

JAPAN SOCIETY OF MATERIAL CYCLES AND WASTE MANAGEMENT

Contents

- Japanese Experience and Knowledge: Greatly Effective in Development Cooperation in the Field of Waste Management
- The Corporate Challenge to Marine Plastic Litter Issue
- Academic Research Committee Report on the 32nd Annual Conference of the JSMCWM (3RINCs Autumn)
- Upcoming Event: The 8th 3RINCs 2022 (Online)

Japanese Experience and Knowledge: Greatly Effective in Development Cooperation in the Field of Waste Management

I have worked as a private consultant for projects in the field of waste management in developing countries since 1988. The projects I have been involved in have mainly been implemented by the Japan International Cooperation Agency (JICA). The institutional, technical, and social experience and knowledge accumulated in Japan have been greatly effective in improving waste management in developing countries, so in this article I would like to talk about them.



My initial involvement in development cooperation in the waste management sector consisted mainly of grant aid projects to procure waste collection vehicles and landfill equipment for final disposal sites. At that time, the aid projects were mainly formulated on the basis of local needs. Soon after, development studies began to be carried out, with the development of a solid waste management plan and feasibility studies conducted for priority projects proposed in the plan, such as the procurement of equipment and the development of final disposal sites. These studies were used to elaborate and validate the projects and to formulate proposals for

grant aid and loan aid. Since 2006, technical cooperation projects have focused on the capacity development of individuals and organizations through support for planning, institutional strengthening, public awareness, and environmental education, among other things.

Prior to 2000, the main issues in waste management improvement projects in developing countries were the removal of waste from settled areas to address the deterioration of living conditions and public health caused by the concentration of population associated with urbanization, and the minimization of the environmental impact of accumulated waste. Since the 3R Initiative was proposed in 2004, projects in the field of waste management have been encouraged to reduce and reuse or recycle waste at its source, and to aim to properly collect and ultimately dispose of remaining waste in an appropriate manner, without adversely affecting the environment. However, the current situation is such that improving waste management in developing countries still has to begin with the removal of waste from urban areas, the securing of landfill sites, and proper operation.

When we look at waste management in Japan, from 1945 to the 1950s, the rapid increase in municipal waste caused by post-war economic development and the concentration of population in cities led to the dumping of waste into rivers and the ocean and the piling up of waste in the open, which caused public health problems such as the mass outbreak of flies and mosquitoes and the spread of infectious diseases. During the period of high economic growth from the 1960s to the 1970s, the economic structure of mass production and mass consumption developed, and municipal waste increased and diversified even more rapidly. In the bubble economy of the 1980s and early 1990s, not only the waste emissions continued to rise due to further increases in consumption and the expansion of production activities, but also the technology for the proper waste disposal had made great strides. Nevertheless, the increasing and diversifying waste contributed to a shortage in the remaining landfill

capacity at final disposal sites and air pollution and other environmental damage caused by the emission of dust and acid gas due to the incineration of plastics. Under these circumstances, in the latter half of the 1990s, the need to curb waste generation and recycle resources became a hot topic. Thus, the idea of waste management promoting the 3Rs and proper waste disposal has become mainstream since around 2000 — breaking away from the mass production, mass consumption, and mass disposal economic system.

In response to this situation, national legislation has been developed. In 1954, the “Public Cleansing Act” was enacted, which stipulates a mechanism for municipalities to collect and dispose of garbage, a framework for financial and technical assistance from the national and prefectural governments, and the obligation of residents to cooperate. In 1970, the “Waste Management and Public Cleansing Law” was enacted to clarify treatment responsibilities and treatment standards for all waste, including industrial waste. In 1991, the “Act on the Promotion of Effective Utilization of Resources” was enacted to ensure the effective use of resources, reduce waste generation, and protect the environment. Moreover, in order to promote the realization of this act, six recycling acts were sequentially developed according to the characteristics of individual items. “The Basic Act for Establishing a Sound Material-Cycle Society” and the “Act on Promotion of Procurement of Eco-Friendly Goods and Services by the State and Other Entities” (the “Act on Promoting Green Purchasing”) were enacted in 2000 and continue to this day.

At the same time, local authorities and private contractors in the waste management sector formed associations from their own standpoints to share experiences, work together to develop and improve efficient management and technology, and carry out various surveys and research. These organizations continue to carry out a wide range of activities from the practitioner’s point of view, such as improving the safety management of collection, transport, and treatment facilities, and proposing plans for wide-area waste treatment.

