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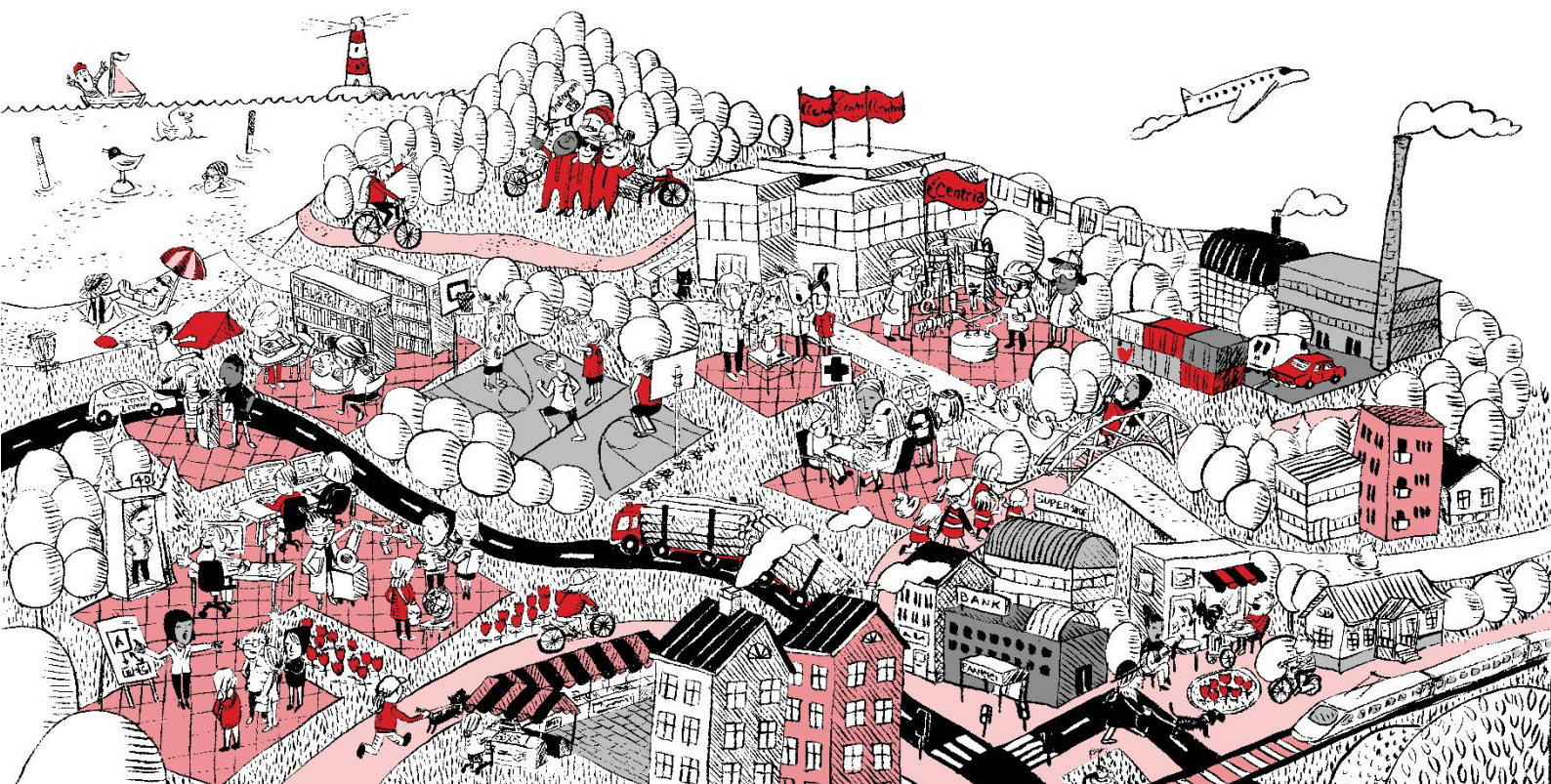
**THE REUSE AND SUSTAINABLE DEVELOPMENT OF BIOLOGICAL
WASTE**

Thesis

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ABSTRACT

Centria University of Applied Sciences	Date April 2022	Author Yupeng Sun
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Name of thesis THE REUSE AND SUSTAINABLE DEVELOPMENT OF BIOLOGICAL WASTE		
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<p>As the world’s economy is developing fast and as a result of this, the life quality of people has become better and better, so they can obtain the living materials they need. It can help people live a better life, but after the valuable parts of the living materials have been used, they will become biological waste.</p> <p>New methods of treating biological waste have been developed. This thesis will first introduce the situation of the global world and the treating methods. Then this thesis will discuss about the new treating methods and their advantages to the environment. The impact of biological waste on the environment can be divided into land, sea and air . The thesis will use some real examples and some figures to show the impact of biological waste on the environment.</p> <p>Finally the thesis will include a discussion of the sustainable development and the circular economy, which can be accepted by many countries around the world and will have a positive influence of the environment.</p>		

<p>Key words</p> <p>biological waste, circular economy, recycle, reuse, sustainable development</p>

