

Comparative Study on Foreign Experience of Municipal Solid Waste Management

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Keywords: municipal solid waste, domestic and foreign comparison, current situation research

Abstract: The impact of MSW management on human beings and environment has become a hot topic of scholars and government, but the MSW management started late, many problems, and has a great significance for the sustainable development of our society. In this paper, the influence factors of MSW management are analyzed and the current situation and deficiency of MSW management at home and abroad are summarized, and the development of domestic MSW management is proposed and the level of MSW management is greatly improved and benefits are brought.

1. Introduction

With the acceleration of urbanization and industrialization, the amount of MSW continues to increase, which poses a major threat to the ecosystem and human health. According to relevant data, the world produces 11.2 billion tons of solid waste every year, of which municipal solid waste (MSW) accounts for 10%. MSW mainly includes household waste, yard waste, housing construction and demolition waste. The main types of MSW and their main hazards to the environment and human body are shown in Figure 1.

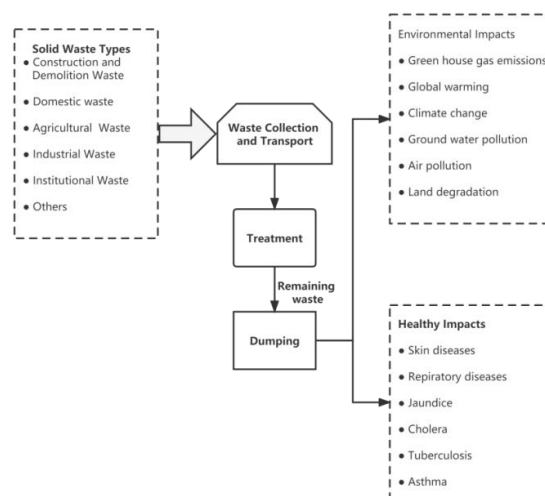


Figure 1: Schematic diagram of the environmental and health impacts of dumping solid waste

In recent years, MSW management has gradually become a hot topic, attracting the attention of scholars and the government. MSW management refers to the development of regulatory requirements and complex procedures for the collection, transportation, transit, treatment and recycling of municipal waste in order to achieve the goals of human health, environmental protection and sustainable economic development. There are many factors affecting MSW management. For example, Sharhollyetal (2008) believes that the meaning and social responsibility of managers and citizens towards the community are particularly important ^[1]. Soltani (2015) proposed that MSW management is affected by multiple factors such as environment, economy, regional characteristics, politics and society ^[2]. Each link is very important for the sustainability of the solid waste management system, and clear plans and management means are needed to reduce the generation of waste and improve the recovery of waste with economic value.

2. Analysis of the Influencing Factors of MSW Management

2.1. Policy Factors

The influence of policy factors on municipal solid waste is mainly concentrated in three aspects. The first is the impact of government expenditure on municipal solid waste. The effective investment of government funds can make up for the shortage of social capital and effectively solve the environmental governance. The second is the impact of tax policy on solid waste. The theoretical and practical circles have reached a consensus that tax policy can affect the treatment effect of environmental pollution. Strict environmental tax policy can effectively reduce environmental pollution, while loose environmental tax policy will aggravate environmental pollution. We will adjust the types and intensity of tax policies and guide social capital to promote solid waste recycling. The third is the influence of local policy competition on municipal solid waste. Environmental performance assessment has been incorporated into the performance assessment of local governments, making more and more local governments realize the importance of comprehensive utilization of municipal solid waste and regard environmental regulation as an important means to realize the coordinated development of environment and economy.

2.2. MSW Disposal Technology

The selection of solid waste disposal technology will directly affect the efficiency of MSW management. At present, the treatment of solid waste mainly includes heat treatment and biological treatment. Heat treatment usually uses heat to treat the organic matter in the garbage. Biological treatment is the use of microorganisms to treat organic matter in garbage. Organic municipal waste includes food waste, kitchen waste, leaves, etc. With the advancement of technology, MSW, such as the disposal of discarded ceramics, rubber, plastic, etc., has gradually become the focus of attention.