In 1990, the Japan Society of Waste Management Experts (JSWME) was established — in response to the shortage of landfill capacity at final disposal sites and the dioxin problem — studying waste science mainly from the viewpoint of proper disposal. In 2008, the Japan Society of Material Cycles and Waste Management (JSMCWM) was newly established based on the activities of the JSWME, and the field of waste

science was expanded to include “resource conservation” and “resource circulation”, in addition to “public health” and “environmental conservation”.

In this way, from post-war reconstruction to the period of rapid economic growth and the transition to a material-cycle society, Japan’s long-term efforts and the experience and research results in waste management accumulated by government, academia, and industry are rare in the world. Japan’s experience and knowledge in the field of waste management is extremely useful for improving waste management in developing countries that are experiencing economic development. In addition, Japan has also experienced many natural disasters, such as typhoons, earthquakes, and tsunamis, with many records of and studies on disaster waste, which is also valuable information.

From this point of view, I truly hope that the JSMCWM will continue to accumulate a variety of research results, which will be used by those involved in development cooperation to improve waste management in developing countries.

Junji ANAI (Kokusai Kogyo Co., Ltd.)

The Corporate Challenge to Marine Plastic Litter Issue

1. Executive Summary

In order to solve the global problem of ocean plastics, it is necessary to bring together a diverse range of knowledge that is not limited to one company or one industry. The Japan Clean Ocean Materials Alliance (CLOMA) is an association of many companies involved in the circulation of plastic resources, including materials, moulding processes, product manufacturing, retailing, and recycling. It aims to create future-oriented solutions together with consumers, local authorities, and the national government, using the diverse technologies and experience of each company, and to present them to the world as a Japanese model.

2. Introduction

Over the years, people have been developing a wide range of chemicals and materials to make their lives more convenient and comfortable, but as everything has a shadow, these can create an adverse impact. The spread and increased use of these products can lead to unintended side effects, and in some cases to risks from which there is no escape.

For example, some pesticides, refrigerants, and heat insulators, which have helped society by improving

hygiene and the living environment, were abolished. This is the result of the 20- to 30-year history of these products — as if the timing of their widespread use had been estimated — just then they were discontinued due to the various safety and environmental problems they had created.

Due to the various ways in which it is convenient and to its diverse cost advantages, plastic has spread to every corner of the world and has become one of the basic materials that support people’s lifestyles and the world economy, with the further development of peripheral technologies and expansion of applications.

If plastic containers, packaging, and cutlery are not collected properly after use and people litter the streets with them, they will flow down rivers out into the sea, affecting not only the waters around own countries but also, carried on ocean currents, other countries far away.

Discarded plastic debris such as plastic bags, beverage bottles, lunch containers, and fishing equipment lead to accidental ingestion by ocean life, cause damage to the landscape, hygiene problems, and negative impacts on fisheries. Furthermore, microplastics, which are miniaturized by waves and ultraviolet light, adsorb chemicals and can be taken in by humans through marine products, potentially leading to health problems in the near future.

3. The Marine Plastic Litter Issue

General purpose and industrial plastics such as polyethylene and polystyrene appeared as materials for military use in the Second World War. Since then, they have been used in a wide range of applications in all sectors, including buildings, infrastructure, household appliances, and daily necessities. Furthermore, because of their ease of use, such plastics have spread to every corner of the globe, to both developed and developing countries, in just 50 to 60 years.

According to statistics compiled by Plastics Europe, the production of plastics has increased 160 times from two million tons in 1950 to 320 million tons in 2015. A study by Jambeck et al. at the University of Georgia estimates that 150 million tons of plastic waste have accumulated in the world ocean, and that the global total continues to rise by eight million tons each year.

The Wild Bird Society of Japan reports that one million seabirds die every year as a result of eating plastic waste. There are reports on concerns that ingesting microplastics via fish, which are microscopically crushed by waves and ultraviolet light and absorb

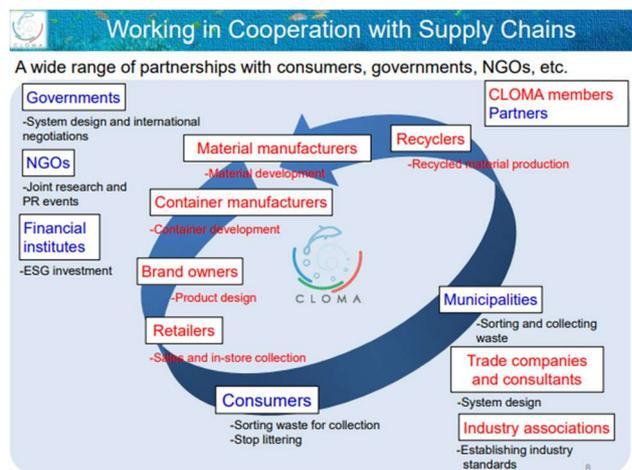
chemicals, can cause health problems for pregnant women and their unborn babies. The issue of marine plastic litter has been globally recognized as a serious issue common to humanity through the SDGs and at the 2019 G20 Osaka Summit, in the Osaka Blue Ocean Vision.

