

## *Original Paper*

# Coastal City and Zero Waste Masterplan: Exploring a Strategy of Resilience and Inclusion

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### ***Abstract***

*The Covid-19 pandemic has once again caused citizens around the world to attach importance to the urgency of the waste management crisis and the need for environmental action in general, and this should act as a wake-up call for taking the boundary between human consumption of non-sustainable activities and the capacity of the natural environment seriously. Governments in the Netherlands and Japan designed and implemented policies to facilitate the transition to a circular economy and to promote sustainable waste management. This paper reviews waste management policies and practices in the two countries, explores a circular economy strategy based on coastal cities, using examples of different zero waste cities to examine how coastal cities have adapted to the zero waste masterplan.*

### ***Keywords***

*coastal city, circular economy, sustainable waste management, zero waste city*

## **1. Introduction**

Cities are areas with high concentrations of population and industrial activities. The traditional development of cities is mostly based on an unsustainable model, with massive consumption of resources and uncontrolled emission of pollution (Note 1). Additionally, cities consume nearly 70 percent of the world's energy, and only 9 percent of the waste has been successfully recycled (Note 2). Thence, how to achieve sustainable management of solid waste in cities has become a global challenge, reflected in the latest concerns about zero waste cities and circular economy by the international community. In this scenario, the European Union (EU) (Note 3), the United States (Note 4), New Zealand (Note 5), and Japan (Note 6) have adopted comprehensive waste management with leading explorations of "Zero Waste Society" and "Zero Waste City"; China launched "Zero Waste City Pilot Project" in 2019 (Note 7); In addition, sustainable solid waste management practices also have been implemented in low and middle-income countries such as India (Note 8), Indonesia (Note 9), and South Africa (Note 10).

The Zero Waste International Alliance defines the term “zero waste” as “the conservation of all resources through responsible production, consumption, reuse, and recovery of products, packaging, and materials without burning and with no discharges to land, water, or air that threaten the environment or human health” (Note 11). As waste management plays a central role in the circular economy, the concept of “zero waste” emphasizes it is a goal for transforming waste management systems towards a “circular economy”. This concept has been applied widely in different phases of production and waste management systems (Note 12). Many scholars have conducted research centering on “zero waste city” from different perspectives, including the core principles and key drivers (Note 13), implementation strategies and policy frameworks (Note 14) and urban case studies (Note 15), etc. However, there has been little research specifically linking “zero waste” to “coastal cities”.

Coastal cities are cities in the coastal zone with dual characteristics of urban cities and coastal zone. They are on the front lines of the growing physical risks associated with climate change and solid waste disposal (Note 16). There’re more reports about the cities adding to the pollution of coastal areas, almost 80 percent of the pollution load in the oceans comes from land-based activities, such as industrial pollution (including offshore oil exploitation, port transportation, and coastal ocean engineering construction) and domestic pollution (like the discharge of wastes) (Note 17). One of the most damaging ways in which cities pollute coastal areas is the discharge of wastes mainly including sewage, industrial effluent, plastics, and other wastewater. Thence, compared to those cities further inland, zero waste master planning is in particular needed in coastal cities, considering the discharge of waste in coastal cities will not only threaten the surrounding seas but also the marine environment (damage to the mangroves, coral reefs, seagrass beds, and sand dunes). Among the converging issues of concern in the zero waste masterplan, coastal cities have received little research attention. This paper will undertake a discussion of the strategy of coastal cities in the context of zero waste masterplan, by summarizing zero waste master planning cases in the Netherlands (Amsterdam) and in Japan (Tokyo).

## 2. Zero Waste Coastal Cities Cases

In 1995, Canberra became the first city to set “zero waste” as an official goal when it passed the bill *No Waste by 2010* (Note 18). Until today, many cities around the globe have declared their zero waste vision and these cities are striving for the goal of a “zero waste city” (Note 19). The emergence and development of zero waste cities in the world basically show two modes: one is the bottom-up mode, city actions are under the influence of solid waste management policies, the consensus of environmental protection and other factors, normally emerged in Europe, North America and Oceania; the other is the top-down mode, using the national or regional plan to promote the implementation of pilot projects from top to bottom, adopted by Japan and China (Note 20). Lens switched to coastal cities, the following case studies were selected in compliance with the above two modes.