Waste classification management has become an important direction of MSW management. At present, relatively safe and low-cost waste monitoring methods include ultrasonic sensors, metal detectors, aromatic hydrocarbon detection, and high-tech waste monitoring system tools, such as sensors, RFID, GSM/GPRS, in addition to solid phase extraction, three-dimensional excitation emission fluorescence and other technologies for harmless disposal of waste.

2.3. Legal Regulation

The purpose of MSW management is to fully achieve "reduction, resource, harmless". Because MSW has the risk of harming the environment, it is very important to construct the waste risk legal regulation system. The risk of MSW is mainly manifested in three aspects: first, public hazard. The

harm of MSW is mainly manifested in the occupation of a large number of land, farmland, air and water pollution, garbage explosion, etc., which brings public hazards, so it needs to be controlled by law. Second, apportionment. The hazardous part of MSW mainly refers to industrial waste and construction waste. The harm caused by treatment is social and cannot be reduced or disappeared. Therefore, the public sharing of MSW requires necessary legal regulation. Third, public welfare. The ultimate goal of MSW management is to protect the environment, which is simply public interest. However, the results brought by various regulations are universal and shared, non-competitive and non-exclusive.

3. Current situation of MSW management in foreign countries

3.1. Municipal Waste Management in Iceland

3.1.1 Basic Information on Waste Management

As a member of the EU economic region, Iceland requires its members to comply with EU environmental requirements for waste management. Before 1970, Iceland knew little about waste management, dumping waste at sea, burning it or burying it in landfills. In 1975, the European Union adopted the Waste Framework Directive (75/442/EEC) ^[3]. The framework included the first set of laws to protect the environment. The EU introduced the "polluter pays" principle, that is, the purpose of waste treatment is to protect human health. In recent years, the EU has committed to realizing circular economy, which aims to use waste as a resource and ensure waste reduction. The amendment to the EU Waste Framework Directive (EU 2018/851) requires Member States to improve their management systems, improve the efficiency of the use of resources and ensure that waste is valued as a resource through sustainable material management. Table 1 shows the current situation in Iceland.

Table 1: Targets for recycling and landfill in Europe and the status of Iceland

year	European targets on recycling and landfill sites			Iceland
	2025	2030	2035	2019
Maximum landfill rate target				
By reusing and recycling waste			10%	56
Minimum landfill rate target	55%	60%	65%	27%
Packaging waste	65%	70%		47%
plastic	50%	55%		25%
wood	25%	30%		16%
Ferrous metal	70%	80%		43%
aluminum	50%	60%		86%
glass	70%	75%		0%
Paper and cardboard	75%	85%		89%

3.1.2 Policies on MSW

Over the past fifty years, waste disposal in Iceland has evolved from no government regulation to a highly control environment. Inter-city cooperation has become the norm, with public or private companies placing an increasing emphasis on recycling. Landfills are the main waste management method for MSW, and landfills in Iceland are managed by municipalities or intermunicipal cooperation, with all cities except Reykjavik contracting with private companies to collect waste

from households. As of 2021, Iceland has 17 landfills. In order to meet the waste management goal of 2035 requiring municipal waste in landfills to be 10% waste, Icelandic authorities have begun to explore the construction of one or more incinerators with energy recovery to reduce landfills ^[4].

3.1.3 Technology for MSW Disposal

In Iceland, there are many landfills, but only three of them can handle a large amount of waste, while the rest can only handle less than 1,000 tons, and the only incinerator. Table 2 shows the facilities in Iceland.

Table 2: MSW treatment technologies in Iceland

Processing equipment	Name	The geographical position	Situation
Landfill plant	SORP	Suburb of Reykjavik	Iceland's largest landfill approves 38,000 tonnes of waste, opens new biogas and composting plant GAJA
	Stekjarvik	Northwest region	21,000 tons of approved waste, most of which comes from the northeast and northwest regions of Iceland
	Fefferholt	The western region	Approved waste 15,000 tonnes, dealing with waste in the Westfjords , the southern and the western region
Incinerator	Kalka	The southern peninsula	Approximately 12,000 tons of waste were incinerated, most of which was MSW from the Southern Peninsula

3.1.4 MSW Laws

The Icelandic government began to focus on MSW management in 1990 and is constantly revising it. Table 3 shows the MSW management developments in Iceland.

