# NEWSLETTER

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***JAPAN SOCIETY OF MATERIAL CYCLES AND WASTE MANAGEMENT***


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## Message from the Editorial Committee

In this message, I would like to introduce the activities of the editorial committee of the Japan Society of Material Cycles and Waste Management (JSMCWM).

One of the primary missions of JSMCWM is to collect, communicate, and share new findings and experiences in material cycle and waste management. The editorial committee tackles this mission through four regular publications.

The first is the Japanese membership journal, Material Cycles and Waste Management. This bimonthly journal is the public face of our society. We try to organize special issues with timely topics, such as articles by experts invited to write about current conditions, efforts being made, and future trends. It also contains commentaries, book reviews, activity reports for each branch, and seminar reports. While the journal is primarily written in Japanese, the table of contents can be accessed in English on the Society's web site and the abstracts of articles in the special issues are in English.

The second publication is the domestic journal, the Journal of the Japan Society of Material Cycles and Waste Management. This journal can be read on "J-Stage", an electronic journal platform for science and technology information on Japan. Both members and non-members can access the latest articles for free. The articles are written in Japanese, with English abstracts.

In line with globalization, many researchers want to publish in international journals, writing in English — particularly in prominent journals with high impact factors, which is one indication of a researcher's value. Nevertheless, I recommend submitting papers to domestic Japanese-language journals for two reasons. First, it is essential that junior or less experienced researchers organize their research, think in a logical structure, and write well in their mother tongue. Reviewers will comment with in-depth explanation on the paper because they also use the same language. Communication during the review process is very important for improving research and enhancing one's qualifications as a researcher. Second, when the domestic applicability of research results exceeds its international applicability, a paper should be submitted to a domestic journal.

The third publication is the international journal, the Journal of Material Cycles and Waste Management (JMCWM), the first volume of which was published in 1999. Currently, its editors-in-chief are Professor Shin'ichi Sakai, Professor Toshiaki Yoshioka, and Professor Seung-Whee Rhe. The journal has been co-edited by the Japan Society of Material Cycles and Waste Management and Korea Society of Waste Management since 2009. Its impact factor has increased rapidly, from 0.78 in 2009 to 2.004 in 2018. The total number of submissions has increased from 53 in 2009 to 572 in 2018, which suggests that processing papers is hard work. It is difficult to find suitable reviewers and to review papers appropriately and speedily. For example, if the assigned editor invites 10 reviewer candidates, eight often refuse the invitation. Because the review process is a peer-review system, researchers have to review each other's papers, which we hope leads to the publication of refined, reliable results. Therefore, the qualifications of the reviewers are very important.

This year, our journal established a “Leading Reviewer Prize” to appropriately reward the hard work of reviewers.

In general, the level of a journal is determined by its impact factor. However, impact factor alone does not reflect the journal’s overall value. For example, the main achievements of Prof. Toshihide Masukawa and Prof. Makoto Kobayashi, who won the 2008 Nobel Prize in Physics, were published in Progress of Theoretical Physics, edited by the Physical Society of Japan. Its impact factor in 2008 was 1.94. The most important thing is how much a journal contributes as a global platform to its research field. To increase their impact factors, some journals try to focus on articles on general principles, rather than local or regional case studies. However, the JMCWM has a section called “Regional Case Study” that is aimed at gathering information on developing countries and areas for which limited data are available. We believe that this information will be useful in the near future.

Lastly, once a year we publish a book for citizens, 3R in Everyday Living — Keeping One Step Ahead of Waste (in Japanese, Jyunkan to Kurashi). This is an outreach activity of our academic society. Based on the realization that problems of material cycles and waste cannot be solved without the understanding of citizens, the book aims to provide society with high-quality, easy to understand information for solving problems and establishing a sound material cycle society. It introduces timely topics, such as “disposable plastic” in the latest edition. The book is written in Japanese, but some articles might be understandable to other nationalities because many photos and illustrations are used.

Because it is believed that the publications of academic societies are inherently reliable amid a wealth of information, their demand will increase. We very much hope for your continuous efforts in, and cooperation with, the activities of the editorial committee.

(Prof. Dr. Masaki Takaoka, Editorial Committee Chair, Department of Environmental Engineering, Graduate School of Engineering, Kyoto University)

## Role of Waste Management Technology for Achieving SDGs and Japan’s future vision – Waste Treatment Facilities that Create New Regional Values –

### 1. The History of Waste Management in Japan

***From the improvement of public health to the preservation of the living environment and establishment of a Sound Material-Cycle Society***

At the beginning of the modern period in Japan — with the opening of the country in the 1850s — waste management started with a focus on ‘the improvement of public health’. The subsequent migration of people to cities and expansion of trade brought the spread of epidemics. Cholera epidemics were a frequent occurrence, with tens of thousands of deaths, and the plague landed at Yokohama Port in 1896. To address these issues and improve public health, Japan's first national law, the Dirt Removal Law, was enacted in 1900. According to this law, each plot of land was to be cleaned by its owner or occupant, while municipalities (towns, villages, and cities) collected and disposed of waste. In addition, it was stipulated that waste should be incinerated if possible. This law shaped the basic scheme of (household) waste treatment that is still common today.

