

Research on the Effectiveness of Urban Waste Sorting in the New Era: A Case Study of Shanghai

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Abstract

This study examines the effectiveness of urban waste sorting policies in Shanghai, reflecting on their implementation, achievements and challenges in the context of China's ecological civilization framework. Through field visits, citizen hotline inquiries, surveys and literature analysis conducted from September to October 2024, the research identifies significant progress in establishing a full-process waste sorting system, including increased public compliance and enhanced waste treatment capacities. However, challenges such as low public participation, insufficient stakeholder coordination and limited policy sustainability remain. To address these issues, the study proposes enhancing public engagement in policy-making, increasing market participation in waste management and fostering social involvement to ensure long-term effectiveness. The findings contribute to the broader discourse on sustainable urban governance and waste management in mega-cities.

Keywords

Urban Waste Sorting, Public Participation, Grassroots Governance

1. Introduction

General Secretary Xi Jinping has profoundly emphasized that “implementing waste sorting is directly related to the living environment of the people, the conservation of resources, and is also an important indicator of social civilization.” (People's Daily Commentator, 2019) Waste sorting is not a trivial matter; it is a fundamental livelihood issue and an integral part of ecological civilization. Since entering the new era, with rapid economic and social development and the

significant increase in material consumption levels, the volume of waste generated in China has grown rapidly. This not only leads to resource wastage but also exacerbates environmental risks, becoming a key constraint to sustainable economic and social development and a major concern for the public. Implementing waste sorting and treatment can promote resource recycling, effectively improve living environments, enhance national awareness, and drive social progress.

Waste management is a critical initiative for Shanghai's development as an innovative, cultural, and ecological city, playing an essential role in its urban governance. At the celebration of the 30th anniversary of the development and opening of Pudong, Xi Jinping emphasized, "Cities are built by the people, and serve the people. Cities should prioritize making life livable and comfortable for residents, reserving the best resources for the people" (Xi, 2020a). The relationship between cities and people is one of mutual dependence and common development. Regarding the governance of mega-cities, Xi Jinping further pointed out that "it is necessary to establish a full-cycle management awareness, accelerate the modernization of the urban governance system and capacity, and strive to find a new path suitable for the characteristics and laws of mega-city governance" (Xi, 2020b).

Based on this, it is necessary to investigate the implementation of Shanghai's waste sorting policy to clarify its overall situation, achievements, and challenges, and propose corresponding countermeasures through comprehensive analysis. This study employs in-depth interviews, surveys, and literature analysis. From September to October 2024, the author conducted field visits, inquiries via the citizen hotline, and interactions on the Shanghai Municipal Government's "One-Stop Online Service" platform to interview over ten individuals, including street (township) office staff, community residents' committee staff, students, and residents, deepening the understanding of the research topic. Additionally, questionnaires were distributed to residents through community committees, and the results were collected. Finally, literature was extensively reviewed, and analytical and inferential methods were applied to discuss the issues and countermeasures related to the implementation of the waste sorting policy.

2. The General Situation and Achievements of Shanghai's Urban Waste Sorting in the New Era

Although waste is small in scale, it is closely tied to public livelihood and civilization. The Shanghai Municipal Household Waste Management Regulations came into effect on July 1, 2019. Over the past five years, with collective efforts across the city, Shanghai has essentially established a full-process waste sorting system. Public awareness of waste sorting has significantly improved, sorting habits have been widely adopted, and the "Shanghai Model" of waste sorting has taken shape, effectively contributing to the development of a "People's City."

2.1. Significant Progress in Non-Hazardous Treatment of Household Waste

From January to May 2024, Shanghai's daily sorted waste volumes included 7627

tons of recyclables, 2.1 tons of hazardous waste, and 9111 tons of kitchen waste, while dry waste was transported at 17,060 tons per day. Compared to data from June 2019, the “three increases and one decrease” results are evident: kitchen waste increased by 70%, and dry waste decreased by 17%. Currently, 97% of residents consciously fulfill their waste-sorting obligations, with the compliance rate of waste sorting in residential communities rising from 15% before the regulation’s implementation to 95%. All household waste in Shanghai is now treated in a non-hazardous manner, achieving “zero landfill” for raw household waste (Chen, 2024).

Student from Shanghai Guangming High School.