Table 3: MSW Management developments in Iceland

Year	The development process
1990	Promulgation of Iceland's first pollution control regulations and establishment of the Ministry of Environment (now the Ministry of Environment, Energy and Climate)
2000	The landfill rate was 75%
2003	Act No. 55/2003 on waste management has been promulgated. Article 5 stipulates that the Minister of Environment, Energy and Climate shall issue a waste management policy in accordance with the recommendations of the Icelandic Environment Agency. Article 6 of the law states that municipalities shall jointly develop a regional waste management plan in accordance with the national policy
2019	Iceland's total MSW is about 237,000 tonnes, of which 61% is landfilled or incinerated, and the remaining 39% is recycled or reused
2020	Fifty-eight of the 69 municipalities are members of regional waste management plans

3.2. MSW Management, Berlin, Germany

3.2.1. Basic Information of Waste Management

With a population of 3.61 million, Berlin is the largest city in Germany. In Berlin, waste disposal

decreased from about 22,233 tons in 1992 to about 80,200 tons in 2012. According to the sources of waste generated, Berlin's MSW is mainly segmented into five types: household waste (73.80 percent), trade waste (10.06 percent), commercial waste (2.30 percent), bulk waste (6.95 percent) and road waste (3.78 percent)^[5]. Figure 2 shows the waste distribution in Berlin, Germany.

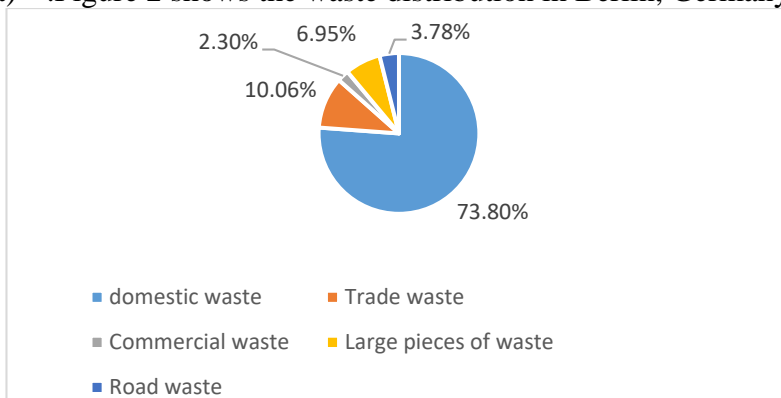


Figure 2: Waste distribution in Berlin, Germany

3.2.2. MSW Policy

The collections are divided into bins designated as waste types, and different types of waste such as paper and organic waste need to be put into the corresponding colored bins. The central task of the City of Berlin (BSR), the statutory authority of the city of Berlin, is to promote waste prevention, separate collection, environmentally compatible treatment and disposal, which maximizes the recycling potential of waste through systematic separation of waste sources. Waste collection fees in Berlin are calculated based on the volume and frequency of collection, but recyclables in Berlin are collected free of charge, and this waste charging system greatly encourages people to participate separation and recycling.