After World War II, the Public Cleansing Law was enacted in 1954 in order to cope with debris from war damage and the increase in the amount of municipal waste. Even after this act, the amount of waste kept increasing with postwar reconstruction and economic development. In 1963, in order to further promote facility construction, the Act on Emergency Measures Concerning the Development of Living Environment Facilities was enacted, and it was decided that facility development would be promoted by creating a five-year plan. This plan is currently approved by the Cabinet Office every five years as the Waste Treatment Facilities Development Program under the existing Waste Management and Public Cleansing Law.

Due to rapid industrialization, not only did the amount of waste increase, but pollution problems also become apparent. At the so-called Pollution Diet of 1970, the 1954 act was fully revised and reenacted as the Waste Management and Public Cleansing Law (“the Waste Management Law”).

The Waste Management Law describes as its purpose the preservation of the living environment in addition to

the improvement of public health, and classifies waste as industrial waste and municipal solid waste according to its waste treatment system. In this law, industrial waste refers to waste that is generated by business activities and is defined as certain types (depending on the type and industry of the discharge source), and municipal solid waste refers to household waste and waste that can generally be handled within the waste management capacity of municipalities. As for the management of municipal solid waste, the principles of the Public Cleansing Law are inherited and the management entity is, in principle, placed within the municipalities' cleaning operations. Regarding the treatment of industrial waste, the responsibilities of business operators for waste treatment are clearly defined; further, they must handle the industrial waste by themselves. Even if the waste discharged by a business operator falls under the category of municipal waste, the operator is assumed to be responsible for its disposal. Municipalities are completely responsible for the management of municipal waste.

In the years after the passage of the 1970 Waste Management Act, the amount of waste increased, the quality (variety) of waste diversified and the problems of heavy metals, dioxins, and large-scale illegal dumping became widespread. Accordingly, the 1991 revision of the law added the restriction of waste discharge and appropriate sorting/recycling (resource recovery) as purposes, while a system was established that manages specially-controlled waste with properties such as explosiveness, toxicity, and infectivity.

In 1992, the United Nations Conference on Environment and Development (the Earth Summit) was held in Rio de Janeiro and efforts toward sustainable development were accelerated on a global scale.
In the field of waste management in Japan, the Basic Act for Establishing a Sound Material-Cycle Society was enacted in 2000 to break free from the 'mass production/mass consumption/mass disposal' type of economic system and promote the establishment of a sound material-cycle society where the 3Rs (Reduce, Reuse, Recycle) are implemented and the proper disposal of waste is secured.

Both prior to and after that, various recycling laws such as the Law for Promotion of Sorted Collection and Recycling Containers and Packaging (Containers and Packaging Recycling Law) in 1995, Law for Recycling of Specified Kinds of Home Appliances (Home Appliance Recycling Law) in 1998, Law Concerning Recycling of Materials from Construction Work (Construction Material Recycling Law) and Law for Promotion of Recycling and Related Activities for the Treatment of Cyclical Food Resources (Food Waste Recycling Act) in 2000, Law for the Recycling of End-of-life Vehicles (End-of-life Vehicle Recycling Law) in 2002, Act on Promotion of Recycling of Small Waste Electrical and Electronic Equipment (Small Home Appliance Recycling Act) in 2012, and Law on Proper Dismantling of Ships for Recycling (Ship Recycling Law) were put in place, and efforts have been made to build a sound material-cycle society and resource circulation.

***Frequent disasters***

Under the Basic Act on Disaster Management, the term 'disaster' is defined as damage resulting from storms, tornados, heavy rainfall, heavy snowfall, floods, slope failures, mudflow, high tide, earthquakes, tsunamis, volcanic eruptions, landslides, or other abnormal natural phenomena, large fires and explosions, or other causes determined by Cabinet Order and similar to the above in the extent of damage they cause.

In recent years, many disasters have occurred. Earthquakes include the Great Hanshin-Awaji Earthquake (1995), the Niigata Chuetsu Earthquake (2004), the Great East Japan Earthquake (2011), the Kumamoto Earthquake (2016), and the Eastern Hokkaido Iburi Earthquake (2018). As for typhoons and heavy rain disasters, the torrential rains in Izu Oshima caused by Typhoon Wipha (2013), the Hiroshima landslide disaster (2014), torrential rains in July 2018, and the Boso Peninsula typhoon/East Japan typhoon (2019) have occurred.

Once a disaster occurs, a large amount of disaster waste is generated, and even if wide-area treatment is performed it takes several years to dispose of it. Therefore the Waste Management Act and the Basic Act on Disaster Management were revised in 2017 to prepare for waste management before and after a disaster and allow for systematic and seamless response.

## 2. Current States of Japan and Waste Management

***Current state and trends of population and waste***

The Japanese birthrate continues to decline, while the population ages. In 1900, when the Waste Sanitation Law was enacted, the population was 43.85 million. It is estimated that the population will fall from its 2008 peak of 128.80 million to 59.72 million in 2100. As the population continues to age, it is said that the aging rate will reach about 40% in 2060 and that the productive population will be about half of its 1995 peak. Regional population distribution is also considerably

uneven, with predictions saying that by 2050 places with populations of less than half their current numbers will account for more than 60% of all residential areas — with 20% seeing complete depopulation. Furthermore, the number of municipalities with fewer than 10,000 people will decline to about half.

