

A Preliminary Study on the Strategy of Building a “No-Waste Society” by Piloting “No-Waste Cities” to Promote the Resource Utilization of Solid Waste

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Abstract: The large amount of solid waste in China has the potential to cause serious environmental problems, which would in turn have adverse effects on society. Solid waste represents misplaced resources. Reducing and recycling solid waste to create a “no-waste society” has significant environmental, social, and economic benefits. Studies on the significance of existing problems with building a “no-waste society” in China and feasibility studies suggest that it is necessary to promote resource utilization of solid waste through piloting “no-waste cities” before building a “no-waste society.” Other strategies such as strengthening the top-level design, consolidating the foundation, defining the stage objectives, and increasing policy support are also proposed in this paper.

Key words: no-waste society; no-waste city; solid waste; resource utilization; strategic suggestions

1 Introduction

China has a large population and faces challenges related to managing large amounts of solid waste. Based on the source, solid waste is mainly divided into social waste (e.g., domestic waste, construction waste, sewage sludge, and renewable waste resources), agricultural and forestry waste, and industrial solid waste. According to statistics, China’s accumulation of various types of solid waste is approximately 8×10^{10} t at present. The annual production is nearly 1.2×10^{10} t [1] and increases annually. If not properly handled and utilized, this huge amount of solid waste accumulation and annual production will lead to serious environmental problems, waste of resources, and will ultimately have adverse effects on society. Solid waste represents misplaced resources and can be recycled. Therefore, we propose a long-term goal of building a “no-waste society.” On the one hand, universal participation and minimization of waste production at the source are needed. On the other hand, solid waste should be completely recycled based on classification and resource utilization, and society should establish a good waste resource

utilization system to achieve near-zero waste emissions. The realization of a “no-waste society” requires long-term efforts. As a first step, we can choose cities in China to take the lead in the building of the “no-waste cities” pilot. Based on the pilot experience and a nationwide promotion, a good foundation for the creation of a “no-waste society” can be laid.

2 The significance of building a “no-waste society”

The level of resource utilization is an important indicator of the degree of social progress. Solid waste represents misplaced resources and valuable wealth. If reduced or recycled to build a “no-waste society,” it will have significant environmental, social, and economic benefits.

2.1 Environmental benefits

The construction of a “no-waste society” is indispensable to forming an ecological civilization and a beautiful China. If improperly handled, the complex composition of toxic and

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harmful substances in solid waste will lead to the pollution of the hydrosphere, atmosphere, and soil; emission of greenhouse gases; haze; and environmental health risks. The construction of a “no-waste society” can reduce the damage to the ecological environment caused by the exploitation of primary resources and improper disposal of solid waste. It can remove the influence of the source on the living environment and promote the construction of an ecological, livable, and beautiful China.

The construction of a “no-waste society” can solve issues such as the “garbage siege,” and the “garbage village,” among other problems. With the rapid development of urbanization in China, the environmental health hazards caused by the “garbage siege” are becoming more prominent. According to statistics, two-thirds of the more than 600 large- and medium-sized cities nationwide are trapped in garbage and a quarter have no suitable place to dump trash [2]. The construction of a “no-waste society” can significantly improve urban and rural living environments, promote the ecological return of urban and rural areas, change the history of “garbage villages,” and form a new pattern of harmonious development of human societies and nature.

2.2 Social benefits

The construction of a “no-waste society” is beneficial to the health of citizens. The resource utilization of solid waste can alleviate pollution, such as haze, optimize urban and rural living environments, benefit the health of citizens, and improve people’s satisfaction with the living environment.

The construction of a “no-waste society” is conducive to social stability. In recent years, landslides in solid waste storage yards, the illegal dumping of solid waste, and other causes of casualties and secondary environmental disasters have been revealed, threatening the lives and the properties of people. Environmental pollution caused by the improper utilization of solid waste in some areas frequently resulted in mass incidents and environmental petition incidents. Therefore, resource utilization of solid waste can fundamentally solve social conflicts due to garbage pollution, create a beautiful space to share, make citizens feel secure, and strengthen the trust in the society and government.

The construction of a “no-waste society” is beneficial to the improvement for people’s quality of life and promotes green and low carbonation in every social cell. The reduction, classification, and resource utilization of solid waste require everyone to participate in continuously improving the civilization and sense of responsibility of the people and forming a green, low-carbon consumption concept, good living habits, and the consciousness of treating nature kindly.

2.3 Economic benefits

The construction of a “no-waste society” can lead to the stra-

tegic development of new industries. The existence of a large amount of valuable solid waste resources, especially rare metals, if used effectively, can greatly relieve the resource shortage in China. The classification and resource utilization of solid waste is an important strategic new industry with large intension span, long industry chain, and great social influence.