3.2.3. MSW Disposal Technology

Table 4: Technical Table of waste disposal methods in Berlin, Germany

The disposal method	The specific technology
MPS	Prepare the waste, detect, sort and separate some waste, and after drying, the separated combustible waste is converted into fuel, achieving 95% material and energy recovery
MBT	Biogas is produced by dry fermentation of organic waste, and the resulting methane is injected into vehicles used to collect natural gas to collect the waste
MA	Mixed construction waste, bulk waste and low-grade construction waste left after classification are treated separately from mixed household waste
WtE	High pressure superheated steam is generated to generate electricity, and scrap metal is separated from ash and slag at the bottom by a magnetic separator

In Berlin, there are a wide variety of treatment and disposal methods, including landfill, incineration, mechanical stabilization treatment (MPS), mechanical biological treatment (MBT), mechanical treatment (MA), as well as WtE power stations^[6]. Table 4 shows the technical table of waste disposal methods in Berlin, Germany

3.2.4. MSW Laws

In Berlin, waste management is governed by the Act on Promoting the Circulation of Closed

Substances and Waste Management and Ensuring Environmentally Compatible Waste Disposal. In 2011, the latest amendments were made and a series of regulations relating to hazardous waste were added, such as the Hazardous Waste Ordinance and the Problem Waste Ordinance. The objective of the Berlin Law on Closed Substance Recycling and Waste Management is to reduce the amount of waste, so that the material can be reused and make waste disposal environmentally compatible.

3.3. MSW Management in Tokyo, Japan

3.3.1. Basic Information of Waste Management

As the capital and political, economic and cultural center of Japan, Tokyo is also the most populous city in Japan, with a population of 13.74 million. In 2016, the gross charge for MSW reached 4.45 million Mt and the recycling rate was 22.7% [7]. The total amount of MSW was 6% lower than the total amount of MSW discharged in 2009, which was about 4.76 million Mt.

3.3.2. MSW Policies

The Tokyo government has set up a highly organized curbside collection system that separates sources of pollution into four categories: recyclable, combustible, non-combustible and bulk waste. According to the type of waste, each municipality has set the collection days and areas, and households must sort the waste, place it in designated bags, and then drop it off at designated collection sites. Non-recyclable waste is collected once or twice a week, while recyclable waste is collected once a week.

3.3.3. Technology for MSW

Figure 3 shows the technology for MSW of Tokyo, in Japan.

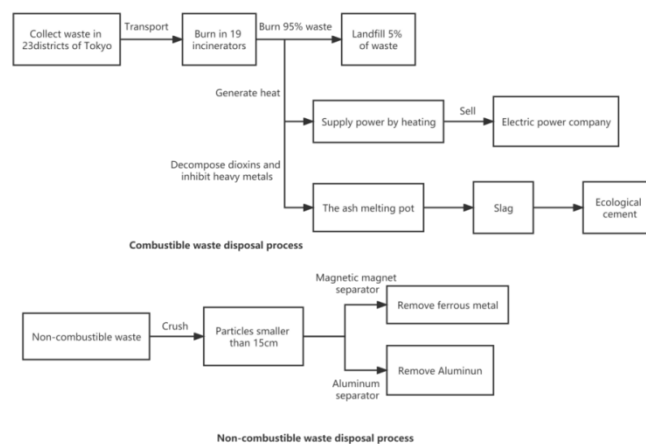


Figure 3: Flowchart of MSW technology in Japan

3.3.4. MSW Laws

Japan's waste management laws are comprehensive. Back in the 1970s, Japan passed the Waste Disposal and Public Cleaning Act [8]. In 1982, the government began to implement garbage sorting, Japan aims to prevent excessive consumption of natural resources and reduce the negative impact on the environment through proper disposal [9]. In June 2000, the Japanese government promulgated and implemented the Basic Law on the Development of a Circular Society. The law introduced the concept of 3R for the first time, specifying that the first step is to achieve energy reduction, then reuse,

and finally recycle.

3.4. MSW Management in Singapore

3.4.1. Basic Information on Waste Management

Singapore is a highly urbanised country. The rise rate of household waste disposed of from 2009 to 2017 (up 5.9 per cent from 2009 to 2017) was lower than that of non-household waste (up 23.4 per cent from 2009 to 2017) as shown in Figure 4, but waste generation in Singapore is on a downward trend.