“I first encountered waste sorting policies during primary and middle school. Initially, my family didn’t understand the difference between dry and wet waste. However, after persisting for several years, our community has improved its waste-sorting efforts, and residents have become more involved.” (September 29, 2024)

2.2. Steady Improvement in Back-End Resource Processing Capacity

Shanghai has nearly completed its full-process waste sorting system. The city now operates 15 incineration plants, 10 centralized kitchen waste treatment facilities, and has a daily resource utilization capacity of 36,000 tons for dry and wet waste. Additionally, there are over 15,000 recycling service points, 198 transfer stations, and 15 distribution centers for recyclables. By the end of the 14th Five-Year Plan, Shanghai’s resource utilization capacity for incineration and kitchen waste processing is expected to reach 38,000 tons per day, ensuring sufficient capacity for the daily processing of approximately 26,000 tons of dry and wet waste and providing robust support for handling other solid waste (Zhou, 2023).

2.3. Revitalizing Urban Grassroots Communities

Using waste sorting as an entry point, Shanghai has launched a series of promotional activities in grassroots communities. These initiatives not only foster harmonious neighborhood relations but also serve as a foundation for grassroots party-building efforts, encouraging residents to co-create, co-govern, and share a better home. Simultaneously, under the co-governance model of waste sorting, residents’ sense of participation and satisfaction has steadily improved.

Staff member from the Yeshiyuan Residents’ Committee, Laoximeng Residential District, Huangpu District.

“At the beginning of implementing waste sorting, we faced many challenges, but with residents’ collective efforts, we achieved remarkable results. Now, when discussing community matters, we can mobilize both long-term residents and newcomers. Waste sorting has helped grassroots governance become more cohesive.” (October 15, 2024)

2.4. Waste Sorting Concepts Deeply Rooted in Public Awareness

As early as the end of 2018, targeted waste sorting awareness campaigns were launched across Shanghai to educate residents about sorting practices and con-

cepts. These efforts cultivated a sense of environmental responsibility and fostered social recognition based on a circular economy. According to a survey conducted by the author on October 12-13, 2024, in Yongxin Community, Xinjing Town, Changning District, 92.72% of residents expressed “strong approval” or “moderate approval” for waste sorting (see **Table 1**). In a test of waste sorting knowledge (see **Appendix 1**), 96.67% of respondents answered all five questions correctly (see **Table 2**).

Table 1. Approval ratings for waste sorting.

Survey Results on Waste Sorting Approval	Strong Approval	Moderate Approval	Disapproval
Number of Respondents	42	9	4
Proportion	76.36%	16.36%	7.27%

Table 2. Results of waste sorting knowledge test questions.

Test Results on Waste Sorting Knowledge	Correct on All 5 Questions	Correct on 4 Questions	Correct on 3 or Fewer
Number of Respondents	29	1	0
Proportion	96.67%	3.33%	0%

From the perspective of promoting Shanghai’s waste sorting policy, this is a process of constructing knowledge about waste classification. For many residents, learning the relevant knowledge of waste sorting is merely the first step. What is more critical is understanding how the standards and knowledge of waste sorting are formed, as well as shaping a cultural awareness of waste classification—transforming the mindset from “being required to sort waste” to “wanting to sort waste.” Breaking the dilemma of the “waste siege” cannot be achieved by focusing solely on the waste disposal phase; instead, a comprehensive approach must be taken from the very source of waste sorting. Urban household waste management involves multiple stakeholders, requires interdepartmental coordination, and is influenced by a variety of factors. The effectiveness of such policies in a specific city depends on whether all government departments related to waste sorting can work together to address the bottlenecks in policy implementation.

In advancing waste sorting in Shanghai, communities and property management companies have played a pivotal role. Communities, guided by party-building initiatives, have achieved comprehensive control over grassroots governance, while property management companies provide basic services to residential areas and property owners in a market-driven manner. This collaboration ensures the optimal implementation of waste sorting policies.

3. Challenges in Shanghai’s Urban Waste Sorting in the New Era

3.1. Relatively Low Resident Awareness and Participation Levels

In the current context of community governance, there remains a persistent issue

of “enthusiasm from a minority, indifference from the majority.” This “participation apathy” results in low public engagement in grassroots governance. Scholars believe that the lack of a “residential identity” among community members is a primary reason for their limited participation in grassroots governance. Many residents feel no sense of belonging or recognition regarding their community, nor do they perceive themselves as members of that community, making it difficult to foster enthusiasm for involvement in community affairs. In practice, Shanghai’s waste sorting efforts have been driven by a top-down government approach, which inevitably places pressure on the administrative system. Under this pressure-driven model, the implementation of waste sorting policies tends to focus more on achieving results rather than emphasizing the process. As a result, different regions often prioritize certain groups while neglecting the majority, leading to enthusiasm from a minority and indifference from the majority. Recent studies suggest that low public participation in waste management often stems from a lack of understanding and perceived inconvenience. Tailored educational campaigns and incentives can significantly boost resident engagement (Yadav & Pathak, 2020).