CONCEPT DEFINITIONS

BOD Biochemical Oxygen Demand

COD Chemical Oxygen Demand

MT Million Ton

K_2CO_3 Potassium carbonate

ABSTRACT

CONCEPT DEFINITIONS

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1 INTRODUCTION

In recent years, with the development of the world's economy, the living quality of people is becoming well. Most people can get the living supplies they need. As the valuable part of these living materials is exhausted, they are transformed into biological waste. At the same time, biological waste can be defined as the waste that can change over time. This kind of waste will also have an effect on the environment if the treatment is not modern and have the same ways to be treated as the other waste, which is not in the category of biological waste. The impact of biological waste on the environment can be divided into two aspects: one is the impact on water and the other is the impact on air quality. To the water, it will break the water body and make the water not clean to drink and use. (Mohamed, Rokaia, Mohamed, Lotfy Nasr 2021.) When it is talking over the gas, the burn or stack of the biological waste will form gases with strange smell and it will also be the main source of carbon dioxide, which is the main reason of the greenhouse effect.

In the traditional waste treatment methods, the first is the collection and transportation of waste. In order to reduce the impact on people's lives and reduce the rent of land, waste treatment plants are generally built far away from the urban area. The biological waste in the city is transported to the waste treatment plant by vehicles. After preliminary sorting, the waste arriving at the waste treatment plant is sent to the combustion pool for combustion after removing the waste that cannot be burned or will lead to explosion in the combustion process. With the continuous introduction of oxygen and the lower end of the combustion pool, the bottom of the combustion pool is continuously heated. With the action of heat conduction, the combustible components in the garbage in the combustion pool will be converted into gas or liquid through combustion when reaching the combustion temperature. In this way, although the waste is disappearing, it will also cause many environmental problems like greenhouse effect and acidic rain. (Quadri & Dohare 2021.)

Although these methods will have an increase on the economy, it will have a vast effect on the environment. Many countries and regions start to implement the method of biological waste recycling, that is, separate the renewable or re-produced components of biological waste for secondary utilization.

With the popularization of such methods, the environmental problems caused by biological waste can be improved.

The sustainable development and the circular economy is using broadly. In the traditional thinking, the economy can be only in a line, which means the valuable will become waste but the waste can not change back to the valuable one. Now with the popularize of the circular economy, people begin to pay attention to reuse and the recycle. The raw materials will be used two or more times until their value disappeared completely. The sustainable development is a new way that be promulgated in 1972, it has showed the new way to keep a balance that the economy will not be affected while the generations can also be benefited. (Xuan, Baoteng & Hua 2011.)

2 BIOLOGICAL WASTE

Biological waste is mainly waste containing natural organic matter. In today's world, the emergence of a large number of items such as biological waste has had a great impact on environmental problems. People start to pay attention to the management and treatment of biological waste. (Odonkor & Sallar 2021.) For example, the production process of citrus will produce many biological waste. With the increase of people's purchase of citrus, the waste produced by citrus production process will also increase. In the process of citrus production, peel and seeds are biological waste that can be recycled. Because many beneficial chemicals can be extracted from citrus waste, such as gum, this kind of biological waste has attracted extensive attention. (Suri, Singh & K. Nema 2022.)

2.1 Different types of biological waste

Before the use of raw materials, they are full of value. But after the value of them is used up, they will be thrown away and become waste. Here is an example of the situation in the UK. In the UK all households currently generate 7.3 Mt of waste each year which consists of 4.4 Mt of avoidable waste ,1.3 Mt of possibly avoidable waste such as potato skin and bread crust and 1.6 Mt of unavoidable waste like the part of food which can not be eaten. (Slorach, Jeswani, Cuéllar-Franca & Azapagic 2020.)

From these information, it is easy to understand that some inedible waste such as bread packaging is difficult to avoid. In other words, this means that this waste forms with the use of materials. However, the recyclable waste such as apple peel needs to pay much attention. For apple peel, most people do not think it has much reuse value, but this product can be used to build up fertilizer. At the same time, acetone in apple pomace can be used to recover phenolic compounds under the condition of ethanol as solvent. (Silva, Viganó, Mesquita, Dias, Souza, Sanches, Chaves, Pizani, Contieri & Rostagno 2021.)

Biological waste involves food waste, which can be divided into avoidable waste and inevitable waste. The inevitable food waste mainly includes some inedible items, such as cores and bones. After being eaten, these items lose all their use value and can only be thrown into the dustbin for disposal. Avoidable waste mainly includes some leftovers, which is mainly in family dinner. Because there are too much food to order, the people at the dinner couldn't eat it and were unwilling to pack it away. This extra food can only be thrown away as garbage, which can be avoided by improving the living habits. (Samuel, 2016)

Forest residue, also known as forestry waste, also includes most of the waste in the forestry process, including forestry waste. In the current horticulture work, most of these items are considered to have no more use value. They choose to be stacked directly or stored in the wood. With the accumulation of time, due to the effect of moist air and sufficient oxygen, the waste will begin to rot and produce some bacteria and fungi, thus losing their utilization value. At the same time, this biological waste will be derived into fuels. Compared with conventional fossil fuels, this kind of fuel will produce more energy due to its high calorific value. At the same time, the emissions of sulfur, chlorine and other compounds that pollute the environment will be extremely reduced. (Lu, Tsai & Chang 2017.)