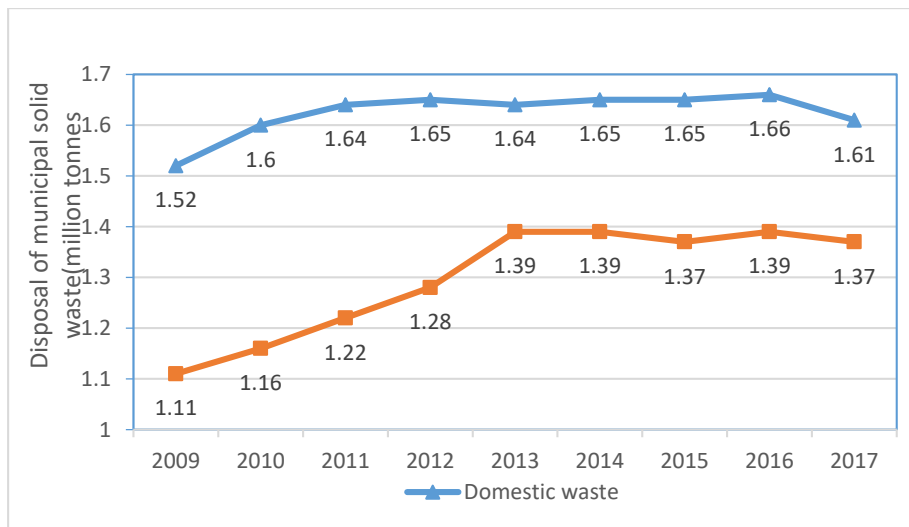


Figure 4: Volume of MSW and Non-MSW related Disposal in Singapore from 2009 to 2017 (tonnes)

3.4.2. Policies on MSW

There are two waste collection systems in Singapore, as shown in the table 5 below.

Table 5: Related policies in Singapore

Collection system	The specific content
Public waste collection system	The household uses a centralized waste chute system and a pneumatic waste collection system
General waste collection system	Industrial and commercial solid waste is transported to special treatment sites for recycling or treatment

3.4.3. Singapore's Technology

Solid waste disposal methods in Singapore include incineration and landfilling. There are four incinerators that deal with combustible waste, namely the TAS Incineration Plant (TIP), the Gipper Waste-to-Energy Plant ((KSTWTEP), the Tas South Incineration Plant (TSIP) and the Senoko Waste-to-Energy ^[10]. Plant (SWTEP).Incineration reduces the amount of waste by 90% and also reduces the need for landfill space, as well as recycling heat energy for electricity generation, which meets up to 3% of Singapore's electricity demand ^[11].

3.4.4. MSW Laws

MSW management in Singapore is mainly legislated under the Environmental Public Health Act (EPHA), which came into force on July 1, 1987^[12]. The key to waste management in Singapore is waste reduction, recycling, incineration to reduce landfill volume, landfill of non-incinerable waste and ash from incineration. By 2030, recycling rates will reach 70 per cent, with 81 per cent for non-domestic recycling and 30 per cent for domestic recycling^[13].

3.5. MSW Management in South Korea

3.5.1. Policies for Urban Waste Management

The main waste management policy in Korea is the Waste Control Law. The Act was issued by the Ministry of Environment on March 8, 1991. The Act has 63 articles and additional articles, including general rules on waste discharge and disposal, regulations on waste disposal and guidance, supervision and support of related businesses or individuals, supplementary rules and penalties, notice of detailed matters, etc.

In recent years, South Korea has developed the concept of a new policy framework. Under the conceptual framework, there are two effective objectives for MSW management: saving natural resources and recycling waste. The new policy mainly includes three aspects for policy design. First, the establishment of an effective recycling system to reuse the waste already generated; second, to convert waste into recycled products (raw materials) materials, heat energy, etc. Third, establish a strategic environmental assessment system to assess all aspects of the waste recycling process^[14].

