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# TOWARDS SUSTAINABLE PRACTICES: A COMPARATIVE STUDY OF JAPANESE, ITALIAN, AND ALGERIAN HOUSEHOLD WASTE MANAGEMENT MODELS

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**ABSTRACT**

Household waste management varies significantly across countries, as illustrated by the examples of Kamikatsu in Japan, Capannori in Italy, and Algeria. Kamikatsu has implemented a highly detailed waste sorting system that actively involves the local community, significantly reducing the amount of waste sent to landfills. In Italy, Capannori has adopted a zero-waste approach through policies such as door-to-door collection and reuse centers, achieving a high recycling rate. These initiatives highlight the importance of decentralization and citizen participation for effective waste management.
In Algeria, however, waste management remains largely standardized, hindering the development of effective local solutions. Compared to the Japanese and Italian models, it appears that greater citizen involvement and more autonomous local governance could serve as key levers to improve waste management in Algeria. These examples underline the need for enhanced citizen engagement.

**KEYWORDS**

Waste Management, Recycling, Reuse, Waste Reduction, Circular Economy, Citizen's Involvement, Decentralization And Zero Waste

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## 1. Introduction:

Household waste management is one of the major challenges facing contemporary societies due to rapid urbanization, increasing waste volumes, and their environmental and health impacts. In response to these challenges, transitioning to sustainable practices has become essential. This transition not only demands effort but also becomes a key driver for the success of waste management models.

In this context, international experiences provide valuable inspiration. Japan, with its rigorous waste sorting and recycling model, exemplified by the small community of Kamikatsu, illustrates a community-driven zero-waste approach. Similarly, Italy, particularly through the example of Capannori, stands out for its local initiatives and policies promoting a circular economy. These two cases demonstrate how citizen

involvement, coupled with appropriate legislative frameworks, can transform waste management into a tool for sustainability.

In Algeria, while progress has been made, challenges remain, particularly in raising awareness and mobilizing citizens. This article offers a comparative study of Japanese, Italian, and Algerian models to identify best practices and lessons for sustainable household waste management in Algeria. It highlights the central role of citizens in these systems and explores the necessary adaptations to strengthen their participation, considering local specificities.

The objective is to contribute to the discourse on possible pathways for a successful transition to sustainable practices in Algeria, drawing on insights from the Japanese and Italian models.

## 2. Research Methodology:

This article adopts a comparative and analytical methodology based on an exhaustive literature review, incorporating scientific articles, official reports, institutional documents, and case studies. The goal is to identify legislative frameworks, public policies, and citizen initiatives in Japan, Italy, and Algeria. The data collected provide context for each model and help understand their unique characteristics.

An analytical framework is used to compare the three systems based on key criteria: sorting and recycling policies, the role of citizens, institutional frameworks, and outcomes achieved. The cases of Kamikatsu in Japan and Capannori in Italy serve as emblematic examples, showcasing the importance of citizen participation and decentralization. The Algerian context is also examined.

Insights from this comparison are synthesized to formulate recommendations tailored to the Algerian context. These proposals are informed by international experiences while accounting for local constraints. The methodology thus aims to provide concrete pathways for sustainable waste management and enhanced citizen involvement in Algeria.

## 3. Legislative Frameworks for Household Waste Management in Japan, Italy, and Algeria:

Effective household waste management largely depends on the presence of appropriate legislative and institutional frameworks that guide local practices, structure responsibilities, and ensure active citizen participation. Each country develops its mechanisms based on its national priorities, economic constraints, and environmental culture.

In the three countries studied, major reforms in household waste management gained momentum in the early 2000s with the adoption of landmark laws that marked decisive turning points. These reforms responded to an increased awareness of environmental issues and the need to align local practices with international standards.

In Japan, while legislative foundations were laid as early as the 1970s, it was with the adoption of strengthened policies in the 2000s that the country fully committed to a circular economy, notably through laws on packaging recycling, electronic waste, and food waste.

In Italy, Legislative Decree 152/2006 often referred to as the Environmental Code, consolidated and modernized waste management regulations, while reforms such as Law 69/2007 reinforced decentralization and encouraged local initiatives. In Algeria, Law 01-19 of December 12, 2001, marked the beginning of a clear regulatory structure for waste management, followed by several decrees aimed at organizing sorting, collection, and recycling. Despite different socio-economic and cultural contexts, these legislative developments demonstrate a shared commitment by Japan, Italy, and Algeria to improve household waste management through robust legal frameworks and sustained reforms.