The total discharge amount of municipal solid waste was 42.72 million tons in fiscal 2018, and the amount of waste discharged per person per day was 918 grams. Japan has set targets for 2025 of approximately 38 million tons and 850 grams, respectively. Household waste is 70% and business waste is 30%; the composition of this waste is 30% each for paper and kitchen waste, while wood, bamboo, straws and other plants and plastic are at about 10% for each. About 80% of the discharged waste is incinerated.

The number of incineration facilities is decreasing due to the promotion of regional solid waste management to tackle problems such as dioxin. There are 1,082 at the present time. Currently, each prefecture is in the process of formulating a plan for further promotion of regional solid waste management.

***Climate Change***

Japan's greenhouse gas emissions were 1,240 million tons in fiscal 2018, the lowest total since fiscal 1990, when emissions estimation was begun. Emissions in the waste management sector are estimated to be about 3% of total GHG emissions.

Japan has set a final goal of becoming a 'decarbonized society' and aims to realize this society as early as possible in the latter half of this century. It has also set a long-term goal of reducing greenhouse gas emissions by 80% by 2050. The waste management sector is related to the emission of carbon dioxide (energy- and non-energy-related CO2), methane, dinitrogen oxide, HFC, PFC, SF6 and NF3, and it is necessary to take measures to reduce them.

'Mitigation' refers to measures to reduce the emission of greenhouse gases that cause climate change. 'Adaptation' refers to measures to prevent/reduce damage due to the impact from climate change that has already occurred or is expected to in the future. 'Mitigation' and 'adaptation' are two sides of the same coin in combatting climate change.

***Plastic***

Plastics began to be manufactured and spread in earnest in the 20th century. In Japan they have been widely used for daily essentials since the 1960s. Plastic is mainly made from petroleum and has become widespread because it is light, rot-resistant, and can be mass-produced at low cost. Recently, about 10 million tons per year are produced in Japan.

The Waste Management Act — by which business-related plastics are managed as industrial waste — and Containers and Packaging Recycling Law — which promotes recycling — are countermeasures that address plastic waste.

In recent years, worldwide concern about plastic waste has been increasing. It is estimated that every year millions of tons of plastic waste flow globally from land into the ocean. It is also predicted that by 2050 oceans could contain more plastics than fish.

***Hazardous materials***

Waste management and hazardous materials are related at various stages of waste management, but various measures have already been taken (in fact, throughout the treatment process it is necessary to manage any waste in a 'non-hazardous' condition in terms of hygiene and the living environment).

In the Waste Management Law, highly hazardous waste is treated as a specially-controlled or difficult item to dispose of properly. Also, each recycling law is utilized for proper management.

After considering the waste treatment process, there exist various safety measures in the manufacturing process.

Among the kinds of household waste, apart from the illegal disposal of organic waste, spray cans, cassette cylinders, and lithium-ion batteries have recently become a problem during the collection, transportation, and disposal stages.

Needless to say, it is necessary to treat these items more safely, and it is also necessary to safely treat items that will be produced as products in the future.

With regard to hazardous chemicals, PCBs are an example of chemicals in products that make an impact on our society. Another example is dioxins, which influence the final stage of the waste treatment process.

In Japan, the sale of PCBs began in 1954; production ceased in 1972. In order to prevent missing PCBs and environmental degradation due to their leakage caused long-term storage, the Law Concerning Special Measures for Promotion of Proper Treatment of PCB Wastes (PCB Special Measures Law) was enacted in 2001.

With regard to dioxins, their emission from waste incineration facilities had a great impact on society in the 1980s and 1990s. To tackle this problem, the structural and maintenance management standards for incineration plants were revised in 1997 to implement perfect combustion and the prevention of regeneration of dioxins. In 1999, the Law Concerning Special Measures against Dioxins was enacted. Due to these countermeasures, the total emission of dioxins in Japan was about 100g-TEQ in 2017, which was less than the 8000g-TEQ emitted in 1997.

### 3. Future Issues and Measures

Considering the historical background discussed in Section 1 of this paper and the current state of waste management in recent years described in Section 2, it is necessary to take the following measures for each issue for future waste treatment.

***Measures on population decline, low birthrate, aging population, and related issues.***

○ **Changes in quantity and quality of waste**

Reconstruction of waste treatment system based on the reduction of total waste discharge due to population decline and increase of disposable diapers due to aging population.

・Construction of a collection/transportation system that responds to the increase in business-related waste and changes in the quality of waste due to the increase in foreign tourists and residents.

○ **Securing human resources to maintain waste management service**

・Creation of opportunities for training, information exchange, personnel exchange, etc.

○ **Increased financial constraints**

・Utilization of private sector vitalization, such as the introduction of Public-Private Partnerships (PPP) and Public Finance Initiatives (PFI).

・Strengthening of monitoring system for private business collaborators/contractors to fulfill the waste treatment responsibilities of municipalities.

・Effective use of energy from waste from a long-term perspective in order not to rely too much on the grid.

○ **Increased efficiency of waste management systems**

・Regional solid waste management; integration of treatment facilities.

・A wide-area network that shares responsibility for waste treatment depending on the waste type or in facility installation among municipalities, from the perspective of overall optimization.

○ **Improved efficiency of wastewater treatment systems**

・Installation o*f Johkaso, decentralized wastewater treatment systems* that have the characteristics of individual treatment that can flexibly respond to population decline.