Straw is widely used in China. Long time ago in China, residents in southern China had the custom of using and producing straw. Straw mainly comes from the part of crops without seeds. For example, wheat will be taken off the remaining stems of wheat grains and becomes straw. Because of its high calorific value, most people in southern China use straw as fuel, and some residents use straw to accumulate fertilizer. It can be seen that straw is widely used in China. (Hou, Keske, Hoag, Balezentis & Wang 2019.)

2.2 The effect of the biological waste on the environment

As the amount of biological waste increase fast, the effect on the environment become more serious. The effect of biological waste in the environment can be divided into three parts, the gas, water and the soil. If this situation continue to existing, the quality of the global environment will become worse . At

present, the largest and most urgent problem in the world is environmental protection. Due to former people's inattention and discharge of a large amount of biological waste into the environment, it has an irreversible impact on the multifaceted stability of the ecosystem.

2.2.1 The effect of burning straw

With the improvement of people's living standards and the wide application of fossil fuels such as coal, oil and natural gas, people no longer use straw as fuel. However, because K_2CO_3 produced by straw combustion is a chemical fertilizer very beneficial to the growth of crops, many people are still burn straw. While burning straw, with the flow of groundwater molecules, the plant ash produced by combustion will enter the soil due to infiltration, and then provide nutrients for the growth of crops in the soil in this area. (Quyn, Rayer, Gouw, Indrawan, Mumford, Anderson, Hooper & Stevens 2013.)

Burning straw in the open air will cause serious air pollution, because its combustion will produce a large amount of flue gas. As a widely used crop, rice will produce a large amount of straw after harvesting. Most of these straws are burned. 95% of the straw is burned every year in the Philippines. Burning straw has a good economic effect on farm management, but it will have great harm to the environment. In the process of burning straw, it produced numerous incomplete combustion, produce volatile organic compounds such as carbon monoxide and dioxin, and let the surrounding people contract cancer. At the same time, it will also produce many carbon dioxide, which will exacerbate the greenhouse effect. (Romasanta, Sander, Gaihre, Alberto, Gummert, Quilty, Nguyen, Castalone, Balingbing, Sandro, Correa Jr & Wassmann 2017.) Figure 1 shows the farmer burns straw and produce a large amount of smog.



Figure 1 The farmer is burning the straw (Global Punjab, 2020)

2.2.2 The effect of wood waste on the environment

The main source of wood is forest. The countries along the Baltic Sea have the richest forest resources in Europe. In the Baltic coastal countries, due to the logging work, a large amount of wood waste will be produced every year. The main function of this wood waste is to be used as fuel. The combustion of fuel will produce greenhouse gases such as carbon dioxide, which will exacerbate the greenhouse effect and dissolve Arctic glaciers. (Muizniece & Blumberga 2015)

2.2.3 The effect of food leftover on the environment

In people's daily life, whether eating at home or in a restaurant, there will be many garbage, of which leftovers account for a large proportion. At home, people will simply classify garbage according to certain requirements, but in many restaurants, restaurant staff will stack all food waste, including uneaten food and leftover materials from the cooking process, in a dustbin without any treatment after daily business. (Blasius, Contrera, Maintinguer & Castro 2020.)

It can be seen that this food waste will produce many problems. The first is the odor problem. Most of the food waste are perishable. The organic substances contained in them will produce strong pungent gases after decay, which will sorely endanger the health of nearby people and the air quality of the environment. At the same time, the rotten organic matter will also breed bacteria and mosquitoes and pollute the containers collect them. During transportation, the liquid produced by the decomposition and decay of food waste will be leaked, which will pollute the transportation equipment and road surface, and remain a liquid with strong pungent smell. Because people do not treat and transport these wastes separately, they will be mixed with recyclable wastes such as paper and plastic bottles, resulting in grave corrosion of recyclable wastes, unable to continue recycling and loss of their value. These food wastes will produce a large amount of methane in the incineration process, and the destruction of methane to the ozone layer is very grievous. Therefore, the treatment of food wastes will not only increase the cost investment, but also bring large environmental problems. (Sinha & Tripathi, 2021.)Figure 2 shows the food waste in the campus of Chinese university.



Figure 2 The food waste in the campus of Chinese university

3 THE TREATMENT OF THE BIOLOGICAL WASTE

With the increase of the amount of biological waste is very fast all over the world. It has become a big problem that so much waste need to be treat or the environment will be worse and worse. If the waste are stored on the road or the rubbish station, the smell will be awful and people who live near there will be difficult to live. Also with the traditional ways, such as landfill and burning of treating biological waste, the emission and the pollution will also be another large problem.

3.1 The traditional method of treating

With the traditional method, the biological waste will treated with burning and landfill. In both methods, the waste will be transported to the waste station at first. Then, after arriving at the station, will had the deeper treat in order that the waste will be treated completely. Incineration and landfill use traditional physical methods to treat garbage innocuously. However, under such treatment, although it can reduce the direct harm of garbage to the environment, there will be some inevitable environmental problems indirectly, such as air pollution.

