measures could be considered not only for cooperating cities, but also for the national government and relevant businesses. The fourth stage can include new business or technology development cooperation such as utilizing digital technology to visualize the waste and recycling flow of a city.

Step 2: Establishing Best Practices

The next step would be to form concrete cases of implementation of the aforementioned plans and strategies at the citizens' and company demonstration levels, so that more stakeholders and top administrative officials of partner cities can gain an understanding. Given that many Asian cities have limited budgets for waste management and resource recycling policies, it is crucial to work at the grassroots level to increase the number of stakeholders who understand the importance of waste management and resource recycling policies, as well as to promote the necessary budget allocations for implementing strategies and plans. In addition, administrative momentum must be increased to allocate the necessary budget for implementing the measures outlined in strategies and plans. In some instances, even if the aforementioned plans are developed, there may be no capacity for data collection and progress monitoring. To improve the plan, it will be crucial to create successful experiences on an activity-by-activity basis, and then to confirm the significance and priority of waste management activities. Typically, such case development occurs ad hoc, without first positioning it within Step 1's strategies and plans. This might result in the cessation of support and activities.

For establishing best practices, an initial approach can include pilot projects to improve the efficiency of waste collection and transportation, as well as the operation and management of final disposal sites, by dispatching experts and implementing training programs for local government officials. Additionally, grassroots activities may include creating examples of small-scale collection of valuable recyclable resources via household composting and waste banks (a community-based purchase and collection system for valuable resources that utilizes local currencies, etc.). The development of medium- to large-scale resource recovery facilities (MRF) could be another step for improving the waste management systems of the targeted cities. Alternatively, when resource management policies are promoted as a national initiative, there is potential for the development of a wide range of recycling and waste management businesses, including intermediate treatment and recycling industries, as well as the creation of B2G (business-to-government) and B2B (business-to-business) collaboration.

Step 3: Technology Introduction and Infrastructure Development

Involvement in infrastructure facilities, such as waste treatment and recycling facilities, can be considered based on the results of Step 1. In this instance, participation in Step 1 will lower the barriers to entry for businesses from the cities offering support to the targeted cities as a result of the built-up trust between the cities, and participation from the upstream stage of strategy and planning will facilitate project proposals that adhere to the plan. This has the added benefit of enabling more comprehensive project proposals. Trust between cities, as discussed in Step 1, and their positioning within the strategies and plans are prerequisites for this. In addition, cost-reduction measures can be proposed by applying the Joint Credit Mechanism (JCM) and other funding sources provided by the various bilateral donors and multilateral development banks. It should be noted that the entities to be supported and areas of cooperation will vary depending on the level of development of the target municipalities; this must be considered for technology to be introduced and infrastructure developed successfully.

Step 4: North-South-South Cooperation

As an exit strategy for the supporting local governments, it is anticipated that not only will the technology be deployed by individual companies in the recipient city, but it will also be expanded to other urban infrastructure areas and possibly disseminated and deployed in other Asian cities. In addition, various international donors may concentrate further investment and support in the targeted cities. In the long-term, the mutual-learning and co-creation process by the recipient and supporting cities, may result in North-South-South (or

Triangular) cooperation defined as “Southern-driven partnerships between two or more developing countries supported by a developed country(ies)/or multilateral organization(s) to implement development cooperation programmes and projects.” (United Nations Office of South-South Cooperation, N.D.) and South-South Cooperation defined as “a process whereby two or more developing countries pursue their individual and/or shared national capacity development objectives through exchanges of knowledge, skills, resources and technical know-how, and through regional and interregional collective actions, including partnerships involving governments, regional organizations, civil society, academia and the private sector, for their individual and/or mutual benefit within and across regions” (United Nations Office of South-South Cooperation, N.D.), in which the recipient city’s experience is transferred to other cities facing comparable challenges.

This can enhance the “city brand” of the both supporting side and recipient side. This enhancement of the cities’ brands will lead to the development and securing of human resources who can play an active role internationally, open the doors for training tours at the corporate level, and help to develop inter-city exchange activities at the citizen level (e.g., exchange study programs for junior high and high school students in the city), which will ultimately result in citizen pride in and attachment to their municipality.

Integrated strategies to promote Steps 1 and 4 are particularly important for the supporting cities. If Step 1 is not taken, Steps 2 and 3 will not be effective in promoting international cooperation. If Step 4 is viewed as the final exit objective, it is essential to be prepared for long-term cooperation and develop the necessary human resources. Human resource development, on the other hand, may be the most likely benefit for the supporting cities.