4. Establishment of the CLOMA Corporate Alliance

The Japan Clean Ocean Materials Alliance (CLOMA) is a group of companies that provide society with the benefits of plastics in a variety of ways. Its mission is to create a vision of the future in which this material can contribute to the sustainability of humanity and the planet, proposing to society innovative ways of using and disposing of it.

CLOMA was established in January 2019, mainly by companies in the food, beverage, and toiletry sectors that are players in the supply chain. This includes materials manufacturing, container manufacturing, product manufacturing, and retailing, as well as the recycling and alternative materials industries, and the trading companies and machinery manufacturers that support them. CLOMA aims to advance the circulation of plastics by integrating the plastics-related technologies and knowledge that Japanese companies have developed over the years, and by deepening 3R (reduce, reuse, recycle) technologies and combining them with alternative materials such as bioplastics, paper, and cellulose.

In addition, in order to turn this initiative into a social system and integrate it into people’s daily lives, companies will need to strengthen their cooperation with consumers, municipalities, and the national government, and try to solve problems through total optimization.



CLOMA will also have an important role to play in

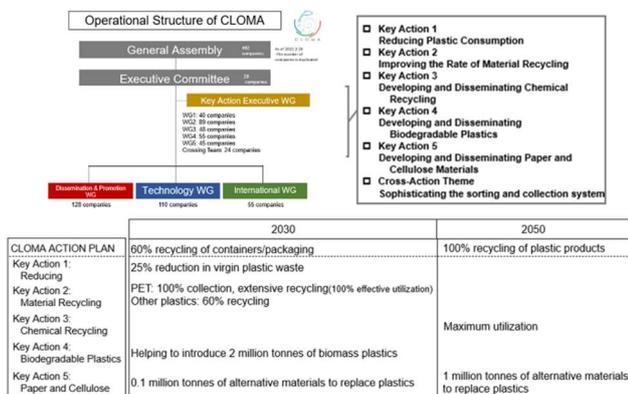
contributing to the international community by using the results of its activities. The Japan Model created by CLOMA can contribute to the Asian region, which is facing a serious marine litter problem, as well as to developing regions, where this problem is likely to become more apparent in the near future.

Currently, CLOMA’s membership has diversified from the food, beverage, and toiletry industries at its founding to include the apparel, pharmaceutical, and consumer electronics industries, growing from 159 at its founding in 2019 to 462 companies and organizations at the end of 2021.

5. CLOMA’s Activities

In May 2020, CLOMA announced its medium- to long-term CLOMA Action Plan, which declares that “CLOMA aims to achieve 100% recycling of plastic products such as containers, packaging, and others by 2050 to contribute to reducing marine plastic litter”.

CLOMA has designated five key actions to take on the challenge of technological development and social implementation. As shown in following table, these are: 1) Reducing Plastic Consumption; 2) Improving the Rate of Material Recycling; 3) Developing and Disseminating Chemical Recycling; 4) Developing and Disseminating Biodegradable Plastics; and 5) Disseminating Paper and Cellulose Materials.



Key actions to be considered include: designing materials and products on the basis of recycling; cleaning technology for extremely dirty containers and separation technology for multi-layered films; horizontal recycling to remake things into products before disposal; the sharing of roles between material recycling and chemical recycling and the development of processes with low CO2 emissions; and the use of ICT to promote changing behavior, such as the

prevention of littering and segregation of waste.

Based on the Action Plan described above, a number of demonstration tests are ongoing at CLOMA. For example, in the material recycling of the popular refillable toiletry containers, CLOMA members who are manufacturing and retail competitors are working together to demonstrate and test separate collection and recycling.

The demonstration and testing of this project aims to overcome the current situation, in which ultra-thin film refill containers, which are used in detergents and shampoos and contribute significantly to reducing the amount of plastic use, are mostly incinerated because they are composite materials that are difficult to separate. The project started as a collaboration between two companies and has now grown to include more than 10 companies, with municipalities as CLOMA observer members taking the lead.

This is a groundbreaking collaboration between a number of competing companies, with few prior examples. It is a major challenge to develop it into a social system innovation. By expanding the target area and the amount of waste processed, we will design a recycling system and cost structure that will take on the challenge of a sustainable society and companies.