With the development of economy and the acceleration of urbanization, the amount of biological waste produced in China has increased sharply. In China, although landfill is a major method to treat biological waste, waste incineration has been widely used in now days due to the serious shortage of land resources. Waste incineration generally needs to be carried out in the fluidized bed. With the flow of the fluidized bed, biological waste will be gradually decomposed. However, due to the high cost of this process, it is not widely used. At the same time, waste incineration will produce a large number of toxic and harmful gases. Based on these reasons, it can be seen that although waste incineration can reduce the amount of land use, it is not widely used because it will cause major environmental problems. (Li, Zhang, Li & Zhi 2016.)

Landfill is another effective waste treatment method. All kinds of biological waste collected by this method will be stacked in the landfill. After the garbage enters the landfill pit, it will be covered with a

layer of loess to ensure that the polluted gas of the garbage will not leak. There are drainage pipes at the bottom and side of the landfill, because the biological waste will decompose into liquid components over time. These pipes are necessary to get the liquid out of the landfill. At the same time, the pipeline outlet at the lower end of the landfill site is also equipped with flood control devices to prevent a large amount of water from entering the landfill site during flood and affecting the landfill effect. Landfill has the characteristics of small pollution, small volume and good economy benefits. However, landfill sites will produce a large amount of methane gas, which will aggravate the greenhouse effect. The concentration of landfill leachate varies materially with the season of landfill, and the landfill leachate has a certain impact on the waste disposal process. Although landfill and incineration have many advantages, their harm to the environment is irreversible. Therefore, many countries and regions are trying to replace these two methods. (Fazzino, Folino, Mauriello, Pedullà & Calabrò 2021.)

3.1.1 The transport process of biological waste

Before having treated, the biological waste will be transported from the people's house to the waste station. Here will has an example that in China, as the speed of life becomes fastly, many people need to save time by cooking in order to use it to earn more money, so they often choose to order dishes online. As this becomes common, more biological waste will form. When people need something to eat, they will place an order with some application such as Meituan. After they finish their food, the dishes which are not finished will become the waste. They will leave them at the rubbish bin of their building. Then the rubbish collector will gather them in a truck and transport them to the transform station. In the station, the waste will have the first treatment which they will be divided into different parts with the different phases of them. Then the waste will be packaged again and use another transform truck to transport to the waste disposal. At that station, the waste will have the further treatment like burning and landfill. (Zhang, Xue, Song & Liu 2021.) The whole process of it will be shown in Figure 3.