### 2.1 Amsterdam, the Netherlands

The Netherlands is the first country in Europe to implement waste sorting through its take-back legislation, requiring product take-back and recycling for the purpose of reducing landfills (Note 21). The latest data shows that the waste recycling rate in the Netherlands has reached 80%, ranking it as one of the front runners in the world (Note 22).

According to Rijkswaterstaat Environment, there are five elements that helped to achieve the above Dutch success, including (a) the order of preference (waste hierarchy) as the guiding principle from the start for waste management; (b) stringent waste treatment standards; (c) cooperation between the different tiers of government; (d) extended producer responsibility and (e) use of various (economic) instruments to stimulate prevention and recycling (Note 23).

The Dutch legislation on waste can be found in Chapter 10 of the *Environmental Management Act (Wet Milieubeheer - Wm)* (Note 24), in line with the *Waste Framework Directive 2008/98* (Note 25), which lays down guiding principles and legal basis for waste management in the EU, key points are putting forward principles of the “waste hierarchy”, “polluter pays” and “extended producer responsibility”. This also shows that the *Waste Framework Directive 2008/98* was incorporated into national law by the EU Member States. In practice, the Ministry of Infrastructure and Water Management (IenW) plays a leading role in overall planning towards waste management and circular economy issues, enforced by two of its support agencies—one is the Directorate-General for Public Works and Water Management (Rijkswaterstaat, RWS) which ensures that policy is implemented, the other is the Human Environment and Transport Inspectorate (ILT) which oversees compliance with statutory regulations by private individuals and companies (Note 26). In addition, the Netherlands Environmental Assessment Agency (PBL) is commissioned to provide policy studies and reports that support policy-making for the Ministry of Infrastructure and Water Management.

Considering that the current development of the circular economy has made waste management increasingly complex and changeable, the Netherlands has chosen not to incorporate quantitative objectives into national laws, but has repeatedly revised various policy proposals jointly issued by the inter-ministerial committees, as well as the National Waste Management Plans formulated by the Ministry of Infrastructure and Water Management, to ensure that waste management and circular economy development across the country complement each other. The Netherlands incorporates the collection and classification of municipal solid waste, industrial waste, and hazardous waste into one national law, and incorporates specifications and management rules in the National Waste Management Plans. The Netherlands provincial governments have no right to amend regulations, there are also no exclusive departments for waste management and circular economy affairs on a provincial level. The disposal of domestic solid waste is jointly handled by the municipal government and the council, to ensure that local waste disposal is in line with the national statutory regulations. The organic waste, industrial solid waste, and hazardous waste must be well-disposed in accordance with central regulations, the management of other types of waste is left to the discretion of each city. In addition, the municipalities

can communicate through the Association of Netherlands Municipalities (VNG); waste treatment companies across the country can communicate and negotiate with the municipal government through the Royal Dutch Waste Management Association (NVRD) (Note 27).

In addition to the administrative management system and various policy plans led by the Dutch central government, many local governments have actively participated in promoting the realization of a circular economy in recent years, and have organized various cooperation mechanisms to seek better waste management models. Amsterdam, the capital city of the Netherlands, as a frontrunner in sustainability and circular thinking, has organized various cooperation mechanisms to seek better waste management models.

Most strikingly, there is a project called “De Ceuvel Sustainable Community” in Amsterdam, it is a Cleantech Playground in which to make sustainability creative, accessible, and fun for everyone in the community. It is situated in the old badly polluted industrial area Buiksloterham, in 2010, the Municipality of Amsterdam made openly bid for a ten-year lease of this land use rights with a criterion of sustainable development. In 2012, a group of architects won a tender to turn the site into a regenerative urban oasis. Until now, it is one of the pioneers in the transformation of the polluted zone into a sustainable residential area. In particular, café de Ceuvel is made from discarded bollards and old building materials from the port of Amsterdam, and has achieved 100% reuse of materials (Note 28). In addition, the project of Amsterdam Clean Water was founded in 2016, targeting to bring structural change in waste management concerning the waters in Amsterdam, specifically to reduce the amount of litter that ends up in canals and the river IJ (Note 29). Furthermore, in 2020, Amsterdam published its Circular Strategy 2020-2025 to embrace the “City’s doughnut” model (Note 30) to mend the post-coronavirus economy, this strategy aims to reduce the city’s environmental footprint by focusing on how locals produce, process, and consume (Note 31).

