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Garbage Classification Based on Fuzzy Mathematical Model

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ABSTRACT

China is the world's largest garbage importer, importing more than half of the global trade volume of garbage every year. By the end of 2019, "foreign garbage" was banned from entering the country, which led to the global attention to garbage treatment and classification. This paper studies the impact of foreign waste ban on China's economy and environment and the problem of waste classification. By using the mechanism modeling method, a solid waste recycling and degradation model is established to analyze the impact of foreign waste ban on China's economy and environment. Finally, it comes to the conclusion that the foreign waste ban slightly hinders the development of China's economy and reduces waste to a certain extent Rubbish's damage to our environment. In addition, the fuzzy mathematical model is established by using the fuzzy clustering analysis method to calculate the membership degree of the given garbage on all kinds of garbage and finally determine the types of garbage.

Keywords: Mechanism modeling; Fuzzy clustering analysis; Fuzzy mathematical model

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1. Introduction

Now, garbage classification is a hot issue. As early as June 2000, Beijing, Guilin, Shanghai, Shenzhen, Hangzhou, Guangzhou, Nanjing and Xiamen were identified as eight pilot cities for waste classification. Garbage can be divided into kitchen waste, hazardous waste, recyclable waste and other garbage. In March 2017, the State Council issued the *Implementation Plan of Domestic Waste Classification System* to the whole country, which marks the beginning of a new stage in China - the construction of waste classification system, which can promote the green development of social economy, improve the level of urban management and service, and optimize the living environment. In 2019, Shanghai issued a new waste classification law and implemented it throughout the city. At present, the more popular waste classification is recyclable, dry waste, wet waste and harmful waste. China, which imports more than half of the world's garbage every year, is the world's largest garbage importer. In April 2018, the Ministry of ecological environment issued a notice on adjusting the *Catalogue of Imported Waste Management*. The Ministry of ecological environment decided to adjust 32 kinds of solid waste, including waste hardware, waste ships, waste automobile pressure pieces, from "limited import" and "non limited import" to "prohibited import". At the end of 2018, the Ministry of ecological environment announced that China will

gradually reduce the import of solid waste, the so-called "foreign waste". So far, the United States and other western countries have not accepted this fact. They are still "blaming" China and trying to export foreign waste to China again. By the end of 2019, "foreign garbage" will be banned. After some of the ban programs came into effect, the world began to pay attention to waste treatment and classification.

2. Problems to be solved

Establish a reasonable model to explain the impact of China's economy and environment under the foreign garbage ban, and judge which type of garbage each of them is based on.

3. Model assumptions

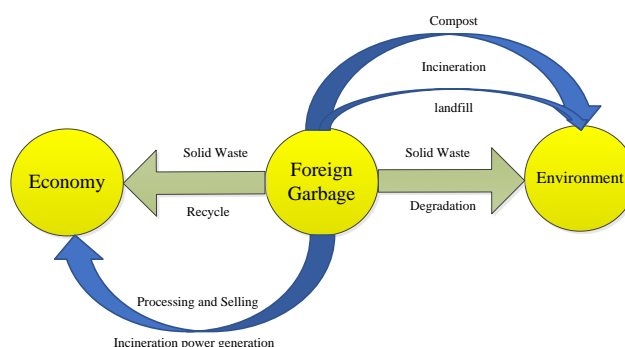
Assumption 1: Assumption does not consider the impact of the waste paper gap after the ban was issued on some enterprises and economic conditions in China

Assumption 2: In the process of garbage treatment, all unrecovered garbage is treated by incineration

Assumption 3: The data collected in this article is true and reliable.

4. Problem Analysis

Study the impact of the foreign garbage ban on China's economy and environment. This article will consider the opposite side and convert the problem into how the impact of imported foreign garbage on China's economy and environment. The specific idea flowchart is as follows.



First, by querying the relevant websites, we obtained the statistics of the import volume and import amount of foreign solid waste (solid paper, waste plastic, and scrap metal) in China from 2012 to 2018. Secondly, this article considers that imported foreign garbage is recycled, processed and processed to obtain benefits; on the other hand, garbage is processed, such as land-fill, incineration and compost, which affects the environment. By using the mechanism modeling method, a solid waste recovery model and a solid waste degradation model are established to analyze the impact of the foreign garbage ban on China's economy and environment, respectively.

In addition, it is required to judge the type of garbage given. According to the classification criteria, garbage can be divided into four categories: dry garbage, wet garbage, recyclable garbage and hazardous waste. Since there is no quantifiable index for the distinction between these four types of garbage, this paper divides them into subdivisions, and the study now knows the types of garbage by common sense, such as waste paper, scrap metal, waste plastic and so on. Therefore, this paper introduces the concept

of "wet base" to determine the type of garbage by detecting the content of wet base in a given garbage. However, because the change of the wet base contained in different objects is a continuous transition process from quantitative change to qualitative change, the evaluation result is too clear, in order to overcome the influence of the boundary of the discrimination standard and the detection error on the evaluation result, in this paper, the fuzzy clustering analysis method is used to establish a fuzzy mathematical model to calculate the membership degree of all kinds of garbage, and finally determine the type of garbage.