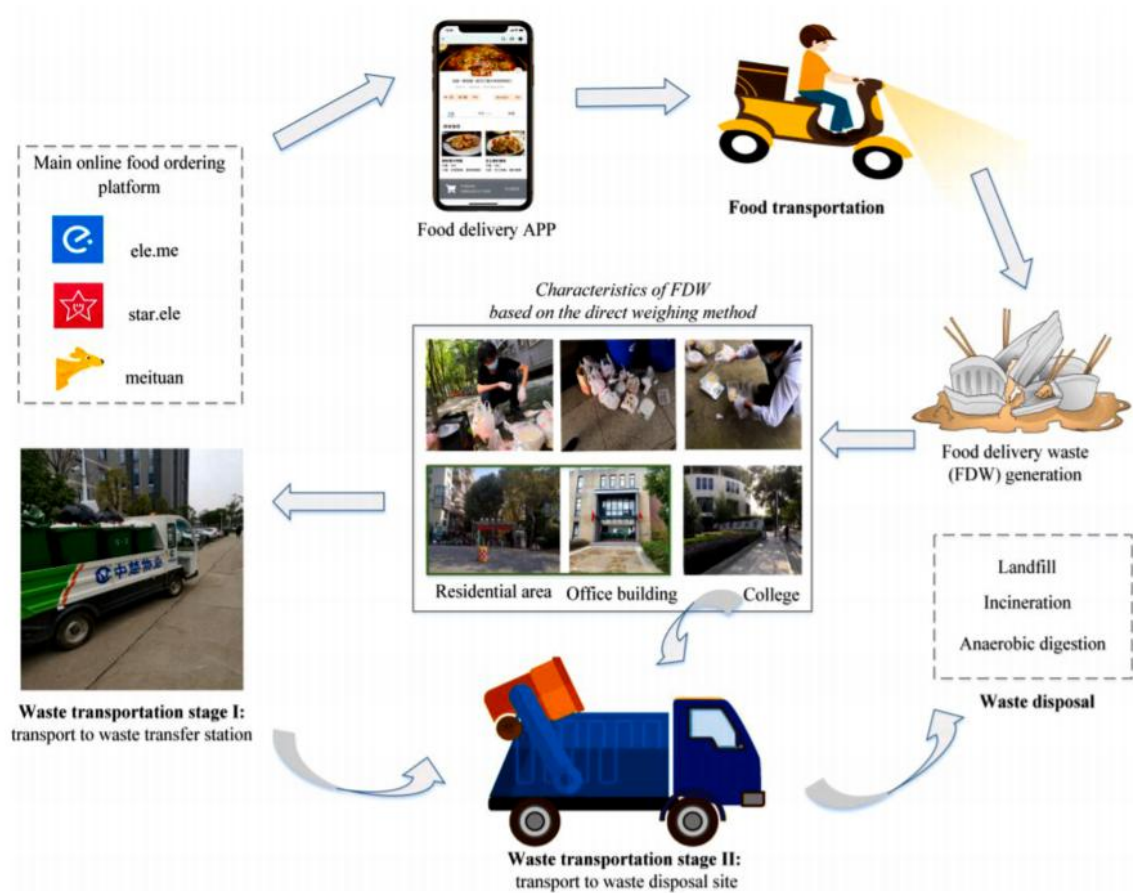


Figure 3 The process of transporting waste (Zhang, Xue, Jiang, Song, Wei & Liu 2022.)

3.1.2 The combustion of the biological waste

In cities, the general biological waste is burned together with wood, so that it can be reused and reduce the impact of incineration on the environment. However, through the combustion test, it is found that the biological waste and wood in the home are burned together for heating, which will also extremely increase the emission of particulate matter. These particulate matters causes people in the home to infect lung diseases and endanger people's health. In addition, the combustion of municipal biological waste will also lead to increased chloride emissions, which will pollute the local air quality. Therefore, the incineration of biological waste is still prohibited in most countries. (Timonen, Mylläri, Simonen, Aurela, Maasikmets, Bloss, Kupri, Vainumäe, Lepistö, Salo, Niemelä, Seppälä, Jalava, Teinemia, Saarikoski & Rönkkö 2021.)

3.1.3 The landfill of treating biological waste

Landfill is another way to deal with waste. With this technology, waste will be collected and stored underground. Over time, waste can be decomposed into different kinds of gases or liquids. Since the landfill will produce a large amount of malodorous gas and affect the normal life of surrounding residents, the general landfill will be set in rural areas far away from the city. Due to the geographical location of the landfill, the station needed to spend money to collect and transport the biological waste of urban residents to the landfill. Landfill is not a simple waste dump or an open waste accumulation station. It also needs a covering layer and a small amount of soil to ensure that methane and carbon dioxide will not leak and lead to the greenhouse effect. During landfill, it should be noted that the liquid infiltrated by garbage will pollute the surrounding soil and make the soil lose the ability to cultivate organisms. Therefore, waste liquid treatment systems have been set up in many large landfill sites. Although biological waste is well treated in this way, it will have a large impact on the environment, which is not in line with the theory of harmonious development between man and nature. Therefore, some countries have abolished landfill laws to let them have a better soil environment. However, for countries that still use landfills, isolation devices need to be set up to avoid waste liquid polluting the environment. (Quadri & Dohare 2021.)

3.1.4 The anaerobic digestion of biological waste

Anaerobic digestion technology is one of the most important biomass energy utilization technologies. It changes solid organic matter into dissolved organic matter, and then converts the energy contained in waste into biogas for combustion or power generation, so as to realize the recovery of resources and energy. After anaerobic digestion, the residue is minor and stable. The reaction equipment is sealed to control the emission of odor. Anaerobic digestion improves the energy balance of organic waste treatment process, and has many advantages in economy and environment. At the same time, anaerobic digestion is widely used in sewage, livestock manure and city organic waste treatment. Methane engineering technology has the following objectives, recycling economy development, environmental protection, reducing greenhouse gas emissions and producing renewable energy. (Slopiecka, Liberti, Massoli, Bartocci & Fantozzi 2022.)

3.2 Reuse of the biological waste

Because incineration and landfill methods will produce large odor and many kinds of toxic and harmful gases, many countries gradually began to abandon these two ways of dealing with biological waste, which are not beneficial to environmental protection. In view of the fact that biological waste is not completely worthless to human beings, the valuable components can be recycled and reused. With the good reuse and recycle, it will have an increase on the benefit as well as the environment.

3.2.1 The method of reuse biological waste

Biological waste reuse is to sort the original biological waste and divide it into reusable part and non-valuable part. For parts without use value, the traditional incineration and landfill method can be directly treated. Supporters in this area believe that this can reduce waste generation and cost consumption. Many countries in today's society, such as Malaysia, which will vigorously adopt recycling methods because of their small geographical area and large amount of waste. Malaysia produces many biological waste every year. If landfill and incineration are used, it will have a large impact on Malaysia's air quality. Therefore, Malaysia mainly uses the method of biological waste recycling. Therefore, for such items, the government of Malaysia organized residents to carry out recycling. They asked residents to sort the waste before throwing it away, so as to ensure that the reusable part will not be thrown away directly. The rest will be sorted by the local waste treatment unit managed by the government, and the valuable items will be left to the corresponding departments for the production of new commodities. The toxic, harmful, worthless or low value items will be incinerated and landfilled. With the sustain of this, Malaysia has reduced its carbon dioxide emissions by about 40%. Therefore, it can be seen that recycling will bring evident economic and environmental benefits. (Umar, Shafiq & Ahmad 2021.)