The construction of a “no-waste society” is of importance for saving energy and optimizing the energy structure. In 2014, the total recovery of China’s top ten major types of renewable resources was 2.45×10^8 t, which is equal to 2.50×10^8 ton of coal equivalent (tce); the production value was 650 billion yuan. Solid waste, such as agricultural and forestry waste and livestock manure, has the potential to be equivalent to 1×10^9 tce per year and is an important potential renewable energy source. Thus, the construction of a “no-waste society” can significantly reduce the exploitation and utilization of primary materials, enable energy savings, improve the proportion of renewable energy, and optimize the energy structure.

The construction of a “no-waste society” can help to ease the tension associated with land resources in China. Statistics show that the total accumulative amount of industrial solid waste in China is approximately 6×10^{10} t, which covers an area of 2×10^6 – 3×10^6 hm², that is, approximately 2.2–3.3 times the area of industrial land in 2013 [3]. If the large amount of industrial solid waste can be recycled, the development space of China’s industrial economy can be expanded. The potential benefits of building a “no-waste society” are enormous. It is estimated that the production value of the classification and resource utilization of solid waste will reach 7×10^{12} – 8×10^{12} yuan by 2030 in China, promote 4×10^7 – 5×10^7 of jobs, and become an important pillar of China’s strategic emerging industries and new momentum of economic growth.

3 Feasibility of the construction of a “no-waste society”

3.1 Experience of developed countries shows that it is feasible to build a “no-waste society”

In developed countries, the classification and resource utilization of solid waste has started earlier and is government-led. Based on their experiences, a development model characteristic of China was gradually formed, the environment was improved, and the resource pressure released. The rate of waste resource utilization is high in many European countries; reaching 90%–99% of the total waste produced in some countries [4]. In December 2015, the European Commission formally adopted new package plans of a circular economy that identified strategic objectives to stimulate the European circular economy and to promote sustainable social transformation. In Japan, solid waste has been fully recycled, the construction of a recycling society has been generally recognized by the community [5], and a law

and regulation system covering the key links in the complete life cycle of solid waste has been designed [6]. In the United States, the solid waste resource utilization industry has developed strict management norms based on multidimensional economy-supporting means to encourage enterprises to participate fully in the development of the industry [7].

3.2 Pilots in mainland China and Taiwan show that it is feasible to build a “no-waste society”

In Taiwan, solid waste resources have been utilized for decades, the citizen’s consciousness has increased, and the social popularization rate of solid waste classification is very high. Recently, Taiwan proposed to build a “sustainable material management” mode to further deepen the utilization of solid waste resources.

In mainland China, the framework of the relevant legal system of solid waste utilization has been preliminarily established. In recent years, pilots on the resource utilization of solid waste have been carried out in different areas. Some achievements have been made and several successful enterprises, such as China Everbright International Limited, have grown. This company invested in the construction of several waste incineration projects; the output from those projects were more than the input into them, making their investment profitable. The company completely owns the independent intellectual property rights of the waste incineration technology system. This investment has enabled the project to reach international advanced levels. Henan Tian Guan Group Co. Ltd. uses biomass to make bioethanol, biodiesel, bio-natural gas, and other bioenergy products to achieve a biomass production and transformation process and to create a green, low-carbon, environmentally friendly economic industry chain. The Anshan Iron and Steel group recovered nearly 6×10^6 t of ore, reduced waste emissions, and effectively made up for the lack of mining capacity. In addition, Anshan Iron and Steel group has a set of world-leading smelting slag treatment technologies. Based on the steel slag treatment rate of 100% and utilization rate of 70%, the extraction rate of metal materials from steel slag reached 98%.

Practical experiences at home and abroad show that the construction of a “no-waste society” is necessary, feasible, and popular. Although China is currently in the development stage, there is still a gap between China and international advanced levels; however, China has laid a very good foundation.

4 Main problems related to the construction of a “no-waste society”

The resource utilization of solid waste in China has greatly progressed, but the utilization rate is low, the industry scale is not reached, and there is a lack of planning and goals. China is far from achieving the long-term goal of building a “no-waste

society.” China’s specific performance is discussed in the following sections.

4.1 Not yet increased to national strategic heights

The essential requirement of the construction of a “no-waste society” is highly consistent with the inherent requirements of ecological civilization construction. It is important to build a resource-recycling and environment-friendly society. President Xi Jinping has repeatedly asserted the importance of basing the construction of a “no-waste society” around people’s lives, ensuring that it is in line with the fundamental interests of the people, and is an important sign of social progress. However, for a long time, the construction of a “no-waste society” has fallen short of the ecological civilization construction and people-oriented national strategy height.

4.2 The foundation is not firm

The legal system is imperfect, the management is uncoordinated, and the standard is unclear. Although China has promulgated the *Law of the People’s Republic of China on the Prevention and Control of Environmental Pollution Caused by Solid Wastes* and other relevant laws and regulations related to resource utilization of solid waste, the type of coverage is incomplete, not enough systems are established, and a complete system still cannot be formed. With respect to the implementation of the system and its management, the phenomenon of unclear responsibilities is more prominent. Environmental pollution control, environmental risk control technology, and other specifications, and environmental health risk quality control standards of products are missing in the process of resource utilization.

