

Current Situation and Countermeasures of Household Waste Classification in Feixi County, Hefei City

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Abstract Feixi County has made significant progress in promoting waste classification, such as establishing a comprehensive classification system, and effectively reducing environmental pollution and waste volume. However, with the increase in waste generation, the county faces multiple challenges especially in the disposal of kitchen waste and improvement of residents' environmental awareness. To address these issues, Feixi County has implemented various measures, such as strengthening the construction of infrastructure for waste classification, improving regulations and clearly defining responsibilities, enhancing residents' environmental awareness to encourage their participation in waste classification through education and promotion, and increasing supervision to ensure effective implementation of the work. It emphasizes community governance, encourage all parties to participate in it, and strengthen publicity, education and training to enhance residents' participation. Feixi County has achieved positive results, but efforts are needed to further improve facilities, raise awareness, enhance supervision, and ensure the continuous effectiveness of waste classification work to promote urban green sustainable development.

Key words Household waste classification; Current situation; Countermeasures; Feixi County

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With the rapid increase in global productivity and sustained economic prosperity, China has inevitably faced the severe challenge of a sharp rise in waste production. It is predicted that by 2035 and 2050, China's annual waste production will reach staggering 5.48 billion tons and 6.52 billion tons respectively. This "waste siege" phenomenon has seriously hindered urban sustainable development and poses a significant threat to the ecological environment.

In response to this environmental crisis, the Chinese government has demonstrated a high sense of responsibility and foresight, setting ambitious goals to achieve carbon peaking by 2030 and carbon neutrality by 2060. To realize these objectives, the State Council has promptly issued a series of policies to accelerate the construction of a green, low-carbon, and circular economic system, placing resource recycling at the core. Waste resource utilization, a key component of this strategy, not only effectively alleviates environmental burdens but also creates substantial economic value through technological innovation and industrial upgrading, forming a virtuous cycle^[1].

As a pioneering province in national waste classification efforts, Anhui Province actively responds to the national call. In particular, Feixi County in Hefei City, as part of the first batch of

key cities for waste classification nationwide, has made significant progress in waste classification in recent years. Through meticulous planning, Feixi County has not only improved the legal system for waste classification but also established detailed local management standards to ensure a systematic and evidence-based approach to waste classification. Additionally, the construction of numerous waste classification collection points has provided residents with convenient disposal conditions, effectively promoting the formation of waste classification habits. In this paper, the current status of waste classification in Feixi County will be further analyzed, and existing issues and challenges will be explored. Meanwhile, targeted strategies and measures will be proposed to provide valuable insights for waste classification work in the region and across the country.

1 Current situation of urban and rural household waste classification in Feixi County

Currently, waste is mainly categorized into kitchen waste, recyclables, other waste, and hazardous waste in Feixi County. In 2022, the daily production of household waste in Feixi County was approximately 720 t, increasing to around 820 t/d in 2023 and 920 t/d in 2024, in which the daily collection volume of kitchen waste is about 100 t^[2]. Due to the low calorific value of kitchen waste, incinerating it together with other waste would result in incomplete combustion and the generation of harmful substances such as dioxins. Additionally, its high moisture content would lead to the production of a large amount of leachate if it is landfilled together with other waste, causing surface water and groundwater pollution. Therefore, it is essential to separate kitchen waste from other waste for proper classification; otherwise, it would contaminate re-

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cyclables, reduce their recyclability rate, and increase the overall waste treatment volume in the city. Kitchen waste that has been centrally collected and classified is processed by environmentally friendly kitchen waste treatment equipment to produce fertilizers, which can be used for cultivation, thus enabling the reuse of kitchen waste^[3].

Feixi County has strengthened the management of waste classification transportation. Specialized transport vehicles have been equipped according to the requirements of the "four-category" waste classification, with clear classification transportation markings to ensure good sealing, clear identification, energy efficiency, and environmental protection. Kitchen waste is promptly collected within 24 h and transported to kitchen waste disposal facilities, while hazardous waste is transported by qualified transport units to disposal enterprises for standardized and safe disposal. Other waste is transported to waste incineration plants or sanitary landfills for harmless treatment.

In order to thoroughly implement the important directives and instructions on waste classification work by General Secretary Xi Jinping, and to implement the *Regulations on the Household Waste Classification Management in Anhui Province*, *Regulations on the Household Waste Classification Management in Hefei City*, and *Implementation Plan for Further Advancing Household Waste Classification Work* (Document No. 85 of the Anhui Provincial Government), Feixi County has formulated the Implementation Plan for Household Waste Management in Feixi County. This plan aims to comprehensively promote waste classification work in the county, and accelerate the establishment of a waste classification system based on the rule of law, government promotion, public participation, and local conditions. It also aims to accelerate the construction of a waste treatment system covering waste classification, collection, transportation, and disposal, establish a long-term mechanism, promote habit formation, and enhance the reduction, resource utilization, and harmless treatment levels of household waste. Currently, Hefei City has clear requirements and divisions for the collection and transportation volume of kitchen waste^[4].