○ **Increase in the number of people who have difficulty in sorting and disposing of waste**

・Construction of a collection and transportation system that contributes to the improvement of local welfare by coordinating with welfare policies such as supporting the elderly in waste disposal and confirming safety.

***Securing and improving efficiency of waste treatment system/structure***

○ **Prolonging the service life of facilities through appropriate facility maintenance and planned equipment renewal**

・Realization of prolonged service life through the promotion of stock management.

○ **Utilization of ICT**

・Utilization of Information and Communication Technology (ICT), such as Artificial Intelligence (AI) and Internet of Things (IoT), for sophisticated operation monitoring, labor saving, cost reduction, optimization of equipment repair and renewal, and automation of sorting.

○ **Ensuring proper processing and promoting resource circulation**

・Establishment of EPR (extended producer responsibility) and an advanced recycling system according to items and materials.

・Development of an appropriate collection/ management/recycling system for waste such as products using lithium-ion batteries and spray cans, which are dangerous at the time of disposal and treatment.

・Promotion of resource recycling efforts by manufacturers and others through the use of wide-area certification systems, etc.

○ **Resource circulation strategy for plastic**

・Reduction of plastic use, turning plastics into biomass and strengthening recycling.

○ **Food loss**

・Efforts to reduce food loss at the discharge stage by improving public awareness.

・Thorough implementation of turning waste into feed, fertilizer, energy recovery and other useful materials.

*Climate change measures*

○ **Decarbonization of the entire waste treatment system**
- Promotion of effective utilization of energy from waste
- Utilization of ICT such as AI and IoT

○ **Examination from the perspective of 'adaptation'**
- Securing a waste management system that responds to rising temperatures and increasing precipitation as well as preparing for disasters due to climate change.
- Increasing the role of waste treatment and securing public health to avoid infectious disease risk.

○ **Innovative technology development for the realization of carbon cycle plants**
- Development of innovative technology aiming at the utilization of waste incineration facilities as a carbon recycling plants

*Disaster countermeasures*

○ **'Preparation during ordinary times' — such as the formulation of disaster waste treatment plans and the conclusion of disaster agreements**
- Preliminary preparations, such as planning based on lessons learned from disasters, and collaboration and cooperation among relevant parties, such as the national government, local governments, and businesses.

○ **National Resilience strengthening waste treatment facilities with measures such as earthquake resistance and flood control**
- Strengthen facilities and systems assuming large-scale disasters due to large earthquakes and large-scale flood damage due to climate change.

○ **Utilization of waste energy in consideration of self-sustaining operation during disasters**
- Promotion of the introduction of waste treatment facilities that have the function of supplying energy to evacuation centers and areas while continuing to operate independently during the occurrence of disasters.

*Waste treatment that creates new value in the region*

○ **Regional revitalization/promotion of local industry**
- Promotion of local industries, attracting companies, and promotion of new business creation by allowing waste treatment facilities to function as local resource recycling bases and energy centers
- Collaboration with primary industries by supplying steam, hot water, electricity, etc. from waste treatment facilities to fishery and agricultural facilities
- Collaboration with farmers by composting and using food waste as feed, and collaboration with waste biomass facilities, night soil treatment facilities, etc.
- Establishment of waste treatment facilities as social and learning facilities that lead to human resource development
- Procurement of funds from both inside and outside of regions through the issuance of green bonds, etc., for resource circulation and decarbonization.

○ **Independent and decentralized energy system**
- The energy system is located in industrial parks and commercial areas, supplying steam, hot water, electricity, etc. to adjacent factories and commercial facilities.
- Introduction of waste energy recovery technology according to regional characteristics in small and medium-sized waste treatment facilities such as depopulated areas and islands.
- Effective uses of biogas, such as for industrial use and as a hydrogen source.

○ **Utilization of waste treatment facilities as disaster management base facilities during disasters**
- Promote the utilization of waste treatment facilities as disaster management base facilities by using them as shelters and supplying heat and electricity to disaster countermeasure bases.

## 4. Creation of Regional Circular and Ecological Spheres – SDGs Cities

The aforementioned 'waste treatment that creates new value in the region' is already being realized based on the concept of a 'Circulating and Ecological Economy' in advanced regions and facilities.

There exist incineration facilities which are installed in the center of cities (e.g. in front of the city hall) to supply the electricity it generates and heat to surrounding public facilities. In some areas, regional solid waste management is promoted, and the conversion of waste into biogas at multiple facilities is realized. Also, intensive incineration of other combustible waste is being implemented. Some facilities use the heat generated at incineration facilities for aquaculture or industrial use (for vaporizing liquefied natural gas). In some cases, the electricity generated at incineration facilities is being used by the local LRT (Light Rail Transit) and electric waste trucks (EV waste trucks). Some waste treatment facilities are equipped with emergency supplies and are placed as disaster management base facilities for the surrounding region,