5. Search and Analysis of data

5.1 Data lookup

In this paper, we first query the relevant data to prepare for the establishment of the model. By querying the Hua Jing Information Network, we can obtain the statistics on the import volume and import amount of solid waste (waste paper, waste plastic, scrap metal) from 2012 to 2018 (import amount: thousands of US dollars). The following parts are listed below (see appendix for details)

Table 1: Import quantity and amount of scrap metal, waste plastic and waste paper

Year		2012	2017	2018
scrap metal	Import quantity (tons)	1246	807	534
	Import amount (1000 us dollars)	22151556	13244120	12688435
Year		2012	2017	2018
waste plastic	Import quantity (tons)	888	583	5
	Import amount (1000 us dollars)	6404011	3260283	39056
Year		2012	2017	2018
waste paper	Import quantity (tons)	3007	2572	1703
	Import amount (1000 us dollars)	6273762	5874652	4292828

In addition, the relevant data of garbage treatment process and garbage utilization process are queried. Through literature investigation and social practice investigation, the relevant parameters of the model are as follows: 1 imported 1000 yuan per ton of garbage, the price after processing is: waste paper: 2000 yuan / t, waste plastic 7000 yuan / t, scrap metal (average) 4000 yuan / t; (2) the cost of garbage collection, transportation and disposal is 65 yuan / t. (3) the cost of follow-up treatment, disposal and operation of classified garbage (calculated according to the normal cost after investigation): the cost

of landfill treatment is 35 yuan / t. The investment cost is 55 yuan / t. Burning a ton of garbage can generate 376 kilowatt-hours of electricity and 0.51 yuan per kilowatt.

In view of the solid waste degradation model, this paper introduces the concept of environmental cost, which needs to measure the environmental impact of foreign waste in China by calculating the environmental cost of disposing of waste paper, waste plastic and scrap metal respectively. therefore, consulting the relevant data, the environmental value standards of various pollutants are as follows: (unit / kg)

Table 2: Environmental value standard of pollutants

Pollutant	<i>COD</i>	<i>BOD</i>	<i>SS</i>
Environmental value	0.7	1.4	0.175
Pollutant	<i>NO_x</i>	<i>SO₂</i>	<i>CO</i>
Environmental value	8	6	1

Later, the environmental cost of the environment to be treated can be calculated according to the environmental value standard of pollutants.

5.2 Analysis of data

5.2.1 Analysis of the import proportion of "three wastes"

As the promulgation of the garbage ban will affect the garbage trade chain and its internal

structure of China's large and small enterprises, and enable domestic garbage recovery and classification institutions to improve the relevant work flow, resulting in a change in the demand for "three wastes". Therefore, in order to clearly show the change in the import proportion of the "three wastes" before and after the promulgation of the ban, we now draw a specific gravity chart of the "three wastes" in 2012:

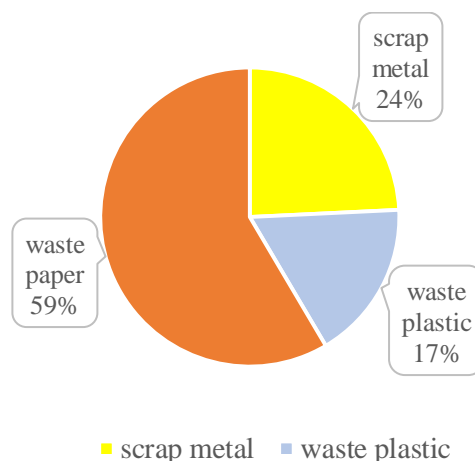


Fig.2: Specific gravity chart of "three wastes" in 2012

According to the chart, before the ban, the import of waste paper was the largest, accounting for 58% of the total, while the import of waste plastics was the smallest, accounting for 17% of

the total. The specific gravity chart of the "three wastes" in 2018 is drawn, as shown in the following figure:

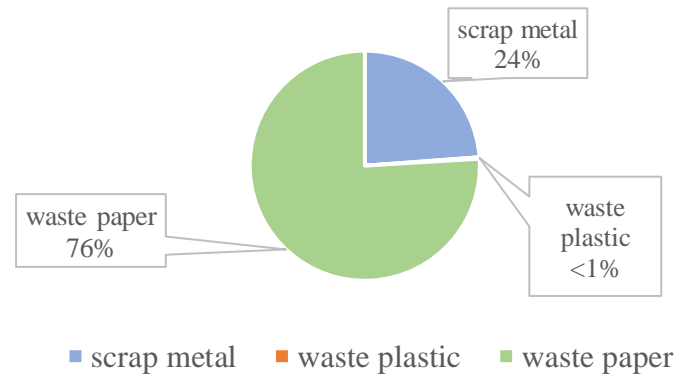


Fig.3: Specific gravity chart of "three wastes" in 2018

The comparison between the two figures shows that the proportion of scrap metal has almost not changed, while the proportion of waste plastics has decreased from 17% to less than 1%, while the proportion of imported waste paper has

increased, from 58% to 76%. It is found that the ban on foreign waste will affect the proportion of "three wastes". Therefore, draw a trend chart of the proportion of "three wastes" from 2012 to 2018, as shown in the following figure:

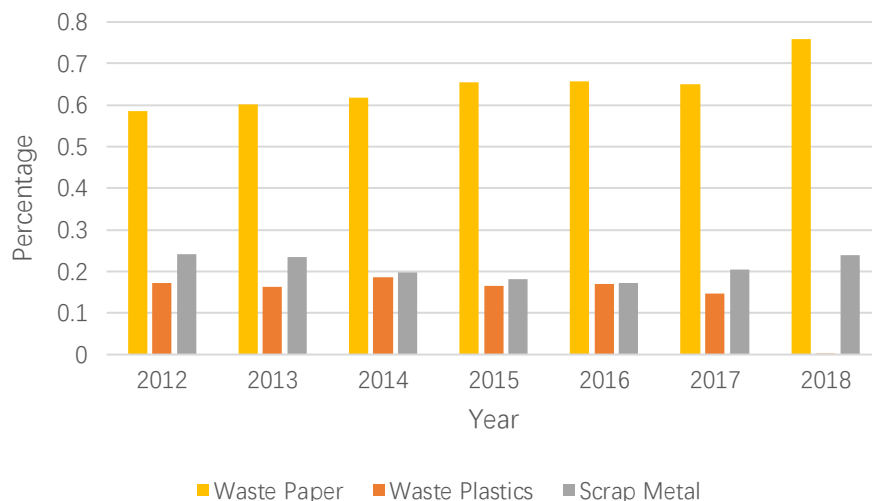


Fig.4: The trend of the proportion of "three wastes" from 2012 to 2018

The analysis of the above picture shows that:

- a) The proportion of waste plastics remained almost unchanged before the ban was issued, but it decreased rapidly after the ban was issued. According to practice, it is found

that most of the enterprises using imported waste plastics as raw materials are "scattered, disorderly, and polluted" enterprises. Its low level of pollution control, to a large extent, will pollute the local atmosphere,

water and soil environment, and have a negative impact on the ecological environment and the health of the people in some areas. Therefore, in order to protect the domestic environment and the health of the people, the import of waste plastics has dropped sharply.

- b) The degree of external dependence of scrap metal in China is very high. According to consulting data, the demand for scrap metal in China is about 18.81 million tons in 2016, and the amount of copper scrap imported into China in 2017 is 3.558 million tons, accounting for about 8% of the domestic demand for copper. Although the ban on foreign garbage has reduced the import of scrap metal, because the domestic aluminum supply is in a state of surplus and the impact is limited, the proportion of scrap metal import has not changed much before

and after the ban.

- c) After consulting the data, it is found that the import volume of waste paper has declined after the ban, and the domestic waste paper recycling volume is unlikely to increase suddenly in a short period of time. As the domestic waste paper recycling price is in short supply, the domestic waste paper recycling price will gradually rise. Cost pressure will push up the prices of related paper products, but China has a large population and a large consumption of resources, so the proportion of waste paper has increased a lot since the ban was issued.

5.2.2 Analysis of import quantity and import amount of "three wastes"

According to the information consulted, in order to reflect the changes in the import quantity of the "three wastes" before and after the ban on "foreign garbage", the following figure is drawn:

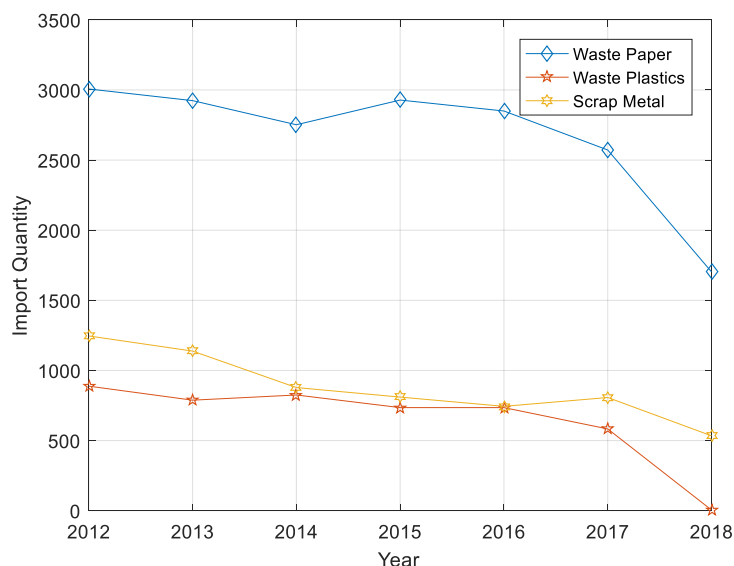


Fig.5: Import quantity chart of "three wastes" in each year

According to the observation chart, it can be found that from the import of "three wastes" in 17 years to the import of "three wastes" in 18 years, the import of scrap metal has dropped by nearly 50%, which also shows China's deter-

mination and achievements in winning the blue sky defense war.

According to the table, the import amount of "three wastes" varies from year to year:

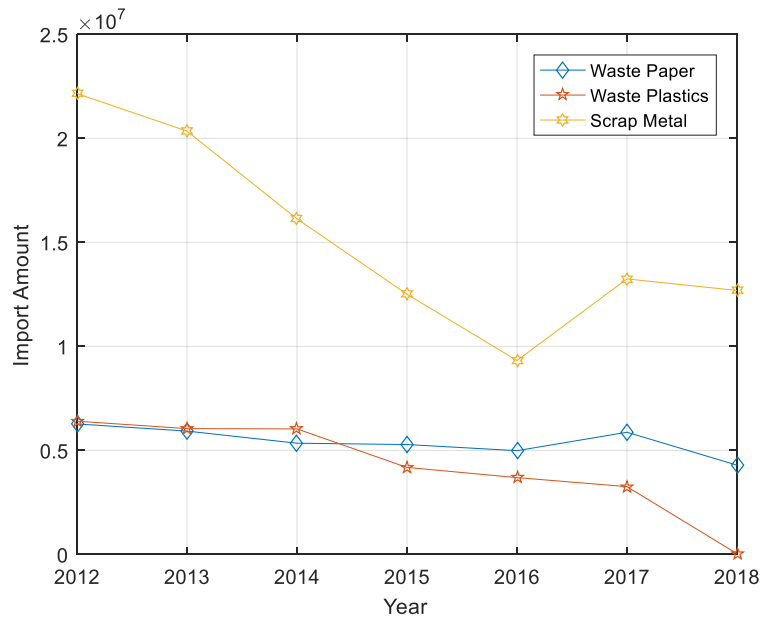


Fig.6: Chart of import amount of "three wastes" in each year

Combined with the analysis of the two maps, the reasons for the sharp decline in imports in 2018, the sharp decline in the import amount of waste plastics and the slight decline in the amount of scrap metal:

China has banned all sources of scrap metal import since December 2018, although enterprises respond in advance, but there is still no import of scrap metal at many ports. Under the growth and decline, the proportion of waste plastics with relatively low value in the "three wastes" has dropped sharply, while the proportion of scrap metals with higher cargo value has increased significantly. It is speculated that the change in the import pattern of "three wastes" has led to a sharp decline in the total amount of scrap metal imports, while the amount of imports has only decreased slightly.

6. Establishment and solution of the model

6.1 Establishment of the model

In order to study the impact of foreign garbage ban on China's economy and environment, and to judge which type of garbage they belong to in view of any given pile of garbage, a simple, clear

and effective analysis is carried out. In this paper, through the establishment of solid waste recovery model, solid waste degradation model and fuzzy mathematical model, this paper analyzes the impact of foreign garbage ban on China's economy and environment, and classifies the garbage. It is described as follows. ^[1]

6.1.1 Establishment of solid waste recovery model

China's imported solid waste will be divided into two parts: on the one hand, it will be recycled and processed to gain benefits; on the other hand, non-recyclable and processed waste will be disposed of, such as landfill, incineration and composting, and incineration can generate electricity and obtain some economic benefits. Therefore, the model consists of three parts: the total amount of solid waste (waste paper, waste plastic, scrap metal) imported from China, the total cost of solid waste consumed in the treatment process, and the total economic benefits generated by recycling foreign waste. It can be expressed by the following formula: ^[2]

$$N_t = P_t - (Q_t + W_t)$$

N_t represents the total economic benefits of solid waste in the t year, and 2012 as the first year. P_t represents the total economic benefits of foreign waste after recycling in the t year. Q_t indicates the total cost of China's imported solid waste (waste paper, waste plastic, scrap metal) in the t year, and W_t represents the total cost of solid waste consumption in the treatment process in the t year. Now the three parts are analyzed respectively.