Supervision is not in place. There are still several supervision problems in the current system of our country such as fewer supervision agencies, low level of businesses, and lack of effective supervision means. Solid waste environmental problem supervision is not in place, affecting the healthy development of the solid waste resource utilization industry; the punishment for illegal acts is too light.

The capital investment intensity is insufficient and the social capital investment enthusiasm is not high. In recent years, China’s financial expenditure with respect to the utilization of solid waste has been relatively low compared to the overall fiscal expenditures and its effect is limited. In addition, due to the small investments and financing channels of small and medium enterprises, the ability to integrate resources is low. A notable efficiency cannot be obtained such that the enthusiasm to put social capital into the solid waste recycling industry is low.

4.3 Low levels of economic and social participation

Due to the limited coverage of existing tax and government subsidies and the lack of technical innovation, solid waste resource utilization faces the problems of high disposal costs, un-

clear profit points, and poor economic benefits, which affects the vigor of the whole market. Popular participation is an effective way to promote the correct classification of solid waste, supervision, and management. However, due to the lack of information disclosure and publicity and the low level of pollution prevention and control in the process of resource utilization, the public knows little about solid waste resources and their participation is low, which leads to the prominent effect of “neighbor avoidance.”

5 Strategic suggestions for the construction of a “no-waste society”

5.1 Strengthening the top-level design

It is necessary to promote the construction of a “no-waste society” to the national strategic level; this is one of the tasks in the process of building a holistic and well-off society. A wide application of quantitative indicators, such as the productivity of resources and utilization of the resource cycle, should be promoted. Strengthening the top-level is an important strategic index of ecological civilization construction that is included in economic and social development evaluation and the government performance appraisal system. The entire society’s solid waste classification and recycling system should be constructed and efforts should be made to minimize the energy consumption of the whole society, maximize the utilization of resources, and build a circular economic and social development model with characteristics suited to Chinese culture and environment to build a “no-waste society” and realize the long-term goal of sustainable development.

5.2 Tamping the foundation

Improve the legal system: Clear the legal responsibility and management requirements of the source of the solid waste-related industry access control, recovery, and comprehensive utilization of the relevant parties to promote the extension of the producer responsibility and the institutional construction symbiosis and metabolism of enterprises. A market exit mechanism of resource utilization of solid waste should be established and the market structure should be constantly optimized to improve the overall level.

Clear standard: The pollution control standard system of solid waste resource utilization should be established and perfected, a product quality control standard system should be comprehensively utilized, key industrial equipment of technical specifications and the product standard system should be remanufactured, an industrial byproduct identification standard and quality standard system should be established, the solid waste quality should be controlled from the source, and the use of available, fully resourced solid waste should be promoted.

Strengthen supervision: This should be to solve “departmental wall” constraints; ensure the rational allocation of different departments of management responsibility to form a clear division of labor, mutual cohesion, and full cooperation of the joint supervision mechanism; and enable engagement with solid waste recycling professionals and institutions at all levels to strengthen the supervision of solid waste collection, transfer, use of disposal, and other aspects.

Pay attention to data statistics: According to the data statistics of solid waste in China, there are problems related to statistic aperture inconsistency, incomplete statistic data, and lack of solid waste statistics. Therefore, the statistical methods should be improved, the statistic range should be expanded, and the veracity and reliability of statistical data should be improved.

5.3 Clear stage objectives

By 2020, the resource utilization of solid waste should reach a solid foundation for industry formation, the initial industrial scale, the technology system of resource utilization, should have been improved, and the ability of comprehensive utilization of solid waste should reach 3 billion ton/year. By 2050, the classification and resource utilization of solid waste should be a mature and advanced industry, symbolizing China’s modernization and the achievement of the “Chinese Dream”.

5.4 Enhanced policy support

It is of significance to carry out the “no-waste cities” pilot. Several basic cities should be chosen for the study of the “no-waste cities” pilot. Based on the pilot experience and nationwide promotion, a good foundation should be laid for the construction of a “no-waste society.”

Social participation should be promoted, publicity and education should be strengthened, and a solid foundation should be laid for society to improve the social governance mode; the “neighbor avoidance effect” should be avoided; the participation of the public and owners should be increases; enterprises, the public, and the government should be combined into an iron triangle; social forces, such as enterprises, communities, families, intermediary organizations, and individuals, should be given full play, and their enthusiasm for participating in the construction of a “no-waste society” should be cultivated. The classification and resource utilization of solid waste should be integrated into the national education system to improve the whole society’s understanding of the urgency of resource utilization of solid waste and the concept of resource circulation, and to promote a greening public life style.

The investment intensity and scientific and technological support should be strengthened. The direct input of national financial special funds and government investments in the market should be strengthened, the input from the national budget

should be increased in the field of resource utilization of solid waste, and direct social capital to the resource utilization industry should be ensured. The resource utilization process and product pollution control technology should be designed including resource-based product quality assessment, risk assessment, and other science and technology support systems and based on engineering laboratories, production and research platforms, industrial incubators, and standard laboratories.

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