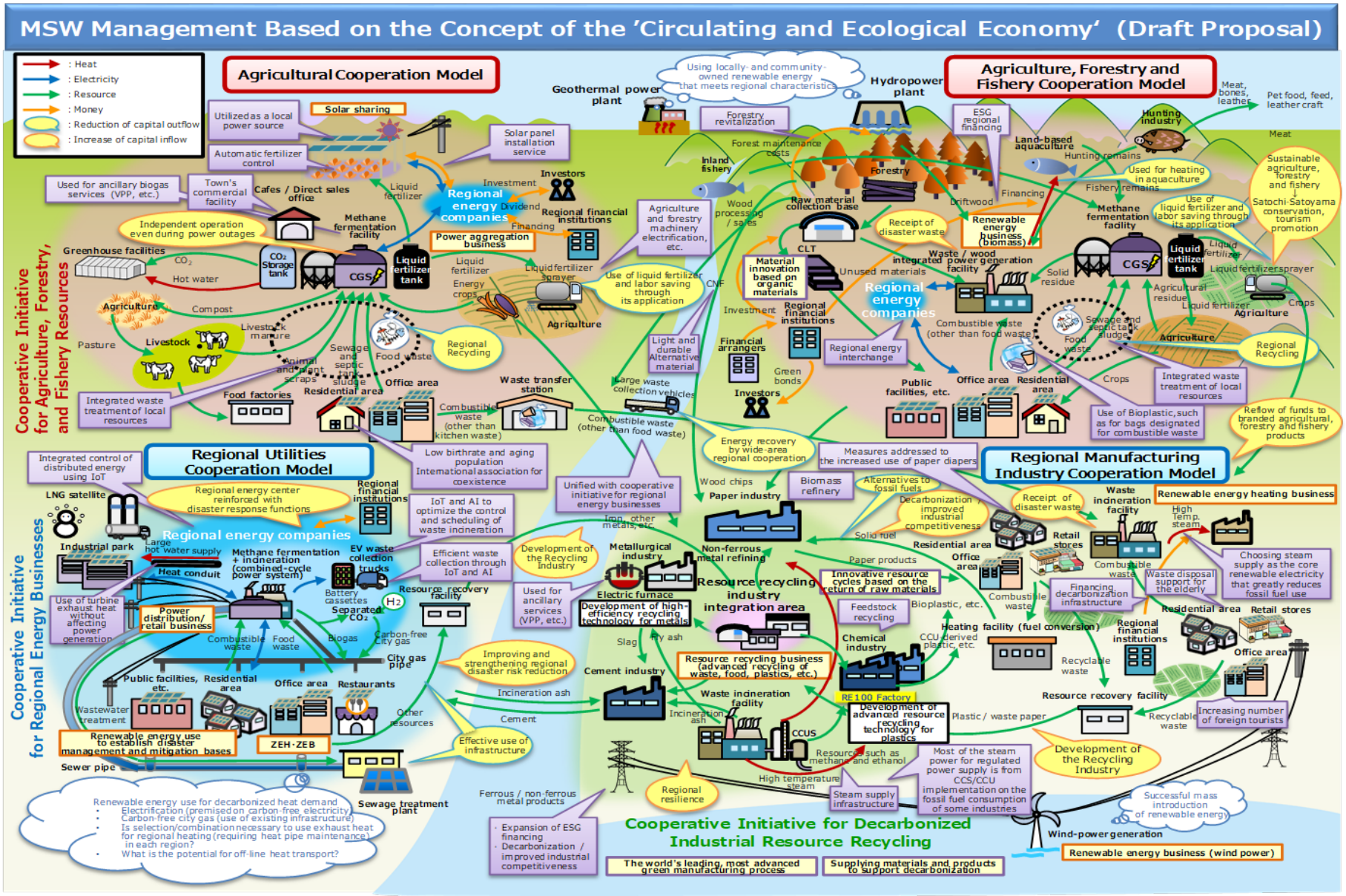


Figure 1　MSW Management Based on the Concept of the 'Circulating and Ecological Economy' (Draft Proposed)

taking advantage of the characteristics that enable them to supply electric power and heat even in the occurrence of disasters.

Waste treatment is indispensable from the viewpoint of conserving the local living environment and improving public health, and waste treatment facilities are basic infrastructure responsible for waste management and resource circulation in the areas in which they are located. On the other hand, waste treatment facilities are generally perceived to be 'nuisance facilities'. Continuous efforts are necessary — based on the ingenuity of the region to ensure the understanding and cooperation of local residents.

Until now, Japan has promoted efforts to create SDGs Cities based on the concept of the 'Circulating and Ecological Economy'. Further down the line we believe that by pursuing the simultaneous resolution of problems faced by society — making efforts toward decarbonization and coexistence with nature, implementing disaster measures, and carrying out regional promotion — we can create Regional Circular and Ecological Spheres.

The image below illustrates (see Figure 1) what we will attain in proceeding with these efforts. The service life of waste treatment facilities are said to be 20 to 40 years. If we move forward with the measures discussed above, it will be possible to find Regional Circular and Ecological Spheres everywhere in Japan by 2050.

(Yoshio Nakura, Director, Waste Management Division Environmental Regeneration and Material Cycles Bureau, Ministry of the Environment)

## Current Situation and Recent Trend of Waste Treatment in Odawara City

1. Introduction

The city of Odawara, located in the western part of Kanagawa Prefecture, has a population of about 190,000, industries cultivated over a long history since the Warring States Period of the 15th and 16th centuries, and historical resources such as Odawara Castle. It is also a hub of Hakone, one of Japan's most famous tourist resorts, with convenient transportation from central Tokyo.

Municipalities in Japan have the overall responsibility of disposing municipal solid waste (MSW) within their areas so that it does not hinder the preservation of the living environment. A new "Municipal Solid Waste Management Plan" has just been formulated in Odawara in March 2020. This paper summarizes the present state of, and recent trends in, waste management in Odawara.