Total economic income

China's imported solid waste to obtain valuable parts, on the one hand for recycling, processing, on the other hand, in the treatment of incineration process used to generate electricity can also obtain part of the economic benefits. Therefore, the total economic benefits generated by solid waste are as follows:

$$P_t = \sum_{i=1}^3 (p_i^1 m_{it} + p^2 m_{it})$$

Among them, i is from 1 to 3 and represent waste paper, waste plastic and scrap metal respectively, P_t represents the total economic benefits generated by solid waste in the t year, m_{it} indicates the quality of class i waste imported in the t year, p_i^1 represents the benefit obtained by the recycling unit class i waste, and p^2 represents the benefit obtained by the waste power generation of the incineration unit, which is equal to the product of the waste generation capacity of the incineration unit and the average electricity price: [3]

$$p^2 = \mu v$$

Where μ represents the generating capacity of waste per unit of incineration, and v represents the average electricity price.

Total cost of imports

China imports solid waste from abroad, including waste paper, waste plastics, scrap metal

and other oxide scale and other substances, because the sum of the first three is more than 95%, so this paper ignores the influence of other substances and only considers the first three. Therefore, the expression of the total import cost is as follows:

$$Q_t = \sum_{i=1}^3 a_{it}$$

Among them, Q_t represents the total cost of China's imported solid waste (waste paper, waste plastic, scrap metal) in the t year, and a_{it} indicates the import amount of category i garbage imported in the t year.

Total processing cost

Some of the imported solid waste (waste paper, waste plastic, scrap metal) can not be recycled and reproduced, so it is necessary to carry out garbage disposal, and the main ways of garbage disposal include landfill, incineration and composting. There is also a certain cost to be consumed in the treatment process, so this paper mainly considers the disposal investment cost, landfill cost and transportation cost in the treatment process. Therefore, the expression of the total processing cost is as follows:

$$W_t = \sum_{i=1}^3 (c_l m_{it} + c_v m_{it} + c_y l m_{it})$$

Among them, W_t indicates the total disposal cost of imported solid waste in the t year, c_l indicates the landfill cost of the disposal unit, c_v represents the disposal investment cost of the disposal unit, c_y represents the transportation cost required by the unit distance of the transport unit, l represents the transportation distance, and m_{it} represents the quality of the imported class i waste in the t year.

To sum up, after finishing, the following solid waste recovery models are established:

$$N_t = \sum_{i=1}^3 \left[(p_i^1 + p^2 - c_l - c_v - c_y l) m_{it} - a_{it} \right]$$

6.1.2 Establishment of solid waste degradation model

Because the environmental cost is an important index to measure the environmental pollution, it makes the environmental impact monetized. Therefore, this paper introduces the concept of environmental cost to measure the environmental impact of foreign waste in China by calculating the annual environmental cost of waste paper, waste plastic and waste metal. Different pollutants will be produced in the treatment of waste paper, waste plastics and scrap metal, and different pollutants have different environmental values, but the process of calculating the discharge of pollutants per unit of waste is similar. therefore, only a mathematical model is established to solve the discharge of pollutants per unit of scrap metal, and the other two are similar. By consulting the relevant data, it is known that the pollutants produced in the process of scrap metal processing include sulfur dioxide (SO_2), nitrogen oxide (NO_x) and carbon monoxide (CO), and relevant models are established to calculate the discharge of pollutants per unit of scrap metal. [4]

① Emissions of sulfur dioxide (SO_2)

$$\lambda_{24} = 1.6 \times B \times 10^3 \times S \times (1 - \delta_s)$$

Among them, λ_{24} represents the discharge of (SO_2) of sulfur dioxide per unit of scrap metal, B represents the amount of coal consumed, S represents the total sulfur in coal, δ_s represents the removal efficiency of sulfur dioxide. If there is no removal device, $\delta_s = 0$

② Emissions of nitrogen oxides (NO_x)

λ_{25} represents the emission of nitrogen oxides

per unit of scrap metal, δ_N represents the conversion rate from fuel nitrogen to fuel-type nitrogen oxides. The value range is 20% to 25%, n represents the nitrogen content in the fuel, and the value range is 0.5% to 2.5%, and C_{NO_x} respectively the gaseous NO_x , generated after combustion is 94 mg/m^3 , δ_N expressed as the denitrification efficiency of the denitrification device.

③ Carbon monoxide (CO) emissions

$$\lambda_{36} = B \times 10^3 \times \phi$$

Among them, λ_{36} represents the emission of carbon monoxide per unit of scrap metal, B represents coal consumption, ϕ represents heat loss due to incomplete combustion. "

In summary, the quality of pollutants produced by treating unit mass of waste paper, waste plastics and scrap metal can be calculated by using the method of analogical reasoning, so the following solid waste degradation models are established.

$$H_t = \sum_{i=1}^3 \sum_j^6 m_{it} \lambda_{ij}^t \eta_j$$

η_j pollutants denote the environmental value of the j pollutant per unit mass. When j is from 1 to 6, it represents chemical oxygen demand (COD), biochemical oxygen demand (BOD), suspended solids (COD), sulfur dioxide (SO_2), nitrogen oxide (NO_x) and carbon monoxide (CO), respectively.