Communication between companies and with society

6. Conclusion

As the environment changes, human society is facing a crisis of survival. In the world of business, which plays a role in solving these problems, sustainability and Environmental, Social, and Governance (ESG) values can only lead to significant results if they are linked to corporate management and implemented by all employees.

Now is the time to think deeply, with a sense of morality

and justice, about the usefulness and legitimacy of the business model that has been practiced for so many years, and to take firm steps to decide and implement how companies' visions can have a positive impact on future society.

Koichi YANAGITA (General Technical Manager,
CLOMA/Japan Clean Ocean Material Alliance)

**Academic Research Committee Report on the
32nd Annual Conference of the JSMCWM
(3RINCs Autumn)**

The 32nd Annual Conference of the Japan Society of Material Cycles and Waste Management (JSMCWM) was held over three days, from Monday, October 25 to Wednesday, October 27, 2021. The conference was held in a hybrid format because of the COVID-19 situation, with on-site participation at the Okayama Convention Center (Mamakari Forum) in Okayama City and online participation via Zoom. This was the first time the JSMCWM held the annual conference in a hybrid format, and it was organized differently from the usual program, including several arrangements. The conference venue, Okayama Convention Center, was a three-minute walk from JR Okayama Station, with a connecting corridor to the station, making it very easy to access. In particular, although it was raining on the first day of the conference, it was possible to get to and from the venue without getting wet, which was very much appreciated.

The conference consisted of 242 research presentations (151 oral and 67 poster presentations in the general sessions, and 24 oral presentations in the international sessions), seven organized sessions by research groups of the JSMCWM, two organized forums, three organized exhibitions, and tours to visit facilities practicing the SDGs in Okayama. There were two types of presentation: on-site presentations in Okayama and online presentations from remote sites. For poster presentations in particular, the sessions were divided

Table 1. Number of Participants Accepted for the 32nd Research Conference

• Members • Supporting members • Public members	• Student members • Citizen members of registered groups	Non-members	International hybrid session	Total amount
496 (531)	116 (94)	52 (61)	24 (37)	688 (723)

(): Number of participants at the 31st Conference

into 42 on-site posters (Day 1) and 25 online posters (Day 2). In addition, all of the international sessions were held in the form of online oral presentations, rather than the usual “oral short presentation + poster presentation” format. The number of participants in this conference was 688, as shown in Table 1.

Table 2 shows the number of participants for each session. The breakdown of participants shows that most of the research presentation sessions either had approximately the same number of on-site and online participants or that the number of online participants was slightly higher. Overall, the conference was as successful as in previous years, with nine research presentation sessions of more than 100 participants and 11 sessions with 70-100 participants (Photo 1).



Photo 1 General session

This year, as mentioned above, the international sessions also included oral presentations, so there was a chairman (Photo 2). There was also a chairman for the online poster session (held in parallel at two venues) (Photo 3).



Photo 2 International session

The special program was entitled “How to Create a Decarbonized Society: Future Prospects and the Role of Industry, Government, Academia, and the Private Sector”. It featured a keynote speech by Mr. Shuzo NISHIOKA of the Institute for Global Environmental