3.5.2. MSW Technology

Table 6: Nine definitions of recycled waste

Recycling type	Define	Types of environmental Assessment
R-1	Reuse target waste without any treatment	Product Type Program (PTP)
R-2	By simple physical processing such as cleaning, repair, etc.	
R-3	Recover valuable materials from targeted waste	
R-4	Manufacturing using target waste in all areas except agriculture or soil improvement	
R-5	Produce agriculture or soil improvement using target waste R-5: fertilizer (including compost and fertilizer), feed, etc.	
R-6	Soil amendments, landscaping projects, etc.	
R-7	Use as embankment material, landfill layer material, subgrade material, etc.	Landfill Type Procedure (LTP)
R-8	Recovery of heat energy from target waste, cement kiln auxiliary fuel or through incineration facilities	Product Type Procedure (PTP)
R-9	Make waste into liquid, solid, gaseous fuel products by refining, emulsifying, etc.	

Korea classifies recycled waste into R-1, R-2, R-3, R-4, R-5, R-6, R-7, R-8, and R-9^[15], which are defined in Table 6 below.

3.5.3. Laws on Municipal Waste Management

Since 2015, the Ministry of Environment of Korea has formulated and revised the Waste Control Law, the Implementation Regulations, the Implementation Regulations, and the Notice of the Ministry of Environment to achieve the new policy framework and environmental assessment, as shown in Table 7.

3.6. MSW Management in Croatia

3.6.1. Basic Information on Waste Management

Croatia is a developed capitalist country located in southeastern Europe. Croatia decouples waste generation from GDP growth in waste management process, and the recycling rate of municipal waste is 23.6%, which is lower than the EU countries as a whole, so the management of urban waste is less efficient than other countries. Table 8 shows the MSW per capita in Croatia and the EU.

Table 7: Notice that the Waste Control Law, the Enforcement Regulations and the Enforcement Regulations and the new policy framework of the Ministry of Environment have been formulated and amended

Waste Control Law (effective from July 20, 2015)(Ministry of Environment, 2018C)
○ Principles of Environmental assessment on waste recycling: Article 13-3
○ Environmental assessment agencies; Article 13-4
○ Hazard criteria for recyclable products and raw materials: Article 13-5
Regulation on the Implementation of the Waste Control Act (effective from 21 July 2016)(Ministry of Environment, 2018A)
○ Compliance matters regarding waste recycling; Article 7-2
○ Prohibit or limit waste that is prohibited from recycling: § 7-3
○ Approval conditions for recycling based on environmental assessment: Article 7-4
○ Definition of environmental assessment agency; Article 7-5
Regulation on the Enforcement of the Waste Control Act (effective from July 21, 2016)(Ministry of Environment, 2018B)
○ Common standards and detailed compliance matters on waste recycling: Article 14-3
○ Procedures and methods for environmental assessment: Article 14-4
○ Companies or individuals applying for environmental assessment; Article 14-5
○ on approval procedures for environmental assessments; Article 14-6
○ Notice of environmental assessment approval: § 14-7
○ Conditions for approval of environmental assessment: Article 14-8
○ Qualifications for designation of environmental assessment agencies: Article 14-9
○ Modification of designated environmental assessment agencies: Articles 14-10
○ Environmental Assessment report: Articles 14-11
○ Inspection of environmental assessment agencies: Articles 14-12
Notice from the Ministry of Environment
○ Definition and criteria of hazardous Attributes: Ministry of Environment Notice No.2016-146 (implemented since July 21, 2016) (Ministry of Environment, 2016A)
○ Waste Types that must be recognized as Hazardous and related industry Regulations: Ministry of Environment Notice No.2016-182 (implemented since September 9, 2016) (Ministry of Environment, 2016D)
○ Regulations on Detailed Procedures and Methods of Environmental Assessment: Ministry of Environment Notice No.2016-144 (implemented since 21 July 2016) (Ministry of Environment, 2016B)
○ Regulation on Detailed Procedures and Methods for preparing Environmental Assessment Reports: Notice of the Ministry of Environment No.2016-145 (effective from 21 July 2016) (Ministry of Environment, 2016C)

Table 8: The MSW per capita in Croatia and the EU

Region	MSW produced per capita (kg)	MSW per GDP (kg)
Croatia	416	75
EU	486	62

3.6.2. MSW Policies and Laws

In the European Union, Council Directive 1999/31/EC (Landfill Directive) compels member States to reduce the amount of biodegradable fraction of MSW sent to landfills. According to the Waste Management Strategy of the Republic of Croatia (WMS) (OGRC 130/05) and the Waste Management Plan of the Republic of Croatia (2007-2015) (WMP) (OGRC85/07), a framework for waste generation reduction and sustainable waste management has been established. The Waste Act (OG RC 178/04, 111/06, 60/08,87/09) highlights the infrastructure development of a complete waste management system.