3.2.2 The application of recycle and reuse

Restaurants produce many leftovers every day, which will cause a large amount of biological waste. In order to avoid this problem, many countries have thought of many ways to reuse leftovers, one of the

most typical is to turn them into pig feed. Historically, pigs are the oldest food waste recycling bin. Nine thousand years ago, in China, Anatolia and Mekong, wild boars first raided the food residues left by humans. However, some artificially domesticated wild boars have large infectious diseases such as foot-and-mouth disease after eating food residue feed, which also makes the food residue needed to be treated before being ate by pigs. (Dame-Korevaar, Boumans, Antonis, Klink & Olde 2021.)

Although the EU regards swill as the culprit that can bring disease risk, other countries still regard it as a potential source of feed. Heat treatment of food residues can kill some viruses, such as foot-and-mouth disease and porcine cholera, and promote them to become safe pig feed. In the same year that the UK banned the use of food residues, the Japanese government also adopted a measure to strictly regulate the use of swill in animal feed. Today, 40% of food residues in Japan and South Korea are being reused as animal feed. In these countries, the utilization of food residues is strictly regulated. The food safety law stipulates that the heating time of food residues containing meat shall not be less than 30 min at 70 °C or 3 min at 80 °C. Food residues are usually fed as pellets after dehydration or as liquid after fermentation. These two technologies have been proved to disinfect food residues and prolong their shelf life without damaging their nutritional value. Although the reuse of food waste will improve many economic benefits, it must be noted that enterprises will bring some environmental problems. (Salemdeeb, Ermgassen, Kim, Balmford & Al-Tabbaa 2017.)

At the same time, garbage classification need to be paid attention. Families and restaurant kitchens will produce many kinds of garbage, some of which are dry garbage and others are wet garbage. Now most of the recycling still do not separate them well, resulting in mutual pollution between them, making the food waste that could be reused lose all its value. While carrying out high-temperature sterilization for food waste, people should also actively classify waste to ensure that all waste can give full develop to its maximum value.

3.2.3 The future of reuse and recycle

As many countries realize that the accumulation and landfill of biological waste will cause environmental pollution, because the countries all over the world are interconnected, with the flow of ocean currents and winds, these wastes will be transported all over the world. If waste producing

countries do not prevent and promote new methods to deal with waste, the whole earth will be full of biological waste. Now many developing countries, such as China, have realized that the harm of biological waste to the environment is irreversible, that is, if it destroys the environment, the self-healing capacity of the whole ecosystem is far from enough. At the same time, the incineration and landfill of waste will occupy many land and produce a lot of pollution. Therefore, China has actively promoted the classified treatment of biological waste. Based on this method, the garbage in the kitchen will follow the standards of dry garbage, wet garbage, toxic and harmful garbage and recyclable garbage. After cooking, the garbage will be placed in different color dustbins, and the garbage treatment organization will treat the garbage in different ways according to the dustbins. (Xu,Liu ,Simi & Zhang 2022.)

4 THE SUSTAINABLE DEVELOPMENT OF BIOLOGICAL WASTE

Sustainable development has now become a widely implemented strategy. Sustainable development means that economic development should also fully consider the impact on the environment. For food waste, if China does not have a good treatment, recycle and reuse, it will make its damage to the ecosystem exceed itself purification capacity, resulting in permanent damage to the ecosystem. Therefore, in order to fully consider the requirements of sustainable development, all biological wastes, including food waste, should be classified, recycled and reprocessed in order to reduce their harm to the environment.

4.1 The aim of the sustainable development

There is a serious problem of unbalanced development in today's society, which is reflected in the unequal level of economic development and people's living needs among many regions. This has also led to differences between developed and developing countries. At present, there are still food crises and dietary problems in many regions such as Southeast Asia and Africa. In other words, many people doesn't have enough food and clean water. The main reason is that the local environment is seriously polluted, resulting in the pollution of all land and rivers. In order to solve this problem, the United Nations sent environmental protection agencies to investigate local water sources and collect water samples. The results show that the contents of BOD and COD in the water source are much higher than the requirements of drinking water. At the same time, for the micro plastic components in the water, the sewage treatment plant can reduce the content of micro plastic in the water and let it achieve the drinking standard. Therefore, countries will energetically build sewage treatment plants to treat sewage (Tang & Hadibarata 2021.)

Many countries have a large population because of their large population base or large population growth rate. With the growth of population, it also brings many problems, the most important of which is the biological waste problem. With the growth of population, a large number of products converted from process of production will be consumed by human beings, resulting in endless garbage. The

accumulation of waste has also brought many environmental problems. This is also a problem that needs to be solved in the process of sustainable development. (Niemets, Kravchenko, Kandyba, Kobylin & Morar 2021.)

4.2 The circular economy

In the sustainable development, a main part is the circular economy. In traditional economy the whole process will be in a line, which means the product or the waste will have no chance to change back to the raw materials. But in the circular economy, the waste will be converted to the raw materials. In this way, the produce process will have a cut of invest and will decrease the amount of the waste. It can be seen that the circular economy strategy can be widely awared.