6.1.3 Establishment of fuzzy mathematical model

In this paper, fuzzy clustering analysis is used to judge a given garbage. In fuzzy mathematics, the absolute membership function of non-zero rule one in a common set is described by $[0, 1]$.

To a certain extent, this method eliminates the error of the measured value and the influence of the boundary is too clear on the evaluation criteria, and reflects the degree of bias (membership degree) of a given garbage on all kinds of garbage.

Construct the domain

According to the meaning of the topic, establish the fuzzy clustering factor set or domain, that is, the various garbage sets given in this paper.

$$U = \{u_1, u_2, \dots, u_m\}$$

Among them, u_1, u_2, \dots, u_m represents all kinds of rubbish given, such as cans, mineral water bottles, etc.

Construct a judgment set

In this paper, the four categories are subdivided into waste paper, waste plastic, fabric, glass, kitchen waste, etc., first determine which cate-

$$P_{ij} = \begin{cases} 1 & (C_i \leq S_1) \\ \frac{S_{i+1} - C_i}{S_{i+1} - S_i} & (S_i < C_i < S_{i+1}) \\ 0 & (C_i \geq S_{i+1}) \end{cases}$$

When the detection value of the wet base of the garbage is less than the standard value of the wet base content of the first kind of garbage, the membership degree of the garbage to the first kind of garbage is the largest, so take 1. When the detected value is between the standard value of the wet base content of the first kind of garbage and the standard value of the wet base content of the second kind of garbage, the distance between the two ends is taken as its membership degree. When the detected value is greater than the standard value of the wet base concentration of the second kind of garbage, the degree of membership of the garbage to the first kind of water quality is the smallest, so it is 0.

Establish a fuzzy mathematical model

The membership degree of type i garbage to

gory a given garbage belongs to, and then determine which category it belongs to, so construct the garbage evaluation set as:

$$V = \{v_1, v_2, \dots, v_n\}$$

Among them, $v_j (j=1, 2, \dots, n)$ stands for class j garbage, for example, v_2 for waste plastic and v_4 for glass.

Establish membership function

The basic idea of fuzzy mathematics is the idea of membership degree, and the key to establishing a mathematical model by using fuzzy mathematics method is to establish a practical membership function. In this paper, according to the assignment method, the membership degree of i kinds of garbage to class j garbage is P_{ij} , the standard value is S_j , and the detection value of wet base is C_i , so its membership function is established.

type j garbage obtained from the above steps is P_{ij} . According to the principle of maximum membership attribute, the type of given garbage can be determined:

$$P_i = \max \{P_{i1}, P_{i2}, \dots, P_{in}\}$$

When the maximum value in $P_{i1}, P_{i2}, \dots, P_{in}$ is P_{ij} , it shows that the degree of membership of the type i garbage to the type j garbage is the largest, and the given garbage of the i type belongs to the class j garbage. [5]

6.2 Solution of the model

According to the established solid waste recovery model, the total economic benefit N_t of foreign waste in the t year is greater than zero by using MATLAB, and the total economic benefit produced by foreign waste from 2012 to 2018 is as follows: (unit: 100 million yuan)

Table 3: the total economic benefits produced by foreign garbage every year

	2012	2013	2014	2015	2016	2017	2018
N_t	2223.88	2025.80	2043.41	2362.26	2470.30	1762.65	525.29

It can be seen from the table that the imported foreign garbage in China can produce huge total economic benefits, and its economic benefits have been significantly reduced since the ban on foreign garbage was issued in 2017, but because China's economic development is in many aspects, it is concluded that **the ban on foreign garbage slightly hinders the deve-**

lopment of China's economy.

Based on the established solid waste degradation model, *MATLAB* was used to solve the total environmental cost of disposing foreign garbage in year t , among which the annual environmental cost of disposing foreign garbage from 2012 to 2018 is as follows: (unit: RMB 100 million)

Table 4: annual environmental costs for the disposal of foreign waste

	2012	2013	2014	2015	2016	2017	2018
H_t	6.89	6.91	5.42	5.03	4.64	4.95	3.21

It can be seen from the table that high environmental costs are needed for the disposal of foreign garbage in our country every year. After the ban on foreign garbage was issued in 2017, the environmental cost has been significantly reduced, that is, the degree of pollution has been significantly reduced. Therefore, it is concluded that the ban on foreign garbage has reduced the damage of garbage to the environment of our country to a certain extent.