2. General Waste Treatment Situation

There are two types of MSW: one is discharged from houses (household waste) and the other from offices (business waste). In Odawara, household waste is separated into nine classifications with a total of 18 items therein (with six different categories in the paper and cloth class and five different categories in the spray can class). It is collected as shown in Table 1. As for business waste, only burnable waste is accepted.

As shown in Table 2, the total amount of MSW discharged has been decreasing for the past six years. The trend for per capita emissions per day is also declining, although it increased slightly to 992 g/person in FY 2018. However, business waste is increasing annually.

The properties of burnable waste, which accounts for 70% of total MSW, can be broken down as follows, as shown below in Figure 2: "paper and cloth" accounts for 38%, while 21.6% is "food waste", 19.8% is "vinyl・synthetic resin・rubber・leather", and 16.9% falls under "wood・bamboo・straws". Thus, "paper and cloth" and "food waste" together account for 60% of total burnable waste. In addition, the category of "vinyl・synthetic resin・rubber・leather" includes containers and packaging plastics that can be separated, so that further thorough separation is required. Regarding resource recycling, incinerated ash is delivered to resource-recycling business operators and recycled into slag and other materials, while other sorted items are also delivered to them so that such waste as metals, glass, and plastics are recycled. The recycling rate for FY 2018 remained around 26%, as shown in Table 3, but has recently been decreasing slightly due to a reduction in the amount of "paper and cloth" collected. On the other hand, the recycling of incinerated ash has been low since the Great East Japan Earthquake of March 2011, but has been increasing slightly in recent years.

**Table 1 Sorting Waste and Recyclables**

| | Classification | Collection | Items |
|---|---|---|---|
| 1 | Burnable waste | Twice a week | Food waste, wood waste, leather, rubber, fabric, dirty paper |
| 2 | Paper and cloth | Twice a month | Newspapers |
| | | | Miscellaneous recyclable paper (magazines, books, wrapping paper, and packaging boxes, such as gift boxes) |
| | | | Cardboard |
| | | | Paper packaging and recyclables |
| | | | Other paper |
| | | | Cloth |
| 3 | PET bottles | Twice a month | Used for beverages and food seasoning |
| 4 | Trays and plastic containers | Once a week | Trays, bags, plastic containers |
| 5 | Cans | Once a month | Used for beverages and canned food |
| 6 | Glass bottles and jars | Once a month | Used for beverages, food, and cosmetics |
| 7 | Non-burnable waste | Once a month | Composite metal, plastic product, pottery, and broken glass |
| 8 | Spray cans, etc. | Once a month | Spray cans, gas canisters |
| | | | Fluorescent lights |
| | | | Dry cell batteries, lighters |
| | | | Videotapes, cassette tapes |
| | | | Cooking oil |
| 9 | Large-scale waste | Sometimes | Things that do not fit in a 45 L bag |

**Table 2 Change in Amount of Waste Discharged**

| Fiscal Year | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|
| Population | 196,073 | 195,125 | 194,086 | 193,313 | 192,407 | 191,181 |
| Total amount of MSW discharged (t/y) | 73,820 | 72,283 | 71,278 | 70,716 | 69,579 | 69,219 |
| Household waste (t/y) | 59,184 | 57,357 | 56,212 | 55,292 | 53,962 | 53,457 |
| Business waste (t/y) | 14,636 | 14,926 | 15,066 | 15,424 | 15,617 | 15,762 |
| Emissions per person per day (g/person/day) | 1,031 | 1,015 | 1,003 | 1,002 | 991 | 992 |

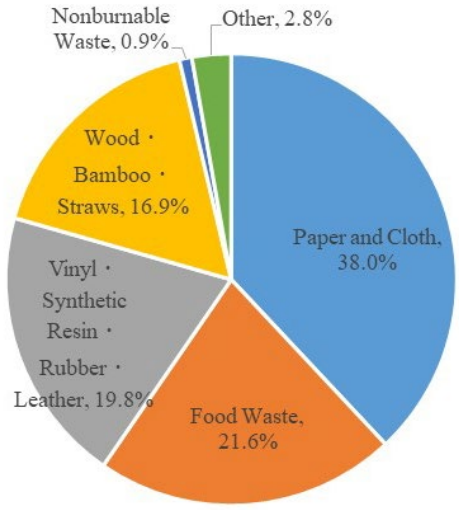


**Figure 2 Properties of Burnable Waste**

3. Major Policies for Waste Reduction

Odawara City is facing some issues with waste management, such as the lack of final disposal sites; therefore, its Environment Department is promoting waste reduction through the collaboration of citizens, companies, and administrative partnership with other government offices. Especially with regard to the amount of combustible waste, Odawara had reduced this by 20% from its peak of 63,787 tons in 2001 to 51,030 tons in 2018. This is mainly due to expansion of the aforementioned sorting of waste. Another important measure is the focus on reducing paper waste, cloth waste, and food waste, which account for 60% of combustible waste. The approach is described in the next section.