2 Factors influencing waste classification in Feixi County

2.1 Incomplete infrastructure The *Detailed Rules for the Implementation of Regulations on Household Waste Classification Management in Hefei City* stipulate that the facilities for household waste classification collection should not be too dense or too sparse, and one facility should be set up for every 300 – 500 households in principle. Currently, the county has solid waste classification pilot projects in progress. Fourteen bio-composting ridges have been newly built in rural areas, and 213 waste classification kiosks (waste collection points) have been established within 170 communities (administrative villages), with standardized classification bins. However, the quantity of these facilities is far from enough for effective waste classification disposal.

2.2 Lack of clear standards in waste classification regulations Through investigation, it was found that Feixi County have no comprehensive environmental laws and regulations. Well-defined waste classification regulations provide strong constraints for advancing waste classification work, and it is challenging to sustain waste classification efforts effectively if there is no complete regulations. The waste classification in Feixi County mainly adhere to the standards of waste classification in Anhui Province and Hefei City, without specific regulations for Feixi County^[5].

2.3 Unclear division of waste classification responsibilities The unclear delineation of responsibilities at various levels leads to a lack of rigid constraints and mandatory safeguards during implementation. In recent years, Hefei City has initiated household waste classification work. As a county under the jurisdiction of Hefei City, Feixi County started waste classification work relatively late. The incomplete waste classification policies have resulted in a lack of clarity among responsible entities, inadequate conscientiousness towards waste classification, and overlapping responsibilities.

2.4 Inadequate waste classification promotion Despite the increase of efforts in waste classification promotion in Feixi County, the promotion of household waste classification lacks continuity and depth. Currently, many residential areas primarily rely on streets and communities as the main bodies for promotion. The methods, content, and means of promotion are relatively rigid, with simple posting of waste classification flyers alongside other notices. The county has not fully utilized new media, relying solely on news coverage, posters in neighborhoods, and distribution of brochures in communities, which have limited effectiveness in changing residents' habitual thinking and behaviors. Close-range promotion methods like "door-to-door" and "face-to-face" interactions lack depth in execution, and there is no in-depth research on the location, effect and effective coverage of publicity materials. The elderly population at home is covered well, but the coverage of young people who are out working during the day is limited. Long-standing habits of mixing waste are hard to change in a short period. Due to the lack of motivation for waste classification in daily life, as well as inadequate integration of environmental protection education in basic and higher education, waste classification is superficially reported as news, and the public's understanding of garbage classification is superficial.

2.5 Incomplete reward and punishment mechanisms Reward and punishment mechanisms are crucial for guiding residents in waste classification. Rewards can effectively stimulate residents' enthusiasm for waste classification, instill their self-awareness, competitiveness, and a sense of ownership, promote their development, and foster a societal atmosphere conducive to waste classification. However, it was found through feedback that Feixi County currently has no clear reward and punishment mechanisms.

2.6 Lack of waste classification knowledge among residents Most people rely on life experience for waste classification, lacking proficient knowledge in the area. Effective waste classifica-

tion requires active participation and cooperation from citizens, but many residents currently have no adequate knowledge of waste classification. They are unaware of waste classification and its significance and impact. As a result, many people are skeptical or even dismissive of waste classification.

3 Strategies and recommendations for the development of waste classification among urban and rural residents in Feixi County

Waste classification is a critical aspect of people's livelihoods and a significant component of sustainable development, and reflects societal civilization. The widespread implementation of waste classification systems is not only a crucial aspect of people's livelihoods but also a major component of green development. It is an important reflection of Xi Jinping's ecological civilization ideology and embodies the "Two Mountains" concept. Waste classification is one of the most universally beneficial aspects of people's livelihoods. Promoting universal waste classification is conducive to sustainable development and the construction of a nature-friendly society. Therefore, according to the current status and issues of waste classification in Feixi County, the following recommendations are proposed for waste classification among urban and rural residents in Feixi County.

3.1 Harnessing the leading role of the government

3.1.1 Promoting the construction of waste classification infrastructure. Waste classification facilities are essential for implementing a waste classification system. Presently, one of the main challenges hindering waste classification progress in Feixi County is the inadequate infrastructure. Therefore, it is necessary to strengthen funding at all levels, enhance support for the renovation of waste classification collection points, the update of collection and transportation equipment, and the standardization upgrade of recyclable materials. The construction of waste classification infrastructure can be improved in the following ways.