6. Conclusion

This paper has emphasized the importance of social experimentation, mutual learning and co-creative international cooperation to transition to a decarbonized, circular economy from the perspective that the role of cities in implementing sustainability practices is growing in significance and that co-creative international cooperation is required. It uses waste management and circular practices in Da Nang, Vietnam, to illustrate the shifting policy priorities and challenges in developing nations.

Da Nang’s experience in improving waste management and resource recovery can serve as a reference when other Vietnamese cities are to implement Viet Nam’s Revised Environmental Protection Act 2020. The key lessons are as follows: 1) Utilize existing strengths: The city promoted source separation in close cooperation with residents without destroying the existing

recycling system that relies on junk shops. Rather, the city tried to integrate the current informal recycling scheme as a part of its formal recycling campaign by recognizing their contributions to resource recovery. 2) Understand the current stage of waste management challenges and prepare for change: At the same time, the city is piloting a public recycling system in case market-based recycling no longer works, based on continuous monitoring of the amount of recyclable resources flowing through the junk shop routes. 3) Invest in infrastructure development: The city is improving and upgrading the collection and management of waste and resource materials, including upgrading a badly polluting intermediate treatment facility to modern equipment, setting up a DONRE office to improve waste management operation at the final disposal site and planning to introduce a waste-to-energy facility. 4) Improving markets for resource recovery: Junk shop routes and informal recovery of resources are the city's main routes for resource recovery. Therefore, there is a common issue of how to secure the recycling market in the case of public intervention in resource recovery. For example, the city has been flexible in its approach to food waste recycling, as stipulated in the revised Environmental Protection Act, by piloting the collection and recycling of cooking oil and composting activities at home and in the community.

As described previously, international cooperation among local governments can be an effective process that facilitates social experimentation and mutual learning for a sustainable transition. Simultaneously, local governments on the supporting side can reevaluate their own experiences more objectively, and local governments on the receiving side can anticipate that international cooperation will facilitate cooperation among related parties and have spillover effects on initiatives and cooperation in other areas.

Based on its experience, if Da Nang can be positioned as a model city for the realization of a circular economy in Vietnam, it may be able to provide a model for key cities and medium-sized cities outside the capital cities of the ASEAN countries. This way, it may be possible to establish a model case for the promotion of North-South and South-South cooperation, as mentioned in Step 4 in Section 5, toward promoting a circular economy in cities in developing Asian countries.

As indicated in Section 6, such international cooperation should be developed within a strategy for support and mutual learning, as well as social experimentation. As numerous experimental attempts and the harmonization of policies through international cooperation are required for a sustainable transition, it is believed that the steady development of inter-city cooperation, as observed in Yokohama and Da Nang, will be an important strategy for both aid-providing and aid-requesting countries to use in achieving a sustainable transition.

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References

- Amin, A. (2002) *The Informal Sector in Asia from the Decent Work Perspective*. www.ilo.org/publns
- Chen, H., Yang, Y., Jiang, W., Song, M., Wang, Y. and Xiang, T. (2017) Source separation of municipal solid waste: The effects of different separation methods and citizens' inclination—case study of Changsha, China. *Journal of the Air & Waste Management Association*, 67(2): 182–195. <https://doi.org/10.1080/10962247.2016.1222317>
- Cudjoe, D., Yuan, Q. and Han, M.S. (2020) An assessment of the influence of awareness of benefits and perceived difficulties on waste sorting intention in Beijing. *Journal of Cleaner Production*, 272: 123084. <https://doi.org/10.1016/j.jclepro.2020.123084>
- De', R., Pandey, N. and Pal, A. (2020) Impact of digital surge during Covid-19 pandemic: A viewpoint on research and practice. *International Journal of Information Management*, 55: 102171. <https://doi.org/10.1016/j.ijinfomgt.2020.102171>
- Department of Natural Resources and Environment (DONRE) (2023) Report on the results of the implementation of household solid waste source separation in 2022 and proposal for activity plan in 2023. Prepared by Da Nang's Department of Natural Resources and Environment, 2023.
- Fujii, Y. (2008) Successful source separation in Asian cities: lessons from Japan's experience and an action research in Thailand. In: Kojima, M. (ed.), *Promoting 3Rs in Developing Countries: Lessons from the Japanese Experience*, pp. 9–35. IDE-JETRO.
- Fukuda-Parr, S., Lopes, C. and Malik, K. (eds.) (2002) *Capacity for Development: New Solutions to Old Problems*. Earthscan Publications.
- Gary, V., Sarah, S. and Deborah, N. (2022) Long-term effects of COVID-19, and Its Impact on Business, Employees, and CO2 emissions, a study using Arc-GIS survey 123 and Arc-GIS mapping. *Sustainability*, 14(20): 13689. <https://doi.org/10.3390/su142013689>
- Gu, S., Ślusarczyk, B., Hajizada, S., Kovalyova, I. and Sakhbieva, A. (2021) Impact of the COVID-19 pandemic on online consumer purchasing behavior. *Journal of Theoretical and Applied Electronic Commerce Research*, 16(6): 2263–2281. <https://doi.org/10.3390/jtaer16060125>
- Hotta, Y. (2011) A phased approach to implementation of 3R policy in Asia. *Material Cycles and Waste Management Research*, 22(2): 148–158. <https://doi.org/https://doi.org/10.3985/mcwmr.22.148>
- Hotta, Y. (2013) Recycling Policy: The sound material cycle society and 3R concepts from Japan to developing Asia. In: Hester, R.E. and Harrison, R.M. (eds.), *Waste as a Resource*, pp. 162–186. Royal Society of Chemistry.
- Hotta, Y. and Aoki-Suzuki, C. (2014) Waste reduction and recycling initiatives in Japanese cities: lessons from Yokohama and Kamakura. *Waste Management & Research*, 32: 857–866.