Examining key legislation reveals a timeline marked by successive reforms that have led to significant and continuous improvements in waste management in Japan and Italy, compared to Algeria, where efforts remain modest. The table below summarizes the main laws and key decrees adopted in each country to structure waste management:

*Table 01: Evolution of Legislative Frameworks for Household Waste Management in Japan, Italy, and Algeria*

| Country | Law/decree | Date | Main objective |
|---|---|---|---|
| **Japan** | Waste management Act of 1970, amended in 1992 and 1997 | 1970 -1990 | Adoption of EPR (Extended Producer Responsibility) and strengthening the role of municipalities. |
| | Law No.110 of June 2, 2000, on the creation of a society respectful pf the material cycle and its 06 recycling laws. | 1990 – 2006 | Aiming to regulate waste disposal practices, improve treatment technologies, and establish a framework for source reduction of waste.<br>The development of a material cycle management system (SMCM), introduction of the 3Rs (Reduce, Reuse, Recycle), sack-based pricing programs, also known as "pay as you throw", and recycling of various materials such as packaging, electronic devices, food waste, etc. |
| | Law No. 60 of April 1, 2022, plastic ressource circulation Act. | 2006 -2022 | Promotion of recycling and circular management of plastics, and promotion of the circular economy. |
| **Italy** | Law No. 475 of 1975 on waste management. | 1975 | Aiming for integrated waste management and emphasizing the importance of source reduction and waste recovery. |
| | The Ronchi Decree of 1997. | 1990-2000 | Introducing a rigorous regulatory framework, transforming waste management into an integrated sector, and incorporating European directives on waste and packaging. |
| | Law No. 152 replacing the Ronchi Decree and law No.191 of 2009. | From 2000 to today | Consolidation of previous regulations, introduction of strict standards for selective sorting and waste treatment. Establishment of mechanisms to promote extended producer responsibility (EPR). |
| **Algeria** | Law No.01-19 of December 12, 2001, on the management, control, and disposal of waste. | From 2001to today. | Establishing efficient and sustainable waste management and introducing extended producer responsibility for waste producers. |
| | Executive Decree No.02-372 of November 11, 2002, on packaging waste, and executive Decree No.2004-199 of July 19, 2004, on the public system for the treatment of packaging waste | | Reducing the amount of waste produced and promoting recycling and recovery of used materials |

**Source:** Author according to Madina Moshkal and al, sustainable waste management in Japan: challenges, achievements, and future prospects: a review. Published in sustainability 2024.P04, Gemechu beyene Mekonnem and Akihiro Tokai, a historical perspective of municipal solid waste management and recycling system in Japan: learning for developing countries. Journal of sustainable development 2020.P16, Toshi h Arimura and Akira Hibiki, introduction to environmental economics and policy in Japan, Edition Springer 2023.P92-98 and national waste agency (AND) 2024.

## 4. The Role of Decentralization and Citizen Participation in Household Waste Management:

Decentralization, by transferring certain responsibilities to local authorities, is often seen as a lever for improving the efficiency of waste management. By delegating the responsibility for waste collection, sorting, and treatment to the levels closest to citizens, local governments can better tailor solutions to the specific needs of their communities. Moreover, decentralization can promote the implementation of more transparent and participatory management systems. It provides citizens with a more active role in decisions concerning household waste management, whether through participation in local committees, awareness campaigns, or selective sorting initiatives. In this context, citizen participation becomes a key element in waste management.

Japan, Italy, and Algeria present varied contexts in terms of local governance and waste management, each developing distinct approaches influenced by their political structures and levels of decentralization.

In Japan, the Local Autonomy Law amended in 2000 played a pivotal role in strengthening decentralization by granting more powers to local authorities to manage various aspects of public life, including household waste management. This law enhanced citizen responsibility. Residents were encouraged to take an active part in waste reduction and recycling efforts, as local authorities could implement awareness and training programs at the municipal level. This decentralized model created a local dynamic of citizen participation essential for the success of waste management policies, leading to remarkable outcomes in cities like Kamikatsu, which adopted the zero-waste strategy.