To sum up, the Amsterdam practical pattern is the local government actively responds to the implementation goal of waste management and circular economy of the central government with clear goals and an open attitude. In addition, local governments coordinate cross-departmental cooperation to jointly implement waste and resource utilization practices, reflected in the zero waste practice of De Ceuvel’s needs working with new technology partners, research institutes, and government agencies, which also enables it to be a pioneer for exploring the future of circular coastal environments.

## 2.2 Tokyo, Japan

Japan is the first country to start environmental governance in East Asia. It has not only established a clear and complete system for waste management, but also has gradually achieved concrete results.

In response to ongoing increases in waste generation and shortage of landfills, Japan approved numerous specialized recycling acts such as the *Waste Management Act of 1970* and the *Effective Resource Utilization Promotion Act of 1991* (Note 32), constructed a zero waste society based on the *Basic Act on Establishing a Sound Material Cycle Society* which was fully implemented in 2001, implemented the 3R (Reduce, Reuse, and Recycle) Initiative in 2005 (Note 33), and issued a new Circular Economy Vision

in 2020 aims to seize new business opportunities that will lead to a virtuous cycle of environment and growth (Note 34).

Japan has adopted the “exclusion principle” in the classification and management of waste, which is different from the EU’s method of managing waste according to source and characteristic codes. It starts with listing 20 types of industrial wastes with strict rules, and then selecting hazardous waste items for management (Note 35). The wastes that are not included in the above two lists are finally divided into general business and general household wastes according to their sources. If the waste itself has special hazards, it is regarded as general waste that needs special management (Note 36). In addition, the Japanese government has also formulated special acts to manage containers and packaging, home appliances, food, construction material, end-of-life vehicles, and small home appliance (Note 37). Japan’s waste management work is jointly undertaken by the central government and the local governments. Similar to the EU, the Ministry of Environment of Japan makes overall plans for waste management. The comprehensive management of waste is mainly carried out by local environmental departments. The Japanese Resource Recycling and Waste Research Center, a National Institute for Environmental Studies, has assisted the Ministry of Environment in carrying out a number of basic studies, and provided policy recommendations for the development of technology and theoretical models for the development of a resource recycling system framework.

Tokyo, the capital city of Japan, is located at the Tokyo Bay region which is the largest industrialized area on the Pacific coast. As one of the most populous metropolises in the world, Tokyo has also encountered the dilemma of garbage siege in the process of rapid urbanization. After efforts, its municipal waste production began to decline after reaching its peak recently (Note 38). To echo the Circular Economy transformation adopted by the central government, the Tokyo Metropolitan Government (TMG) has contributed efforts to realize a Zero Waste Tokyo through its environmental initiatives and policy targets, mainly reflected in the Tokyo Environmental Strategies and the Sustainable Materials and Waste Management Plan formulated from 2016 to 2021 (Note 39). In addition, the TMG makes efforts to build a sustainable society by steadily implementing the programmes (including environment education videos, management of food waste, management of plastic waste and marine litter, 3Rs, industrial waste management, countermeasures against illegal dumping and international cooperation) set forth in these plans with municipalities, companies, NGOs and other organizations (Note 40).

It is worth mentioning that the Tokyo Super Eco Town Project, as part of a national urban regeneration project, achieved success in solving waste problems and creating a sound material cycle city. In this project, the TMG invited private enterprises to run businesses through open tender since 2012. Until now, super eco town facilities in this project include a hazardous waste treatment facility, waste fuel electric power generation facility, recycling facility for IT and other electronic devices, facility to convert food waste into animal food, facility to generate biogas power from food waste, industrial waste and sludge recycling facility and others. This project also calls for public awareness of recycling and reusing by holding tours for residents to visit their facilities (Note 41). Furthermore, the Tokyo Tama Wide Area

Resource Recycling Project is representative in promoting the zero landfilling of solid waste. In order to minimize the amount of domestic waste in landfills, on the one hand, the Tama project is committed to promoting the classification of domestic waste at source and recycling of renewable resources, aiming to reduce the amount of waste incineration and burning ashes; on the other hand, the ecological cement project was officially launched in 2006, the ecological cement was made of the incineration ashes, which provides an idea for basically realizing zero landfill of domestic waste (Note 42).