Firstly, centralized waste classification disposal points should be built to facilitate waste separation. Convenient and practical waste classification disposal devices should be set up according to local conditions, and containers, box rooms, and stations of waste classification collection should be strategically placed in residential communities, commercial areas, and office spaces.

Secondly, it is needed to build waste classification transfer stations based on local conditions to prevent odor pollution caused by prolonged waste transportation.

Thirdly, it is necessary to upgrade existing waste collection and transportation facilities, and promote the use of compacting collection equipment to address issues such as dirt, odor, noise, and spillage during waste collection, transfer, and transportation processes. Besides, the use of Internet of Things technology should be explored to optimize routes, ensure cost-effectiveness, and promote environmentally friendly waste collection models.

Fourthly, a comprehensive waste classification transportation system should be established to effectively connect the waste clas-

sification input and processing ends and prevent the issue of "sorting before mixing". Meanwhile, it is needed to fill gaps in the recycling chain, establish a industry chain of "recycling – classification – clearance – regeneration" for household waste, and actively nurture intelligent waste recycling enterprises. In addition, it is necessary to make full use of internet of things, big data, cloud computing, and other information technologies to streamline waste classification, input, collection, transportation, and processing processes, reduce manual labor and significantly enhance management efficiency.

3.1.2 Improving local laws and regulations according to local conditions. To effectively implement General Secretary Xi Jinping's important directives on waste classification work, and comply with the spirit of regulations such as the *Regulations on the Household Waste Classification Management in Anhui Province*, *Regulations on the Household Waste Classification Management in Hefei City*, and *Implementation Plan for Further Advancing Household Waste Classification Work*, when formulating waste classification standards, the government of Feixi County should scientifically formulate waste classification methods according to local waste characteristics, treatment methods, and management levels, clarify work objectives, implementation steps, and policy measures, mobilize communities and households to actively participate it, and gradually promote waste classification to make it a daily practice. This approach will ensure the smooth and long-term development of waste classification initiatives.

Urban and rural areas should work together in accordance with local conditions. By strengthening classification guidance and developing reasonable measures based on local circumstances, we focus on addressing issues, setting goals, and achieving results to systematically advance household waste classification work. A co-operative urban-rural waste classification system should be gradually established rather than implementing blanket policies. Mandatory legal constraints provide institutional support for waste classification efforts^[6].

3.1.3 Clarifying waste classification responsibilities. The implementation of waste classification policies is not the responsibility of a single group but should be the responsibility of every citizen. Constructing a beautiful environment requires the active participation of everyone. To effectively promote waste classification in urban and rural areas of Feixi County, it is essential to clarify the responsibilities of each participating entity.

Firstly, the training of waste classification supervisors should be strengthened. Waste classification supervisors, also known as waste classification volunteers, are responsible for educating residents on proper waste classification, and providing services and guidance. These supervisors directly influence residents' attitudes towards waste classification. After systematic training, they should regularly visit households, use standardized language and civilized communication to educate residents on waste classification knowledge, and reinforce the importance and necessity of waste classification.

Secondly, it is necessary to increase oversight of property service companies to ensure compliance, conduct regular inspections of property service companies' performance, improve the incident response mechanism for managing residential waste in housing communities, and allow property service companies to play a significant role in advising, preventing, and reporting issues. Besides, it is needed to strengthen grassroots organizational development, enhance community governance, and address issues such as inadequate timing and placement of waste collection points, insufficient promptness in bin replacement and clearance, inadequate proportions of waste container placement, and insufficient cleanliness at waste disposal sites.

Lastly, it is necessary to increase guidance from local streets and towns on waste classification efforts at the grassroots level, classify waste classification as a crucial component of community comprehensive governance, develop an individual plan for each residential area, coordinate efforts among party organizations, residents' committees, homeowner committees, property service companies, and other stakeholders in a residential area to create collaborative governance mechanisms^[7].

3.2 Giving play to the driving role of society

3.2.1 Increasing publicity to foster a waste classification atmosphere. To quickly disseminate and promote a concept, the most direct and effective approach is to utilize the power of media and public opinion to achieve the desired impact through intensified publicity. Therefore, citizens' environmental awareness is directly related to the intensity of environmental protection propaganda. Strengthening environmental education and publicity is a vital way to enhance residents' environmental awareness, and can motivate them to actively participate in environmental protection efforts, increase their understanding of the environment, and promote harmonious coexistence between humans and nature. Therefore, it is imperative to strengthen environmental publicity work.