In summary, waste sorting efforts are still primarily government-driven. The phenomenon of “enthusiastic street-level officials versus indifferent grassroots citizens” indicates that solely relying on government initiatives is insufficient for long-term and effective governance. Despite policy promotion and pilot programs, the current development status reveals that mechanisms to encourage resident participation in governance are still incomplete, and policy implementation is constrained by limited government manpower, financial resources, and material conditions.

Therefore, a key issue for China in advancing waste sorting policies is how to enhance public communication and guidance, fostering awareness among citizens about the importance of waste sorting and encouraging their involvement in the decision-making and legislative processes. Only by fully engaging the public can a waste management system led by the government, guided by the market, and actively participated in by citizens be ultimately established.

3.2. Insufficient Coordination among Grassroots Governance Stakeholders

From the perspective of actual policy implementation, challenges such as poorly planned placement of waste bins, untimely waste collection, and low efficiency in waste processing persist. Waste sorting is now integral to grassroots social governance, requiring ongoing improvements to long-term management mechanisms. In the early stages of implementing waste sorting policies in Shanghai, many communities adopted economic incentives or points—based reward systems. While such strategies effectively curbed improper waste disposal in the short term and nurtured residents’ sorting habits, they lacked sustainability. Economic incentives, when applied strategically, can drive behavioral change. However, research

cautions that reliance on short-term rewards may undermine intrinsic motivation, necessitating a shift toward long-term educational and community-based interventions (Deci & Ryan, 2020). Under the logic of economic incentives, residents would need ongoing material rewards to fully develop waste sorting habits, which would significantly increase policy costs and is not feasible under current conditions.

Resident from Minghui Xijiao Garden, Xinjing Town, Changning District:

“In 2018, when Changning District began piloting waste sorting, they introduced a points system where compliant sorting earned points that could be exchanged for daily necessities such as rice, flour, oil, and tissues. They said the program would run long-term, but by the end of 2018, it stopped without notice, and the points we had accumulated became useless.” (October 12, 2024)

4. Countermeasures for Addressing Challenges in Shanghai’s Urban Waste Sorting Governance

4.1. Enhancing Public Participation in Policy Formulation

Public opinion is the foundation of public policy. During the problem identification phase, public input plays a crucial role in bringing issues to the forefront, while citizen feedback serves as an important reference for policymakers designing solutions (Zhu, Zhu, & Li, 2019). In many instances of public policy formulation in China, government departments have adhered to a people-centered approach, soliciting input from various societal sectors. However, during the localized implementation of waste sorting policies in Shanghai, public engagement has been relatively low. For example, residents frequently report that they were not consulted on the placement of waste bins or the time windows for centralized waste disposal. This lack of public involvement contrasts sharply with other public policy processes that often involve extensive consultation before policies are introduced. One reason for this indifference is that waste sorting policies require individuals to significantly alter their daily habits, a change for which the public may not feel an urgent need. As a result, they lack enthusiasm for participating in subsequent policy discussions.

Our interviews were conducted in representative communities within Changning District and Putuo District of Shanghai. These two central districts are emblematic of the implementation of the waste sorting policy and reflect the diverse population of Shanghai.

Resident from Yongxin Community, Xinjing Town, Changning District:

“I think some people are resistant to the waste sorting policy. Fundamentally, even though the policy mandates it, many people believe how they dispose of waste is their personal freedom. Additionally, the centralized placement of waste bins wasn’t planned with resident input. The bins are far from most buildings in the community. No matter where you place them, someone will complain. Some waste is heavy; previously, you could dispose of it downstairs. Now, you have to walk a long way, so enthusiasm naturally decreases.” (September 30, 2024)

Resident from Xingxia Community, Xinjing Town, Changning District:

“I’m used to waste sorting now, but at the beginning, there was no transition period. They suddenly announced it without consulting residents. I’m a senior, so it’s fine for me, but when the policy first started, the time restrictions for waste disposal during weekdays were so strict that young people who worked long hours couldn’t manage to comply.” (September 30, 2024)

Waste sorting is a moderately engaging issue: it requires minimal specialization but carries significant social implications. The policy aims to sustain public engagement (Fu & Wang, 2022). Generally, the stronger the public’s awareness of participation, the more actively they will engage in grassroots governance, and the better the policy outcomes will be (Nan & Chen, 2022). Low levels of public participation often stem from the perception that waste sorting policies are unrelated to personal interests, with some residents believing they still have the “freedom” to dispose of waste as they please. In practice, residents’ reluctance to engage in community governance often arises from a lack of connection between governance issues and their daily lives. For policies like waste sorting, whose importance may not be immediately apparent to the public, the government needs to strengthen public education during the agenda-setting phase, encouraging residents to contribute ideas during the policy-making process. This will help residents understand the significance of the policy, its development process, and its impact on both individuals and society, thereby reducing difficulties during implementation.