- <http://www.ncbi.nlm.nih.gov/pubmed/25023986> (accessed 9 April 2024)
- Hotta, Y., Elder, M., Mori, H. and Tanaka, M. (2008) Policy considerations for establishing an environmentally sound regional material flow in East Asia. *Journal of Environment and Development*, 17(1). <https://doi.org/10.1177/1070496507312562>
- Hotta, Y., Tasaki, T., Koide, R., Kojima, S. and Kamei, M. (2021) SCP policy design for socio-technical system change: envisioning-based policy making (EnBPM). *Global Environmental Research*, 25(1&2): 15–22. http://www.airies.or.jp/journal_journal_25-1-2eng.html (accessed 9 April 2024)
- JICA (2003) *Capacity Development and JICA's Activities - Cooperation for Promoting Knowledge Acquisition*. https://openjicareport.jica.go.jp/360/360/360_000_11721792.html (accessed 9 April 2024)
- JICA Institute for International Cooperation (2005) *Supporting Capacity Development in Solid Waste Management in Developing Countries: towards Improving Solid Waste Management Capacity of Entire Society*. Institute for International Cooperation, Japan International Cooperation Agency.
- Liu, C., Bunditsakulchai, P. and Zhuo, Q. (2021) Impact of COVID-19 on food and plastic waste generated by consumers in Bangkok. *Sustainability*, 13(16): 8988. <https://doi.org/10.3390/su13168988>
- MOEJ (2014) *History and Current State of Waste Management in Japan*. <https://www.env.go.jp/content/900453392.pdf> (accessed 9 April 2024)
- OECD (2016) *Extended Producer Responsibility. Updated Guidance for Efficient Waste Management*. <https://doi.org/10.1111/jiec.12022>
- PwC (2017) *The Long View How Will the Global Economic Order Change by 2050?* <https://www.pwc.com/gx/en/research-insights/economy/the-world-in-2050.html> (accessed 9 April 2024)
- Rousta, K., Zisen, L. and Hellwig, C. (2020) Household waste sorting participation in developing countries: A meta-analysis. *Recycling*, 5(1): 6. <https://doi.org/10.3390/recycling5010006>
- Sang-Arun, J. (2011) *Practical Guide for Improved Organic Waste Management: Climate Benefits through the 3Rs in Developing Asian Countries*. <https://www.iges.or.jp/en/pub/practical-guide-improved-organic-waste/en> (accessed 9 April 2024)
- Shinkuma, T. and Managi, S. (2010) On the effectiveness of a license scheme for E-waste recycling: The challenge of China and India. *Environmental Impact Assessment Review*, 30(4): 262–267. <https://doi.org/10.1016/j.eiar.2009.09.002>
- United Nations Office of South-South Cooperation (N.D.) *About South-South and Triangular Cooperation*. <https://unsouthsouth.org/about/about-sstc/> (accessed 9 April 2024)
- URENCO (2024) Report on the current status of municipal solid waste management at source in Da Nang city (2019–2022). Prepared by Da Nang URENCO.
- Williams, E., Kahhat, R., Bengtsson, M., Hayashi, S., Hotta, Y. and Totoki, Y. (2013) Linking informal and formal electronics recycling via an interface organization. *Challenges*, 4(2): 136–153. <https://doi.org/10.3390/challe4020136>
- Wilson, D.C., Velis, C. and Cheeseman, C. (2006) Role of informal sector recycling in waste management in developing countries. *Habitat International*, 30(4): 797–808. <https://doi.org/10.1016/j.habitatint.2005.09.005>



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