Italy offers an interesting model of decentralized household waste management. Decentralization and citizen participation in Italy have evolved through significant legislative reforms that enhanced local autonomy. The 1993 reform decentralized powers, transferring essential responsibilities, including waste management, to regions and municipalities. This allowed local authorities to implement policies better suited to the specific needs of each territory. In 2001, autonomy was further strengthened, enabling more localized and responsive management of resources and waste. This decentralization facilitated sustainable citizen participation, as seen in the municipality of Capannori in Tuscany, which successfully implemented a zero-waste strategy.

In Algeria, waste management remains a major challenge. Although decentralization is provided for in the constitution and the 1990 and 2011 municipal code reforms, household waste management remains largely centralized at the national and municipal levels. The Ministry of the Environment is the primary actor in defining and implementing waste management policies, resulting in uniform approaches across the country. In this context, citizen participation remains limited, and the role of local governments is secondary. Community initiatives and individual efforts often face a lack of structural support and incentives from local authorities.

## 5. Results and Discussion:

### 5.1. Analysis of Waste Sorting and Recycling Practices: Comparative Case Studies

The rural commune of Kamikatsu, with approximately 1,500 residents, was the first in Japan to adopt a zero-waste policy in 2003. Over the past decades, it has established itself as an exemplary model in household waste management. However, the history of this commune has not always been so pristine; it transitioned from a time when waste was indiscriminately discarded to its current status as a leader in zero-waste practices. Waste sorting has become a deeply ingrained habit for the residents since 2003. They separate their waste into 45 distinct categories, including various types of plastics, metals, and even textiles. This meticulous organization is supported by tailored infrastructures, such as community centers where waste is carefully inspected before being recycled or composted.

This initiative is supported by strong public awareness campaigns and educational workshops to help citizens master sorting guidelines. This demanding model is the result of a partnership between the municipality and its residents. Kamikatsu demonstrates how a local and participatory approach can overcome challenges related to waste management, even with limited resources.

The evolution of the recycling rate in Kamikatsu since the implementation of the local zero-waste policy up to 2020 shows significant progress in the commune's recycling efforts. In 2000, the recycling rate was 56.5%, indicating an early commitment by local authorities and citizens to adopt sustainable waste management solutions. Between 2008 and 2010, Kamikatsu experienced a decline in its recycling rate, dropping below 50% in 2010.

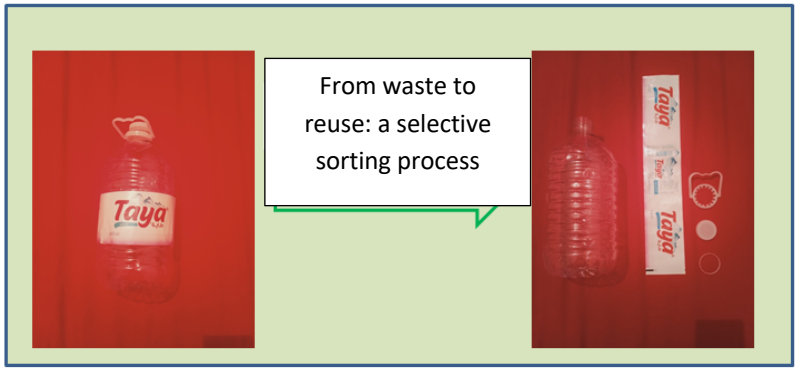


*Fig 01: Waste sorting following the Kamikatsu model – a water bottle divided into three categories. Source: Author, 2024.*

This decrease can be attributed to several factors, including the increased amount of waste sent for incineration, the complexity of waste sorting, and the expansion of waste categories, which grew to 34 types. In the years following 2010, the citizens' decision to pursue zero waste proved to be the right one. By 2020, the recycling rate had risen to 81%, compared to approximately 20% at the national level.

This demonstrates that, despite fluctuations, the commune maintained a strong commitment to recycling, making it a model for other localities.