Resident from Xianxia Dajun Community, Xinjing Town, Changning District:

“I’m young and feel waste sorting is a good policy, but it places high demands on the overall quality of citizens. After the policy was implemented, the garbage bins in our community were moved far away. I often see residents throwing trash in the old bin locations, even though the bins are gone. They don’t want to walk to the new centralized disposal points, and in the end, cleaners have to pick up the trash and return it to the proper area.” (September 30, 2024)

Moving forward, the government should expand institutionalized channels for public participation in subsequent revisions to waste sorting policies. Public input should be encouraged, particularly on decisions affecting their interests, to make policy-making more scientific and democratic. By improving democratic channels for grassroots community governance, residents’ committees and village committees can address practical issues raised by the public. This will prevent a disconnect between government decisions and public needs, ensuring that residents meaningfully engage in policies affecting them. Ultimately, this will optimize the allocation of public resources and facilitate the smooth implementation of livelihood-oriented policies.

4.2. Increasing Market Participation in Policy Implementation

Market and business involvement is essential to waste sorting policies, as these entities play a decisive role in resource allocation during waste treatment. Private

sector involvement in waste management has been shown to enhance operational efficiency and innovation. For instance, public-private partnerships (PPPs) in waste treatment have successfully reduced costs while improving recycling rates in several global cities (Guerrero et al., 2021). In cities where waste sorting policies have been successfully implemented, governments have established effective partnerships with businesses to promote policy execution. For instance, in some places, kitchen waste accounts for over 60% of daily waste. Specialized biotechnology companies process this waste through pre-sorting, high-temperature aerobic fermentation, and post-treatment deep processing, converting it into soil conditioners for agricultural use. Since kitchen waste is rich in proteins and energy, its transformation into soil conditioners enhances soil quality and reduces environmental pollution and resource wastage.

Staff from the Urban Planning and Environmental Protection Office, The People's Government of Xinjing Town, Changning District:

“Waste management must involve businesses. Waste treatment is a highly specialized task that the government cannot handle on its own. Many steps require professional third-party companies. One significant challenge for the government is limited financial resources. Building dedicated kitchen waste processing facilities or transfer stations is costly, and finances have been tight in recent years. However, as fiscal conditions improve, the priority should be to involve more market players, which will help streamline all aspects of waste sorting. Otherwise, if the backend remains disorganized after front-end sorting, the entire effort will be in vain.” (October 10, 2024)

A 2022 study of waste management practices in Asia found that cities focusing on waste reduction at the source, combined with robust recycling initiatives, were able to decrease landfill dependency by over 30% (Zaman & Ahsan, 2022). Such results underscore the importance of incorporating circular economy principles into waste sorting policies. Waste sorting involves three stages—front-end precise sorting, midstream standardized collection and transportation, and backend categorized processing. Advances in technology, such as AI-driven waste sorting systems and IoT-enabled monitoring, have revolutionized waste management practices. Research indicates that cities leveraging these technologies have achieved greater efficiency and reduced contamination rates in recycling streams (Singh et al., 2021). While front-end sorting depends on public compliance, the midstream and backend stages require extensive involvement from market entities. Specialized third-party companies can manage centralized collection and transportation while also accelerating the construction of on-site kitchen waste processing facilities, bulky waste shredding and sorting sites, and hazardous waste storage facilities. This comprehensive approach ensures a complete policy cycle and guarantees effective implementation.

4.3. Enhancing Social Participation in Policy Execution

Waste sorting is a long-term policy that benefits the nation and its people, not

a short-term initiative. Sustainable waste policies require long-term commitment and adaptability. Research shows that continuous policy evaluation and stakeholder engagement are critical for maintaining momentum and addressing emerging challenges (Baud et al., 2020). All stakeholders must recognize that we are now in a “waste sorting era,” and this policy must continue indefinitely. Cities that have made significant progress in waste sorting have invested substantial human, financial, and material resources, demanding high levels of grassroots governance.

In China, grassroots governments bear a large portion of governance responsibilities. Over time, it will be unsustainable for grassroots governments to shoulder the entire burden of waste sorting. Therefore, it is essential to involve more social actors and restructure the governance system for waste sorting. During the research process, the challenges faced by grassroots communities in implementing waste sorting policies have become increasingly evident.