(1) Composting of waste using corrugated cardboard composter

**Table 3: Change in Recycling Rate**

| Fiscal Year | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|
| Recycling rate excluding incinerated ash | 26.1% | 25.9% | 26.0% | 25.6% | 25.2% | 24.6% |
| Incinerated ash recycling rate | 4.9% | 4.9% | 5.2% | 6.0% | 5.5% | 6.2% |
| Recycling rate including incinerated ash | 26.6% | 26.4% | 26.5% | 26.2% | 25.7% | 25.2% |

The city and a civic group, the "Odawara Ikigomi Club" * have been cooperating since 2010 in the effective utilization of household waste as compost.

Specifically, a set for starting corrugated cardboard compost (consisting of cardboard, an insect repellent cover, rubber string, a thermometer, shovel, sawdust, and other base materials) is provided free of charge by the city (after this initial start-up set, these need to be purchased; they are available at city hall and some supermarkets). The Odawara Ikigomi Club holds an "Ikigomi Salon" to explain the composting method and share information on how to continue the effort. As of March 2019, approximately 5,700 households have participated in this activity.

(2) Thorough sorting of used paper
As for paper, a separate collection system has been established with the cooperation of the residents' association, the Odawara-shi waste paper recycling business association, and the city.

Specifically, each citizen carries paper to the waste station managed by the residents' association, the recycling association collects and recycles the resources, and the city pays the cooperation fee to the recycling association and informs the citizens about the sorting method. As a result, the financial burden is lighter than that of contracted collection and resource recovery does not depend on the market for paper.

In addition to this, the collection of "other paper", such as memo paper that could not be bundled in small amounts, was started in 2005 to improve the recycling rate. However, there was still a large amount of contamination from burnable waste, so PR bags were distributed in 2014 and requests made that they be used for collection; the amount of collection then increased. The amount of separate collection is increasing by sequentially providing door-to-door collection services for the elderly.

In addition to these efforts, new businesses have been started in response to recent changes in waste management. Details are given below in Section 5.

4. Formulation of New Wastes Processing Basic Plan
Based on Article 6, Paragraph 1 of the Waste Management and Public Cleansing Law, municipalities are required to establish an Wastes Processing Basic Plan. Since the most recent plan in Odawara covered the period through 2019, a new plan has been established as the basic policy for the treatment of municipal solid waste from the long-term perspective of 10 years, beginning in 2020.

In considering this matter, the city consulted with an environmental council consisting of four scholars, three publicly recruited citizen representatives, one residents' association representative, one company representative, one agriculture, forestry and fisheries industry representative, and one official each from the national and prefectural government levels. A subcommittee established under the council reviewed the plan four times from March 2019 onward, then the council discussed it twice, compiled the draft, and solicited public comment for one month. Finally, the plan was formulated in response to a report from the council in March 2020.

The new plan clearly states that, to build a sustainable society, it is important to promote waste reduction, with an emphasis on restraining the generation of waste. Moreover, it is essential for each individual initiative to work under the cooperation of citizens, businesses, and government.

On top of that, Odawara City will further promote the separation of generated waste to reduce the amount of burnable waste and recycle resources.

In addition, Odawara City will address new challenges such as the reduction of food loss and plastic waste, while taking into consideration changes in social conditions such as the diversification of lifestyles.

In implementing the plan, numerical targets for waste reduction have been established as shown in Table 4. Odawara City aims to reduce the amount of household waste emissions that exceeds future projections associated with population decline (from 509 g/person/day in 2018 to 459 g/person/day in 2029). For business waste, we set the goal of ending the recent increasing trend in 2024 and reducing it by 2029 to the same level as it is now.

Going forward, Odawara City will implement waste reduction policy based on this plan. Major policies from FY 2020 onward are food loss reduction and the pruned branch recycling business. These are introduced in Section 5.

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* *Ikigomi* is written with the same Chinese character as the word *namagomi*, which means "food waste". Here, the alterative reading of the character — *ik(asu)* instead of *nama* — means "make the best use of", so *ikigomi* also means "exploiting waste".

Table 4 **Main Numerical Targets for Waste Reduction in the New Wastes Processing Basic Plan**

| Item | Present Value | Target FY | Target |
|---|---|---|---|
| Combustible household waste | 509 g/person day | 2024 | 484 g/person day |
| | | 2029 | 459 g/person day |
| Business waste | 15,762 t/y | 2024 | 15,907 t/y |
| | | 2029 | 15,762 t/y |

5. New Approach

(1) Food loss reduction

The reduction of food loss is one of the United Nations' Sustainable Development Goals (SDG 12.3) and a global issue. In Odawara as well, the compression of food waste, which accounts for 40% of the city's waste, is also an important challenge.

For this reason, the city has been conducting a survey since 2019 to understand the factors related to food loss occurrence, studying effective and efficient measures. Odawara City has just started efforts for reduction in 2020. Specifically, Odawara City will hold a class for citizens on planned shopping and usage of food ingredients, introduce a small serving menu for restaurants, and start a registration system for "Eat It All" shops that cooperate by providing take-out containers.

(2) Pruning branch recycling business

Beginning in 2020, Odawara City is starting to consider the recycling of pruned branches, which account for about 20% of total waste, in order to further reduce the amount of combustible waste and promote recycling. In the recycling of pruned branches, there are issues related to collection method, recycling method, the use destination of recycled material, and cost. To begin with, some of the pruned branches discharged from municipal public works will experimentally be converted into resources, while recovery from households will be considered in stages.