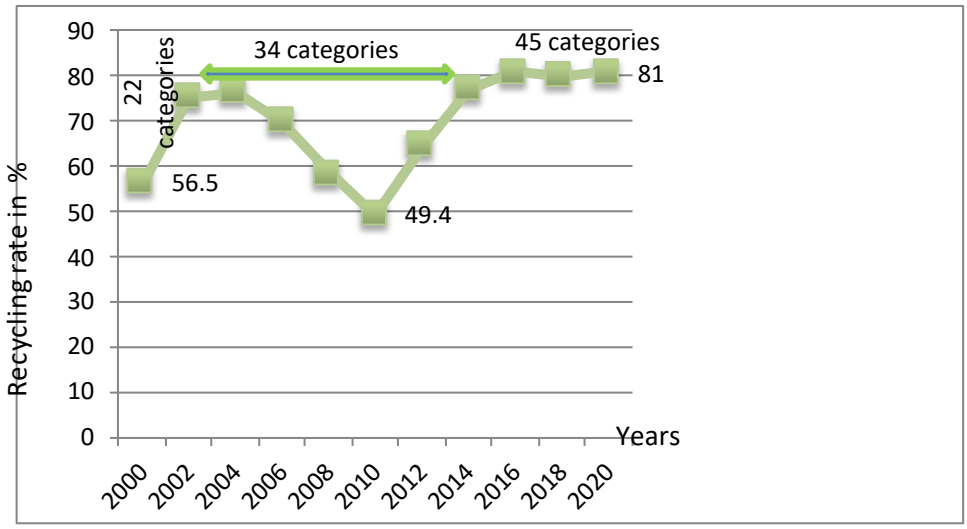


*Fig 02: Evolution of the recycling rate in Kamikatsu, Japan, from 2000 to 2020. Source: Author based on K. Shenyoputro and Thomas E. Jones, Reflections on a Two-Decade Journey toward Zero Waste: A Case Study of Kamikatsu Town, Japan, published in Frontiers in Environmental Science, 2023, p.02.*

In Italy, the municipality of Capannori exemplifies the zero-waste strategy at the European level, having adopted it since 2007 under the leadership of Rossano Ercolini. Its success lies in a combination of innovation, citizen participation, and institutional support. One of the initial steps was the introduction of door-to-door selective sorting, targeting a population of approximately 39,970 residents in 2007. This initiative led to recycling rates exceeding 80% by 2024.

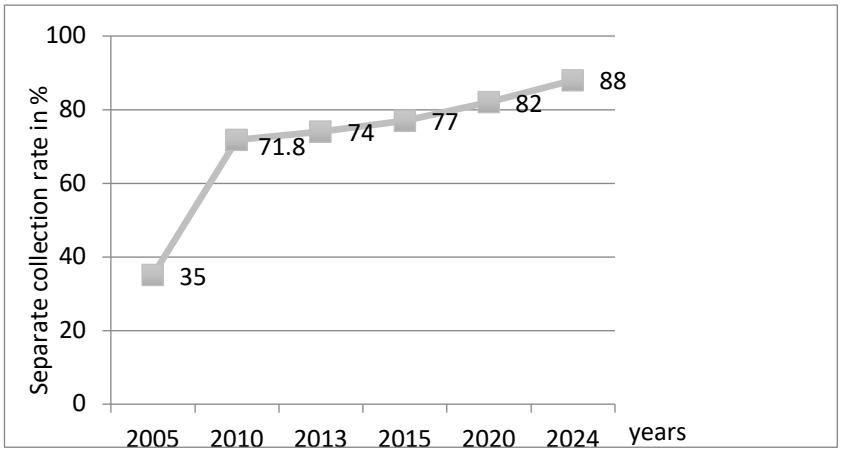


*Fig 03: Evolution of selective collection rates between 2005 and 2024 in Capannori, Italy.*
*Source: Prepared by the author based on data from www.journalcorse.com and Zero Waste Europe.*

This system, coupled with penalties for poor sorting and economic incentives for environmentally conscious households, quickly mobilized citizens. Capannori also established repair and reuse centers where reusable items are recovered and recirculated. Public awareness has been at the core of this transition. Educational campaigns were organized to highlight the benefits of zero waste, and citizens were involved in decision-making through local assemblies.

The municipality also collaborated with local businesses to reduce packaging and promote reusable products, thereby contributing to waste reduction at the source. This localized strategy demonstrates that zero-waste goals are achievable with strong local governance and an engaged community.

In Algeria, source separation and recycling remain limited. The waste recovery rate is nearly 10% of the 13.5 million tons of waste generated in 2020 (AND) across all sectors, which is very low compared to the quantities produced. The challenge is to triple the current rate by 2035. The infrastructures dedicated to waste management remain insufficient, with existing sorting centers being few in number and often poorly equipped, which limits their effectiveness.

The informal sector also plays an important role, with waste collectors manually retrieving recyclable materials, particularly plastic and metal. Although this activity is essential, it lacks structure and official recognition, hindering its integration into a formal circular economy. Furthermore, public awareness remains limited, with education and awareness campaigns being sporadic and not reaching the entire population.