To summarize, Tokyo's urban waste management pilot projects have been developed through a national initiative. In addition, those eco projects have achieved great success, this is due to the forethoughtful strategy, improved policy framework and legal system, strict waste classification, government enforcement, and collaboration across levels.

### **3. Resilient & Inclusive Framework for Coastal Cities**

At present, there is no international strategy for coastal cities to respond to sustainable waste management at the national level, based on the above two cities' policies and public domain efforts, it can be summed up the following steps for coastal cities' strategy to achieve the "zero waste city" goal:

- a. Form a fairly complete law system of solid waste management, including refining the division of the implementation of waste disposal between the tiers of government (at national, provincial, and local levels) to achieve a joint and coherent approach for the waste management challenge. Set up a strict environmental evaluation system, in order to address the marine environmental problems if it is due to those landfill sites set in coastal cities.
- b. Call for multi-party participation and coordination to reach a dynamic system. The government plays a vital role in managing waste management in coastal cities. The steps taken by the local government to overcome the waste problem are collaboration, education, and action. It can be cooperating with business entities in realizing 3Rs of the solid waste. In addition, it is also necessary to include multi-support such as urban planning institutes, think tanks, and cleantech.
- c. Network with other countries to improve waste management and recycling. In coastal cities, waste collection is still a challenge, especially plastic leaking into the ocean environment. Coastal pollution is a transboundary issue, requiring concerted efforts by all the cities located around a particular water body for effective action. Not limited to the national level, but also the global level, to carry out exchanges of experience and go for cooperated research in this regard.

### **4. Conclusion**

The rise of the circular economy transformation is an indicator of the intention to address crucial waste challenges commonly found in efforts to promote sustainable waste management in cities. Whether it's the bottom-up mode in Amsterdam or the top-down mode in Tokyo, policies and legislation are purposefully designed to tackle waste issues and catalyze a circular economy transformation. Through

this, governments have taken numerous steps to pursue a “zero waste society”, often through a strong public-private collaboration scheme with a high recycling rate.

Coastal cities, in particular, need to consider waste issues in conjunction with the marine environment. These cities stand at the intersection of climate change and solid waste disposal challenges, making the execution of zero waste master planning especially critical. The discharge of waste in coastal cities not only threatens the surrounding seas but also the broader marine environment, including mangroves, coral reefs, seagrass beds, and sand dunes. This emphasizes the imperative for an exhaustive legal framework addressing solid waste management, a collaborative effort encompassing multiple stakeholders, and international alliances focused on enhancing waste management and recycling.

The core approach of a resilient and inclusive strategy should be to integrate zero waste and circular economy strategies in coastal cities, thereby driving forward regeneration in the post-pandemic era. The progress will be measured as multiple parties become increasingly involved.

To conclude, the implementation of zero waste master plans in coastal cities is a complex but achievable goal. Through international cooperation, stringent legal frameworks, robust waste management systems, and inclusive strategies that involve all stakeholders, coastal cities can become leaders in the move towards zero waste societies. The experiences of cities like Amsterdam and Tokyo provide compelling illustrations of successful transformation. Ultimately, the urgency of the waste management crisis necessitates action, and coastal cities, with their unique challenges and opportunities, can pave the way towards more sustainable futures.

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Note 27. This paragraph is a summary from those National Waste Management Plans, including the green growth programmes From Waste to Resources (Van Afval Naar Grondstof - VANG) in 2013, VANG-HHA Programme in 2014 and in 2018, A Circular Economy Programme adopted in 2016, the new National Waste Management Plan (LAP3) enacted in 2017. Also, the related webpage on “What are the secret ingredients that make the Dutch system so good when it comes to waste management and recycling?” is also contributed to this paragraph, see: <https://waste-management-world.com/artikel/dutch-successes/>

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