6. Future Tasks

In order to build a sustainable waste treatment system, the city of Odawara is promoting the aforementioned waste reduction efforts and is in the process of creating a wide area for waste treatment with three towns in the western part of Kanagawa Prefecture to cope with the deterioration of incineration disposal facilities in the future, the lack of final disposal plants, and depopulation. For the time being, Odawara City will extend the life of existing facilities in anticipation of the widening of the waste treatment area for the city and three Kanagawa towns.

(Kazuki Fukui, Deputy Director General, Environment Department, Odawara City)

## Call for the Special Issue of the 6th 3RINCs to JMCWM

Dear participants of the 6th 3R International Scientific Conference on Material Cycles and Waste Management (3RINCs) 2020, Tsukuba, Japan

We are pleased to invite you to submit a manuscript for a Special Issue of the Journal of Material Cycles and Waste Management (JMCWM) on the 6th 3R International Scientific Conference on Material Cycles and Waste Management (3RINCs) 2020. The 6th 3RINCs has been canceled due to global concerns about the contagions. However, in order to keep a record of the academic achievements of the conference participants, we will try to edit this Special Issue of the 6th 3RINCs.

The first issue of JMCWM was published at the end of October 1999, and the latest issue, Vol. 22, No. 2, was published in March 2020. At first, we published a biannual English journal. Beginning with Vol. 22, it has become bimonthly. In 2019, JMCWM obtained an Impact Factor of 2.004.

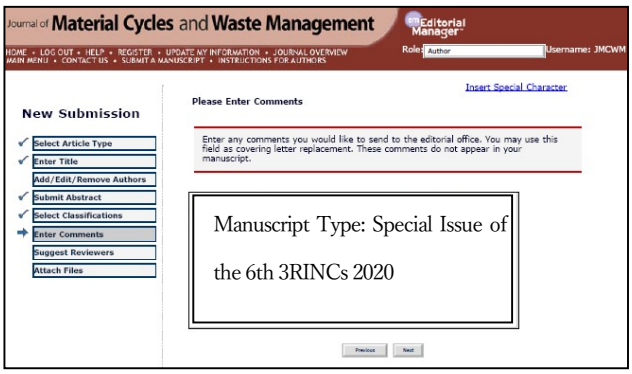
These are the conditions for paper submission to the 6th 3RINCs Special Issue: 1) Those who had an abstract registration for the 6th 3RINCs, and those who paid and did not request a refund of the conference registration fee, can submit his/her paper to the Special Issue; and 2) the submitted manuscripts should be significantly enhanced and updated from the original short abstract published in the proceedings of the 6th 3RINCs 2020. We would like you to keep the above two points in mind. In particular, point 2) is important in order to avoid any possibility of receiving duplicate submissions. Please note that only manuscripts containing data and information beyond the material presented in the proceedings of the 6th 3RINCs 2020 will be accepted for publication. All manuscripts for the 6th 3RINCs 2020 Special Issue of JMCWM will be subject to the standard rules and review process for peer reviewed papers, including the review of each manuscript by at least two international experts. The deadline for paper submission is July 15, 2020. Accepted papers will be published at the end of March

or May 2021 (Volume 23).

There will be no page charge for authors in the 6th 3RINCs 2020 Special Issue of JMCWM. Color illustrations will be accepted; however authors will be expected to make a contribution to help pay for extra costs. Instructions for authors are available on the JMCWM page on the Springer Link site (website address below). You can also find other information for submission and publication.

http://www.springer.com/engineering/civil+engineering/journal/10163
Please submit your manuscript using the online system, Editorial Manager (EM): https://www.editorialmanager.com/jmcw/

Specifications for your submission to the Special Issue of the 6th 3RINCs 2020 would be appreciated. Please provide them in the space reserved for author comments ("Enter Comments", as shown in the figure below).




We are looking forward to receiving your manuscripts.
Best regards,

Special Editors for the 6th 3RINCs 2020, the Special Issue of JMCWM

(Dr. Tomonori Ishigaki, Prof. Toshiaki Yoshioka, and Prof. Shinichi Sakai)

## The 6th 3R International Scientific Conference on Material Cycles and Waste Management (The 6th 3RINCs)

- Date: 16-18 March 2020 (Canceled)
- Venue: Tsukuba International Congress Center, Japan (https://www.epochal.or.jp/eng/index.html)
- Web page: http://www.3rincs.org/
- Facebook page: https://www.facebook.com/3rincs/
- Program and proceedings are available online https://www.pco-prime.com/3RINCs/
  IDs and passwords have been sent to participants who completed registration.
- Special Issue on the 6th 3RINCs in the *Journal of Material Cycles and Waste Management* https://www.springer.com/journal/10163
  Detailed information for submission is summarized on another page.

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Journal of Material Cycles and Waste Management, Vol. 22, Issue 2 (March 2020)

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## Current Members of JSMCWM
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| Current Members of JSMCWM as of April 30st, 2019 | |
|---|---|
| Regular Members | 1,858 |
| Fellows | 44 |
| Seniors | 71 |
| Honorary Members | 8 |
| Students | 136 |
| Public Institutions | 87 |
| Supporting Companies | 117 |
| Supporting Individuals | 1 |
| Regular Association Citizens | 3 |
| Individual Citizens | 15 |
| Korea Society of Waste Management | 20 |
| Total | 2,360 |

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