According to the established fuzzy mathematical model, for any given garbage, its membership degree to all kinds of garbage can be calculated, but based on the actual situation, the wet base content of the garbage should be detected before each garbage classification. and to find its membership degree to all kinds of gar-

bage, finally, the process of judging the type of garbage according to the membership degrees.

6.3 Result analysis

6.3.1 Analysis of the impact of Foreign garbage on China's economy

Domestic renewable industries and related processing industries, which have long used foreign waste as raw materials, are facing a huge impact after the ban was issued. Previously, because the cost of imported solid waste is lower than the cost of raw materials, and the profit after processing is extremely high, so most enterprises choose to buy foreign waste. Therefore, according to the number of data series investigated, the total import amount of the "three wastes" each year is listed in the following table: (unit: 100 million yuan)

Table 5: the total import amount of "three wastes"

Year	2012	2013	2014	2015	2016	2017	2018
The import	2089.8	1939.6	1650.7	1318.6	1080.3	1342.7	1021.2

amount							
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In order to clearly show the relationship between the annual actual profit and the import amount, according to the annual total economic

benefit table of foreign waste and the total import amount table of "three wastes", the following figure is drawn:

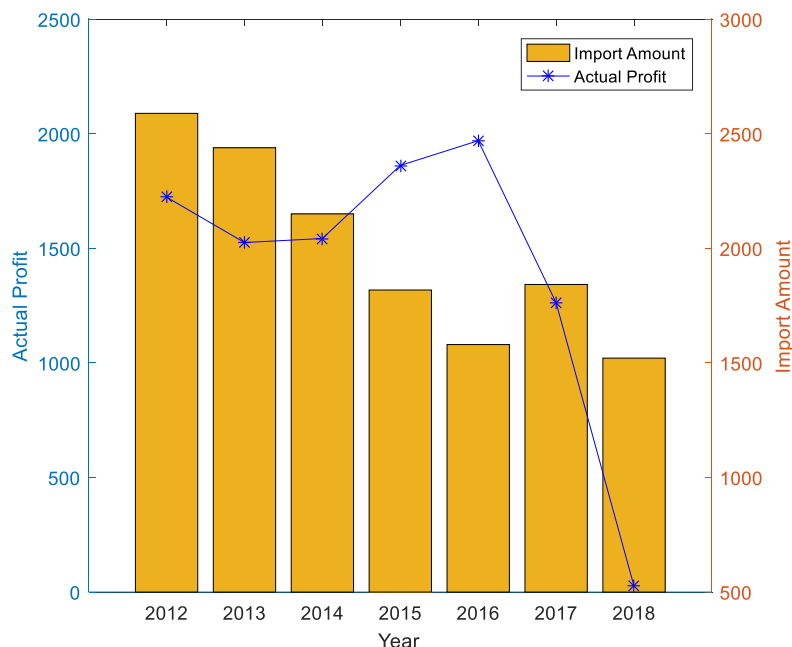


Fig.8: Annual import amount and actual profit chart

By observing the above picture, we can find that:

- although the total import amount increased slightly from 2016 to 2017, from the overall trend, the total import amount of "three wastes" decreased year by year, and the annual decrease was not significant. Observe the actual profit curve, real profits decreased significantly from 2016 to 2018.
- observe the actual profits and import amount, combined with the ban on foreign waste issued in 2017, Although the total amount of imports has not changed much before and after the ban on foreign garbage, the actual profits have decreased significantly, because the sudden promulgation and implementation of the ban on foreign garbage has created a huge gap in the demand for raw materials in related industries, which is in short supply. the price of the

corresponding raw materials is rising rapidly. This shows that the ban on foreign garbage will hinder the development of China's economy to a certain extent.

- it is predicted that the import volume of "three wastes" will continue to decline from 2019, because from December 31, 2018: 1. the import of "three wastes" is banned as a whole, and the state will continue to step up efforts to crack down on the smuggling of imported "three wastes"; 2. The substantial reason for the decline in the import volume of "three wastes" is that the list of scrap metals allowed to be imported is greatly reduced.

6.3.2 Analysis of the impact of Foreign garbage on China's Environment

Due to the rapid rise in the price of raw materials, in order to reduce costs, relevant enterprises

will recycle domestic garbage and sort it for processing, while the sharp increase in demand for domestic garbage by relevant enterprises will prompt domestic garbage recovery and classification institutions to improve the relevant work flows. further recycling and solid waste institutions will take measures to make domestic residents' classification of garbage more meticulous and perfect, which is conducive to the renovation and protection of the domestic ecological environment.