Staff member from the Liziyuanliucun Residents' Committee, Taopu Town, Putuo District:

“In our town, property management companies are responsible for waste sorting in most residential areas. However, older communities like ours charge very low property fees, about 50 - 60 yuan per month. With rising costs and increasing public affairs, it's hard to cover expenses. If we raise property fees, residents won't accept it. Waste sorting requires significant funding for infrastructure construction and manpower. Relying solely on property fees isn't enough, so the financial pressure on all sides is immense.” (October 19, 2024)

Social participation is crucial for the long-term implementation of waste sorting policies. Grassroots community organizations or relevant social groups can actively mobilize residents to participate in waste sorting efforts. Social organizations can play roles in persuasion, participation, and guidance, adapting to different governance contexts (Li & Li, 2021). Non-governmental organizations (NGOs) and social enterprises have increasingly taken up key roles in waste governance. Their ability to engage communities and foster partnerships has proven critical in bridging gaps between policy and practice (Vollmer et al., 2021). Additionally, social organizations have autonomy and flexibility, making them valuable allies in grassroots governance. For example, they can use community bulletin boards or other innovative methods to educate the public about waste sorting. Incentive mechanisms can also be established to reward individuals who excel in waste sorting, encouraging broader societal engagement. For instance, during the summer of 2024, the Shanghai Communist Youth League and the Shanghai Greenery and Public Sanitation Bureau jointly organized a series of youth-oriented waste sorting campaigns, including trash pickup events, milk carton recycling initiatives, and eco-friendly crafts workshops. Notably, these activities were open for public registration, attracting diverse groups of young people (Wang, 2023).

Reducing waste generation is the central goal of urban waste policies in the EU and the UK. A successful waste management system should focus on minimizing

waste production, addressing both technical factors (collection, disposal, recycling) and issues of social governance. From Shanghai's experience, more efforts are still needed to reduce the total amount of waste generated, which involves transformative changes to the entire production system. Moreover, unlike Western countries that impose fines for non-compliance with waste sorting policies, Shanghai has not adopted such punitive measures. This is because, at the initial stage of implementation, the focus was on a gradual approach—ensuring the policy was acceptable to residents rather than enforcing it rigidly through fines. Thus, the implementation of waste sorting policies requires mutual support from residents, institutions, and technological advancements.

5. Conclusion

Since the 18th National Congress of the Communist Party of China, the central government, led by Xi Jinping, has incorporated ecological civilization into the “Five-Sphere Integrated Plan” for China's socialist development. The report of the 20th National Congress further identified “harmony between humanity and nature” as a key component of Chinese modernization. The Third Plenary Session of the 20th Central Committee emphasized the need to “improve the ecological civilization system, promote carbon reduction, pollution control, green development, and growth simultaneously, and accelerate the institutionalization of the ‘lucid waters and lush mountains are invaluable assets’ philosophy.” Waste sorting is a microcosm of this vision, reflecting the broader framework of Xi Jinping's ecological civilization thought. It also embodies the achievements of environmental protection, sustainable development, and ecological civilization over the 75 years since the founding of the People's Republic of China.

The implementation of waste sorting in Shanghai serves as a comprehensive indicator of urban management capabilities and citizen quality, representing a key benchmark for social progress. This study reveals that Shanghai's waste sorting policy has met expectations, achieving notable success and establishing a renowned “Shanghai Model” for waste management. The “Shanghai Model” aligns with global best practices in waste management, emphasizing integrated approaches that combine policy, technology, and community participation. Such models can serve as benchmarks for other mega-cities aiming to implement sustainable waste management systems (Karak et al., 2020). While the accomplishments are commendable, challenges such as low public participation and limited coordination among governance stakeholders remain. Efforts must continue to address these issues, ensuring that this critical initiative enhances public satisfaction, well-being, and security in a more substantial, sustainable, and guaranteed manner.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Appendix 1. Waste Sorting Knowledge Survey Questions

- 1) Clean old clothes belong to:
 - A. Hazardous waste
 - B. Recyclable waste
 - C. Dry waste
 - D. Wet waste
- 2) Tea leaves should be disposed of in which bin?
 - A. Hazardous waste
 - B. Recyclable waste
 - C. Dry waste
 - D. Wet waste
- 3) Waste paper belongs to:
 - A. Recyclable waste
 - B. Dry waste
 - C. Hazardous waste
 - D. Other waste
- 4) Used fluorescent tubes belong to:
 - A. Hazardous waste
 - B. Recyclable waste
 - C. Dry waste
 - D. Wet waste
- 5) Hazardous waste includes:
 - A. Insecticides
 - B. Used tissues
 - C. Expired cooked food
 - D. Soda cans