For long-term waste classification efforts, it is necessary to provide in-depth guidance and promotion for residents, and explore the placement, effectiveness, and coverage of promotional materials. In addition, various forms of media should be utilized to promote waste classification, such as public welfare activities, educational tours, exhibitions, knowledge contests, artistic performances, online live streams, and interactive online platforms, to shape residents' thoughts and foster a comprehensive waste classification culture. Additionally, a group of waste classification speakers should visit schools, enterprises, government offices, and communities to conduct standardized waste classification training, disseminate waste classification policies and knowledge to residents, and increase the awareness and influence of waste classification. In order to promote a green and healthy lifestyle, diverse themed promotional activities should be organized to encourage waste reduction and recycling.

Furthermore, waste management knowledge should be integrated into textbooks and extracurricular reading materials of primary and secondary schools to guide everyone to establish the con-

cept of "waste reduction and waste management start from everyone and everyone is responsible". Meanwhile, the media plays a crucial role and should actively guide public opinion, widely publicize the effectiveness of urban waste management policies and measures, objectively report relevant information, and create a supportive atmosphere for urban waste management efforts^[8].

3.2.2 Letting waste classification sorting into schools: starting from Children. Schools are used as platforms to conduct in-depth waste classification education. Waste classification awareness is transmitted to students through classroom education, extracurricular activities, and various aspects of school management. School bulletin boards, posters, and other means are used to vigorously promote the concept of zero waste, encourage collaboration between schools and communities, strengthen the effectiveness of joint promotional efforts, and encourage schools to prioritize the purchase of reusable office supplies, guide students to use eco-friendly practices, and organize events like old item exchanges. Besides, it is necessary to implement a comprehensive waste classification system to ensure that all levels of schools diligently implement the waste classification requirements of Hefei City, guide teachers and students to conduct waste classification, and properly dispose of campus renovation waste and green waste. At the same time, it is needed to conduct waste classification creation activities to reinforce waste classification awareness among teachers and students, and solidify the achievements of waste classification education. Taking young people as the center, waste classification should be incorporated into the educational content of all levels of schools, and knowledge dissemination and social practice activities like "small hands leading big hands" should be organized by organizations like the young pioneers and school clubs, in which families should be mobilized to actively participate. Schools and communities with the resources should establish youth volunteer teams for waste classification.

3.2.3 Establishing a reward and punishment incentive mechanism. A reward mechanism for waste classification should be established, and neighborhoods that have made significant progress in waste classification work should be commended. It is needed to conduct targeted publicity and education, highlight advanced examples, and create a demonstration effect. Similarly, within neighborhoods, residents who excel in waste classification should be praised and rewarded, and "waste classification pioneer residents" should be selected to serve as role models, encourage other residents to actively engage in waste recycling, and promote waste reduction, harmlessness, and resource utilization. Meanwhile, effectiveness evaluation should be strengthened by establishing a comprehensive waste classification performance evaluation mechanism. The execution, goal achievement, system operation, and fund utilization of waste classification are evaluated through professional supervision, third-party reviews, social assessments, and public opinion surveys. Waste classification should be integrated into key components of mass civilized activities such as construction of a civilized city^[9].

3.3 Giving play to the principal role of the people Waste classification, a crucial component of environmental civilization, directly influences public interests, residents' daily lives, and serves as the fundamental and most effective means to address environmental crises and improve environmental quality. China is a socialist country under the people's democratic dictatorship, fundamentally empowering the people. In waste classification word, it is essential to give full play to the principal position of the masses and enhance their sense of ownership.

The success of waste classification relies on residents' support, and its basic knowledge serves as the foundation for cultivating good waste classification habits. In their daily lives, residents should consciously learn, understand, and master the fundamental principles of waste classification, aiming to reduce waste at the source and accurately and properly dispose of it. Cultivating good waste classification habits is paramount, and these habits internalize residents' awareness of waste classification, manifesting in their actions.

Residents play a pivotal role in waste classification, and their active participation is essential for the success of waste management initiatives. By empowering residents with knowledge and fostering a sense of responsibility towards waste classification, communities can create a sustainable environment where waste is managed effectively and responsibly. Encouraging residents to adopt and practice proper waste classification habits not only benefits the environment but also instills a sense of environmental stewardship and civic duty among the populace.

4 Conclusion

Waste classification serves as the cornerstone of environmental civilization, directly affecting the well-being and quality of life of the population. It is a critical measure to alleviate environmental pressure and enhance environmental quality. Waste classification in Feixi County faces challenges such as unclear government responsibilities, insufficient social publicity, and reward mechanisms, as well as weak resident awareness.

It is suggested that Feixi County should strengthen infrastructure, improve regulations, clarify responsibilities, intensify publicity efforts, initiate educational campaigns, establish reward and punishment mechanisms, and foster waste classification habits. This study has only scratched the current status of waste classification in Feixi. It is hoped that future research will provide further insights to advance these efforts.

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