3.6.3. Technology for MSW

More than 500 wild landfills are in the process of rehabilitation, and it is estimated that there are still more than 700 wild landfills on Croatian territory. According to financial resources, their rehabilitation is scheduled to be completed by the end of 2010. The separation collection aims to reduce the impact of MSW by not only separating useful materials but also removing hazardous substances from the waste, such as waste from batteries, electricity and electronic equipment, and medicines.

3.7. Make a Comprehensive Comparison

3.7.1. Experiences

The above countries are all developed countries, and the treatment of urban waste has started relatively early. The policies of these countries have certain similarities and have made certain achievements.

(1) Formulate strict waste separation policies

In today's growing urban solid waste, just choose a simple landfill for land pressure, it has a great influence on the environmental pollution, so governments choose to waste classification, will be able to use recyclable waste, reduce energy consumption and the amount of landfill, which in order to effectively reuse recycling, adopted a policy of relatively strict classification

(2) The treatment method adapted to local conditions

Although the policies, laws and technologies selected by countries are quite different, and are basically influenced by national conditions, population distribution, land resources and other relevant factors, the treatment methods are formulated according to their own circumstances. Landfilling is the main way to deal with waste in regions with small populations and rich land resources. In areas with large populations and limited land resources, incineration is adopted to reuse the energy generated from incineration to provide electricity and heat for the country, thereby reducing energy consumption.

(3) Increase the enthusiasm of the whole people

In some areas, waste is collected free of charge, and the government and enterprises cooperate to collect waste, so that residents and enterprises actively observe the classification rules, so that the treatment of MSW can reach the participation of the whole people and achieve a high recovery rate.

3.7.2. Insufficient

However, there are still some problems in the treatment of MSW in many countries, which affect the low efficiency of the treatment of MSW.

(1) Technology not up to standard

① Technology cannot meet the requirements of MSW

② The government still relies on landfill methods, and advanced disposal methods are used on a small scale

③ Lack of funds, unable to establish an effective circular management system

(2) There is a disconnect between policy formulation and implementation

① When formulating relevant policies, relevant personnel lack relevant professional background

② Public institutions are not willing to engage in waste recycling

③ The policy does not use incentive policies to encourage individuals and organizations to conduct waste sorting

4. MSW Management in China

4.1. The Basic Situation of Waste Management

With urbanization and the improvement of living standards the amount of MSW in China has increased significantly. China's MSW has increased from 31.3 million tons in 1980 to 203.6 million tons in 2016, and is expected to rise to 480 million tons by 2030, especially the production of MSW increased substantially in eastern Chinese provinces. Waste siege, like energy shortage and traffic congestion, has become a problem for city managers.

4.2. Policies and Laws on Waste Disposal in China

The Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste, which was passed in 1995 and revised in 2020, is China's basic law on solid waste in order to solve the problem of increasing MSW caused by the rapid growth of urbanization. The Law requires cities to establish and accelerate the sorting, delivery, collection, transportation and recycling of MSW to achieve effective waste management.

In China, the main disposal methods of MSW are landfill treatment, incineration and composting. Different provinces adopt different methods. The new MSW treatment method puts forward higher requirements for the source classification. Therefore, China has formulated national policies and regulations, including the MSW Classification Symbol (GB/T19095-2008) and the MSW Classification and Evaluation Standard (CJJ/T102-2004). On January 31, 2019, Shanghai adopted the "Shanghai Municipal Waste Management Regulation", which will be formally implemented after July 1, 2019, representing that Shanghai has entered the "mandatory era" of garbage sorting. Since the regulation was put into effect in Shanghai, Hangzhou, Xiamen and Guangzhou have formulated their own MSW classification and management measures based on the characteristics of MSW.