4.2.1 Principles of circular economy

The idea of circular economy was born in the United States in the 1960s. The term "circular economy" appeared in China in the mid-1990s. In the research process, academia has defined it from different angles, such as comprehensive utilization of resources, environmental protection, technological paradigm, economic form and growth mode, between broad and narrow. Currently, the definition of circular economy by the national development and Reform Commission is generally implemented in the society. Circular economy is an economic growth model with efficient utilization and recycling of resources as the core, the principle of 'reduction, reuse and recycling'. Also low consumption, low emission and high efficiency as the basic characteristics, and in line with the concept of sustainable development. It is a fundamental change to the traditional growth model of 'mass production, mass consumption and mass abandonment. (Stumpf, Schöggel & Baumgartner 2021.) This definition not only points out the core, principles and characteristics of circular economy, but also points out that circular economy is an economic growth model in line with the concept of sustainable development. It grasps the crux of China's relative shortage and massive consumption of resources, which is of urgent practical significance to solve the bottleneck restriction of China's resources on economic development. Face to people is the essence and core of the scientific outlook on development. Adhering to people-oriented requires that we should not only see things but not people in development, but should focus

on improving people's living conditions, improving the quality of people's material, political and spiritual life and promoting people's all-round development. (Stumpf, Schöggel & Baumgartner 2021.)

All countries in the world must adhere to the scientific outlook on development to guide the overall situation of economic and social development and promote the coordination of economic development with population, resources and environment. In the long run, circular economy is essentially an ecological economy, which is the concrete embodiment and realization of the concept of sustainable development. It requires following the ecological and economic laws, making rational use of natural resources and environmental capacity, developing the economy on the principle of "reduction, reuse and recycling", reconstructing the economic system according to the law of material circulation and energy flow of the natural ecosystem. And harmoniously integrating the economic system into the material circulation process of the natural ecosystem, and realizing the ecology of economic activities, In order to establish an ecological socio-economic system coordinated with the structure and function of the ecological environment system. (Xuan, Baoteng & Hua 2011.)

People started to realize that in the ecological economic system, the demand for natural resources in the growing economic system is endless, and the restriction of stable ecosystem on resource supply will inevitably constitute a contradiction from beginning to end. To promote the process of modern civilization around this contradiction, we must take a more reasonable path of ecological and economic development in which ecosystem and economic system adapt, promote and coordinate with each other. Ecological economy is a form of economic activity in which economic development and ecological environment protection and construction are organically combined and mutually promoted. It requires that under the guidance of the thought of coordinated economic and ecological development and in accordance with the principle of layered utilization of material and energy, nature, economy, society and environment should be regarded as a systematic project, based on ecology and focusing on economy. It emphasizes that economic construction must pay attention to the investment benefits of ecological capital, and recognize that ecological environment is not only the carrier of economic activities, it is also an important factor of production. It should be realized that the mutual coordination and organic unity of economic development, resource conservation, environmental protection and harmony between man and nature. Taking China's Yangtze River Delta Urban Agglomeration as an example, with the rapid advancement of China's urbanization process, it has produced better economic

benefits, but it is accompanied by more serious population and environmental problems, such as much population and scarce resource imbalance. (Luo, Liang, Wang, Chen & Zhang 2021.)

4.2.2 The application of the circular economy in biological waste treatment

In Amsterdam, the Netherlands, 4 million tons of domestic waste will be generated every year, including kitchen waste and food waste from restaurants. According to the original treatment method, a large number of toxic and harmful gases will be produced, polluting the living environment of local residents. In order to overcome this problem, the Dutch government announced the implementation of circular economy. That is to sort and select residents' garbage before incineration, collecting the recyclable part and transform this to the raw material factory to continue to produce biological products. In this way, on the basis of reducing the emission of incineration waste gas, the problem of high production cost is also solved. It can be seen that the implementation of circular economy will minimize the damage to the environment on the premise of controlling the cost. It can also avoid the use of environmental pollution methods such as incineration and landfill, but use circular methods to deal with a large amount of domestic waste. (Tonini, Wandl, Meister, Muñoz Unceta , Dewulf & Huygens 2020.)

5 CONCLUSION

With the gradual increase of biological waste and the large environmental problems it brings, it can be seen that the original treatment methods can no longer meet people's needs for environmental protection. Therefore, the method of recycling is widely used. Through the environmental improvement of countries and regions that have implemented this method, it can be seen that this method has a great sustainable effect.

For the kitchen waste of restaurants, catering practitioners should be required to actively classify the waste and place the waste with utilization value separately to avoid contacting the other perishable waste. At the same time, citizens should also be actively guided to improve their awareness of waste classification in their lives. All people can separate their own waste dry and wet at home, and place the waste classification in the designated garbage can in the designated area, instead of mixing all types of waste together and losing their original value. For those who do not comply with waste classification, appropriate regulations should be used to restrict their behavior.

If countries and regions around the world can do well in their own biological waste recycling and reuse process, the existing environmental problems caused by waste in the world will be gradually improved, and there will be no new problems.