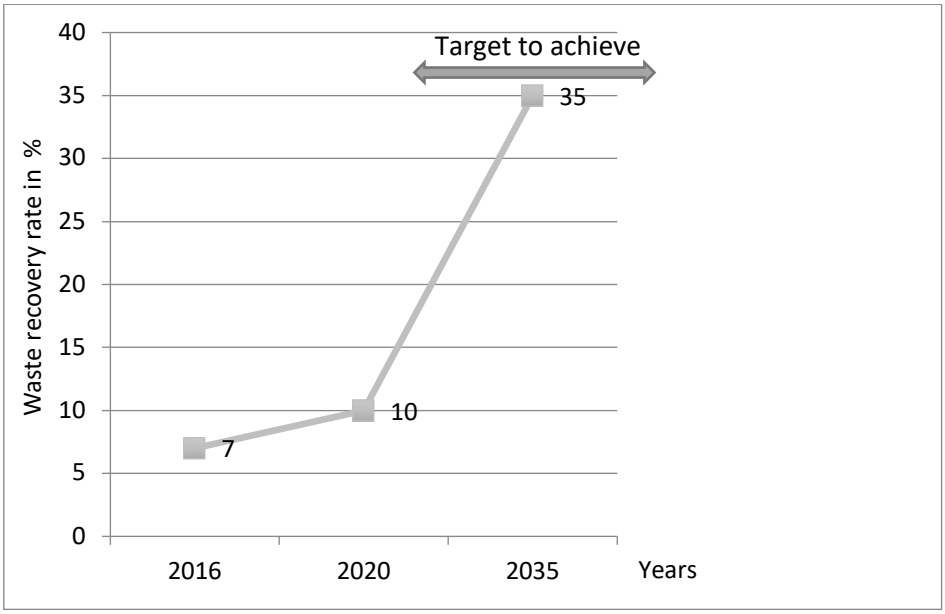


*Fig 04: the waste recovery rate in Algeria and the target to achieve according to the 2035 national integrated waste management scheme (SNGID).*
*Source: author based on data from the National Waste Agency, 2020.*

## 6. Toward Zero Waste: Future Prospects for Waste Management in Algeria

Waste management in Algeria is at a critical crossroads, requiring a transition to more sustainable and integrated models. The zero-waste concept, based on waste reduction at the source, reuse, and recycling, offers a promising pathway to address the country's growing environmental challenges. Currently, Algeria generates approximately 13.5 million tons of solid waste per year, 90% of which is landfilled. The ambitious goal set in the National Integrated Waste Management Strategy (SNIGD) aims to recover 35% of the waste generated by 2035. This initiative reflects a commitment to transitioning toward sustainable waste management by reducing landfilling and promoting recycling, reuse, and energy recovery. However, considering the insufficient infrastructure, lack of awareness and citizen involvement, complex governance, limited funding, and outdated technology, achieving this objective appears challenging.

Despite these difficulties, the zero-waste concept could serve as a guiding principle to redirect public policies and local practices, while also stimulating the green economy, creating new jobs, and protecting the environment for future generations.

## 7. Conclusions.

The examples of Kamikatsu in Japan and Capannori in Italy demonstrate that smaller municipalities can better facilitate participatory and tailored waste management. These experiences highlight the importance of local management autonomy in implementing environmental policies that are adapted to specific local conditions. Local authorities, being closer to their citizens, have successfully established a culture of recycling and waste reduction.

In both cases, the citizen's role is essential, extending beyond mere participation: they are the drivers of change. In Kamikatsu, residents, together with local stakeholders, implemented an extremely rigorous sorting system that brought the municipality close to achieving zero waste. In Capannori, citizen mobilization led to the first zero-waste program in Italy, proving the capacity of citizens to steer local policies toward more sustainable solutions.

Algeria can draw a fundamental lesson from these examples: successful waste management cannot occur without active citizen involvement from the outset. By granting local communities greater autonomy and promoting genuine decentralization, Algerian municipalities could encourage the emergence of similar citizen-driven initiatives capable of initiating significant changes toward sustainable household waste management. It would be wise to start with small municipalities, towns, or villages in Algeria, where direct citizen involvement and the proximity of local authorities could help test and adapt innovative solutions before scaling them up.

**Conflicts of interest:** The authors declare no conflict of interest.

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