Therefore, in order to observe the changes of the environment before and after the ban on foreign garbage, that is, the change of environmental cost, based on the data from 2012 to 2017, the environmental cost in 2018 is calculated according to the data from 2012 to 2017. as shown in the following table: (unit: 100 million yuan)

Table 6: forecast the environmental cost of foreign waste disposal in 2018

	2012	2013	2014	2015	2016	2017	2018
H_t	6.89	6.91	5.42	5.03	4.64	4.95	4.82

In order to clearly show the changes in environmental costs after the ban on foreign waste, we now draw a picture of the actual and projected

environmental costs from 2012 to 2018, as follows:

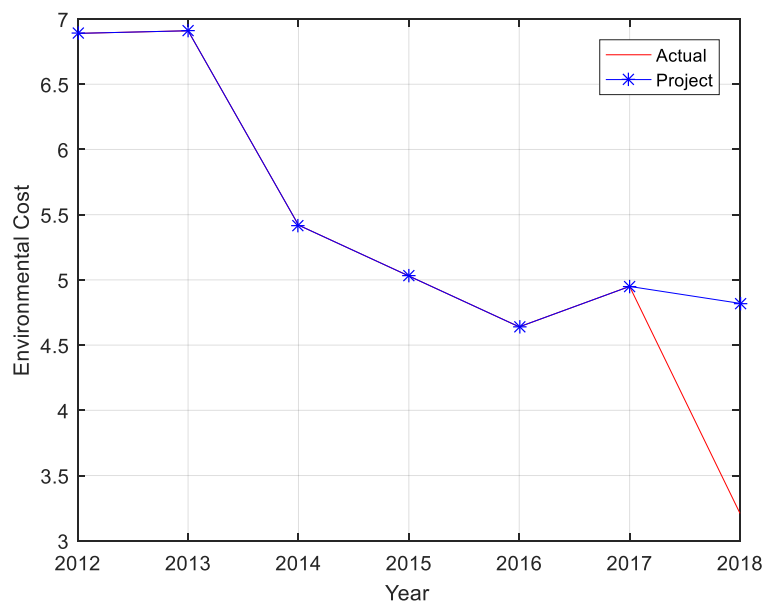


Fig.9: comparison between actual environmental cost and projected environmental cost

It is found from the chart that after the ban on foreign garbage was issued, the projected environmental cost in 2018 was much lower than the actual environmental cost, because the press conference of the ban had a great impact on the relevant large enterprises, constantly strengthening the compliance of the waste treatment

and processing and utilization process, rectifying the relevant links, and adjusting the industrial structure to adapt to the new rules and regulations on garbage classification, treatment, and recycling. Due to industry competition, non-compliant small businesses will be eliminated. Thus, to a certain extent, promote the substan-

tial improvement of the domestic ecological environment.

7. Evaluation, improvement and popularization of the model

7.1 Advantages of the model

- a) The mechanism model has clear physical or practical significance, and the parameters of the model are easy to adjust, and the resulting model has strong adaptability.
- b) When the production equipment is still in the design stage, the mechanism model can be established directly, and when the problem is not allowed to test, the mechanism method is the only desirable.
- c) The mechanism analysis method is especially suitable for a thorough understanding of the relevant factors of a problem, and the mathematical model can be established directly through the relevant properties.

7.2 Model Disadvantages

- a) For some objects, it is difficult to write mathematical expressions or certain coefficients in the expressions are difficult to determine. A mechanism model cannot be established.
- b) A large number of parameters are often required in the establishment of a mechanism model, and the mechanism model can only be used for simple process modeling. The mechanism modeling has great limitations in the relatively complicated actual production process.

7.3 Model improvements

Analyze the environmental and economic changes in Shanghai according to the waste classification policy released by Shanghai, and explain the reasons for the improvement of the environment of the remaining seven waste separation collection pilot cities nationwide in 2000 through data. And write out how to improve it to make the garbage classification policy popular.

7.4 Generalization of the model

The mechanism analysis method is a theoretical principle and theorem that has been proved to be correct in the application of theoretical methods such as natural science and mathematical science. The mechanism model is to analyze the internal mechanism of the production process and use known theorems to find out the relationship between variables, such as the energy balance equation, material balance equation, and the law of chemical reaction. The mechanism analysis has a wide range of uses and has a specific role in the fields of chemistry, physics, business management, mathematical modeling, etc.

8. Conclusion

By using the mechanism modeling method, this paper establishes a solid waste recovery and degradation model, analyzes the impact of the ban on foreign garbage on China's economy and environment, and finally comes to the conclusion that the ban on foreign waste has slightly hindered the development of China's economy. to a certain extent, reduce the damage of garbage to the environment of our country. In addition, a fuzzy mathematical model is established by using the method of fuzzy cluster analysis to calculate the membership degree of a given garbage on all kinds of garbage, and finally determine the type of garbage. Through the model established in this paper, we can more powerfully and theoretically explain the impact of China's economy and environment under the ban on foreign garbage.

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