REFERENCE

Blasius, Contrera, Maintinguer & Castro, 2020, Effects of temperature, proportion and organic loading rate on the performance of anaerobic digestion of food waste, 27, e00503

Dame-Korevaar, Boumans, Antonis, Klink & Olde, 2021, Microbial health hazards of recycling food waste as animal feed, 4, 100062

ElFetyany, Kamal, Helmy & Lotfy Nasr, 2021, Study the Effect of Food Waste on Egypt Water Resources - wheat case study, 12, 2401-2412

Fazzino, Folino, Mauriello, Pedullà & Calabrò, 2021, Biofuel production from fruit and vegetable market waste and mature landfill leachate by an active filter-anaerobic digestion integrated system, X12, 100130

Global Punjab, 2020, Wheat straw burning cases in Punjab hit season's high,

Available at:

<https://globalpunjabtv.net/wheat-straw-burning-cases-in-punjab-hit-seasons-high>

Accessed: 7 February, 2022

Hou, Keske, Hoag, Balezentis & Wang, 2019, Abatement costs of emissions from burning maize straw in major maize regions of China: Balancing food security with the environment, 208, 178-187

Li, Zhang, Li & Zhi, 2016, The Status of Municipal Solid Waste Incineration (MSWI) in China and its Clean Development, 104, 498-503

Lu, Tsai & Chang , 2017, Forest waste derived fuel with waste cooking oil, 105, 1250-1254

Luo, Liang, Wang, Chen & Zhang, 2021, Exploration of coupling effects in the Economy–Society–Environment system in urban areas: Case study of the Yangtze River Delta Urban Agglomeration, 128, 107858

Muizniece & Blumberga 2015, Assessment of the amount of coniferous wood waste in the Baltic States, 72, 57-63

Niemets, Kravchenko, Kandyba, Kobylin & Morar, 2021, World cities in terms of the sustainable development concept, 2, 304-311

Odonkor & Sallar , 2021, Correlates of household waste management in Ghana: implications for public health, 7, e08227

Quadri & Dohare, 2021, Site selection and designing of landfill using Nexus approach, 3, 100019

Quyn, Rayer, Gouw, Indrawan, Mumford, Anderson, Hooper & Stevens, 2013, Results from a pilot plant using un-promoted potassium carbonate for carbon capture, 37, 448-454

Romasanta, Sander, Gaihre, Alberto, Gummert, Quilty, Nguyen, Castalone, Balingbing, Correa Jr & Wassmann, 2017, How does burning of rice straw affect CH₄ and N₂O emissions? A comparative experiment of different on-field straw management practices, 239, 143-153

Salemdeeb, Ermgassen, Kim, Balmford & Al-Tabbaa, 2017, Environmental and health impacts of using food waste as animal feed: a comparative analysis of food waste management options, 140, 871-880

Samuel, 2016, Leftover Food Reuse or recycling in Households, 978, 149-157

Silva, Viganó, Mesquita, Dias, Souza, Sanches, Chaves, Pizani, Contieri & Rostagno, 2021, Recent advances and trends in extraction techniques to recover polyphenols compounds from apple by-products, 12, 100133

Suri, Singh & K. Nema, 2022, Current applications of citrus fruit processing waste: A scientific outlook, 2, 100050

Slopiecka, Liberti, Massoli, Bartocci & Fantozzi, 2022, Chemical and physical characterization of food waste to improve its use in anaerobic digestion plants, 5, 100049

Slorach, Jeswani, Cuéllar-Franca & Azapagic, 2020, Assessing the economic and environmental sustainability of household food waste management in the UK: Current situation and future scenarios, 710, 135580

Stumpf, Schöggel & Baumgartner, 2021, Climbing up the circularity ladder? – A mixed-methods analysis of circular economy in business practice, 316, 128158

Sinha & Tripathi, 2021, Trends and challenges in valorisation of food waste in developing economies: A case study of India, 4, 100162

Tang & Hadibarata, 2021, Microplastics removal through water treatment plants: Its feasibility, efficiency, future prospects and enhancement by proper waste management, 5, 100264

Timonen, Mylläri, Simonen, Aurela, Maasikmets, Bloss, Kupri, Vainumäe, Lepistö, Salo, Niemelä, Seppälä, Jalava, Teinmaa, Saarikoski & Rönkkö, 2021, Household solid waste combustion with wood increases particulate trace metal and lung deposited surface area emissions, 293, 112793

Tonini, Wandl, Meister, Muñoz Unceta, Ellen Taelman, Sanjuan-Delmás, Dewulf & Huygens, 2020, Quantitative sustainability assessment of household food waste management in the Amsterdam Metropolitan Area, 160, 104854

Umar, Shafiq & Ahmad, 2021, A case study on the effective implementation of the reuse and recycling of construction & demolition waste management practices in Malaysia, 12, 283-291

Xuan, Baoteng & Hua, 2011, The Research Based on the 3-R Principle of Agro-circular Economy Model-The Erhai Lake Basin as an Example, 5, 1399-1404

Xu, Liu, Simi & Zhang, 2022, Recycling and reuse of construction and demolition waste: From the perspective of national natural science foundation-supported research and research-driven application, 16, e00876

Zhang, Xue, Jiang, Song, Wei & Liu, 2022, Food delivery waste in Wuhan, China: Patterns, drivers, and implications, 177, 105960