4.3. Disposal Technology of MSW in China

At present, China mainly uses landfill to treat MSW, and has 650 landfill plants with a capacity of 120 tons. The Tianziling landfill in Hangzhou, which has a landfill gas (LFG) extraction system, is one of the representative plants for converting MSW into electricity. The efficiency of converting its waste into biogas is 60.6 cubic meters per metric ton, which translates into 135.7 KWH of electricity. China is also working on new technologies for the treatment of MSW, focusing on converting

incineration ash into raw material substitutes, ceramics, which are partly used in the production of cement.

4.4. Problems with MSW Management in China

4.4.1. Late Start Time

Mouth less and scattered in west of China, with the method of landfill, incineration, and composting, urban solid waste did not do it resources recycling, and some of the more developed city of large population and relatively dense, land is precious and solid waste can realize the collection, classification, technical processing and transformation, so as to generate heat and electricity. However, compared with South Korea, Berlin in Germany, Tokyo in Japan and Singapore, China's developed regions have a relatively late start to waste classification. Shanghai only started to implement a strict waste classification system in 2019.

4.4.2. The Technology is not Up to Standard

At present, China does not meet the standards of developed countries in terms of MSW system management and treatment and resource utilization technology ^[10]. China's landfills are still the main technology for MSW treatment, and although Hangzhou's Tianziling landfill is one of the country's representative plants that convert MSW into electricity using landfill gas (LFG) extraction system, it has an inefficient performance and can convert 60.6Nm³ per ton of MSW Biogas, can only be converted into 135.7 KWH of electricity ^[16]. By comparison, one ton of MSW should produce about 300Nm³Biogas for 1,200 KWH ^[17].The comparison between China and Japan, Singapore is shown in Table 9.

Table 9: Comparison of power conversion of 1 ton of MSW in China, Japan, and Singapore

Countries	1 ton of MSW converted to electricity
China	135.7 KWH
Japan	630 KWH
Singapore	2040 KWH
standard	1200 KWH

5. Conclusions

Therefore, although incineration technology in China has developed rapidly in the past 10 years, it still needs to be combined with MSW management optimization to improve the technology. The following implications can be drawn from the research on MSW management in foreign countries:

5.1. Leveraging Technological Innovations to Enhance MSW Treatment and Resources

Like other countries, China is at a stage of technological development and is committed to developing the conversion of incineration ash into cement, ceramics, In contrast, the world is using IBA or IFA to transform into asphalt concrete layers, lightweight materials, binders, mesoporous adsorbents, geopolymers, etc.

5.2. Use Advanced Technology to Propose Ideal Systems

China need to use advanced methods and technology development, put forward a solid waste management and treatment and resource utilization technology of combining the ideal system, but

should also in city solid waste collection, separation, transportation, treatment and disposal problems on operation and behavior analysis, the key is how to effectively convert MSW to energy or fuel.

5.3. Emerging Materials MSW Strategy

Due to the large amount of MSW in China, an emerging material-based MSW strategy is worth implementing, and further green initiatives should be discussed to promote waste incineration, with some ongoing discussions pointing out that increasing waste incineration capacity could jeopardize recycling. Therefore, prudent policies should be adopted to enhance prevention, reuse and recycling, while promoting waste incineration that generates waste.

In summary, this paper compared the current situation and deficiencies of municipal solid waste in foreign countries and brought some enlightenments to the management of municipal solid waste in China and provided some help for the future research.

Acknowledgements

Funding: This research was funded by The Research on the Vulnerability and Governance Mechanism of Urban Waste Resource Symbiosis Network Based on CAS Theory, grant number (18YJC790167); Study on the Influence of Financial Policy on Enterprises' Participation in Ecological Governance of Liaohe River Basin (Injc202029).

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