Table 2. Number of Participants by Session

Numbers refer to: top row: local participants; middle row: online participants; bottom row: total											
Day/time	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6	Room 7	Room 8	Poster	Total	
Oct. 25 th	9:30~	D3: Pyrolysis, carbonisation and gasification	B3: Disaster waste management and planning	E1: Maintenance and monitoring of final disposal sites	A4: Food loss	C3: Organic waste from food, sludge, livestock, etc.	International Sessions (A)				
			66	20	30	44	19	13		192	
			76	45	38	44	34	30		267	
			142	65	68	88	53	43		459	
	11:00~	D4: Bottom ash, fly ash and flue gas (1)	B5: LCA and low carbon society	E2: Maintenance and monitoring of final disposal sites	A3: Residents' awareness and environmental education	C2: Automotive, electrical and construction waste	International Sessions (B)				
			89	31	37	40	18	12		227	
			100	46	39	40	29	31		285	
			189	77	76	80	47	43		512	
	13:30~	D5: Bottom ash, fly ash and flue gas (2)	E5: Leaching and behaviour of hazardous substances	C1: Packaging and plastics	B4: Solid waste culture and history	Citizens' Forum (Consumer & Citizens Research Group)	International Sessions (C)				
			76	31	56	35	26	14		238	
			81	43	78	31	19	27		279	
			157	74	134	66	45	41		517	
15:15~	E6: Early stabilisation of landfill sites, use of former sites, and illegal dumping	F1: Hazardous wastes, their analysis and treatment techniques	C4: Methane fermentation, composting and animal feed	A5: Industrial waste	Environmental Learning Forum (Environmental Educational Facility Research Group)	International Symposium					
		39	31	55	27	30	10		192		
		44	42	63	35	23	93		300		
		83	73	118	62	53	103		492		
17:15~									Poster (On-site)		
									145	145	
									0	0	
									145	145	
Oct. 26 th	9:00~	D1: Incineration (1)	B1: Waste management and planning (1)	E3: Leachate, evolved gases (1)	A1: Reduction of waste generation and discharge	Solid waste culture and history research group	International Sessions (D)				
			76	56	25	37	15	18	227		
			74	60	32	36	19	36	257		
			150	116	57	73	34	54		484	
	10:45~	D2: Incineration (2), gasification and melting	B2: Waste management and planning (2)	E4: Leachate and evolved gases (2)	A2: Material flow analysis	C5: Separation and recovery of valuable materials	International Sessions (E)				
			64	53	30	33	31	14	225		
			72	66	44	44	61	24	311		
			136	119	74	77	92	38		536	
	13:30~	Special Program									
											150
											195
											345
16:00~	Poster Presentation (Online 1)			Poster Presentation (Online 2)							
		14			12					26	
		54			33					87	
										68	
Oct. 27 th	9:20~			Material flow research group	Test & examination research group	Industrial waste research group	Conference Award Lecture				
				8	17	24	20	69			
				24	64	43	34	165			
					32	81	67	54		234	
	11:00~			Meeting for junior members	Test & examination research group	Biomass waste research group	Recycling system research group				
					15	11	18	15	59		
					15	65	37	53	170		
					30	76	55	68		229	
	PM	Facility tours	Tour Route 1		18						
			Tour Route 2		13						
			Tour Route 3		16						

Strategies (IGES) and guest lectures by Mr. Satoru IINO of the Ministry of the Environment and Mr. Masayuki KANZAKI of the Sustainable Management Promotion Organization (SuMPO). Mr. Norikazu TAKEDA of the Chugoku Bank, Ltd., Mr. Koetsu INOUE of San-in Godo Bank, Ltd., and Prof. Takeshi FUJIWARA of Okayama University participated in a panel discussion. Further, during the international symposium, “Paradigm Shift towards Sustainability: An Interdisciplinary Discussion on Globally Critical Issues on Waste Management”, a number of participants had an active exchange of opinions in an online seminar format.



Photo 3 Online poster session

As part of the effort to prevent the spread of COVID-19, the event for an exchange of views was unfortunately cancelled at the conference. Instead, a live classical mini-concert was held at the convention hall and streamed online during the lunch break on the second day. A wonderful performance of violin and piano was presented to the conference participants.

As for the poster presentations, the Academic Research Committee reviewed them after the conference and selected six prizes for the best posters, shown in Table 4. The award certificates were mailed to the winners. All of the presentation manuscripts have already been published on J-Stage.

The tour to visit facilities practicing the SDGs in Okayama was held on the last day of the conference. Three tour routes were organized for the facility visits and all of these tours were very well received — including the visit to the “Environmental Model City” of Nishi-Awakura Village. There were a total of 47 participants.

In concluding this article, special thanks are due to the organizing committees of Okayama University and the Chugoku-Shikoku Section for their efforts in organizing the 32nd Conference, to members of the Online Working Group for their strong support of the hybrid

online format, to all of the supporters and sponsors, and to all of the participants.

Table 3. Poster Presentation Awards

No.	Name	Affiliation	Presentation title
A1-7-P	Yoshinori SAITOH et al.	Takasaki City University of Economics	Categorisation of measures to promote the reduction of household waste for verification of their effectiveness (2)
A4-8-P	Yukie KIRIU et al.	Okayama University	Supply and demand matching using actual data on the generation and use of industrial food losses in Okayama Prefecture
C4-9-P	Ayano NAKASHIMA et al.	Hokkaido University	Study on dissolution of odour components into surface water and microbial degradation in biological deodorisation using foamed glass materials
E5-8-P	Ryogo KARYU et al.	Ehime University	Bioaccessibility assessment of halogenated and phosphate ester flame retardant contamination and potential exposure of workers at e-waste and ELV demolition sites in Vietnam
F1-13-P	Mina OTA et al.	Tohoku University	Recycling of byproduct wastewater in the wet treatment of aluminium dross
F1-14-P	Ryoji WAKIHAMA et al.	Hiroshima Prefectural Technical Research Institute	Development of a simple asbestos detection technique using N,N-diethyl-p-phenylenediamine (DPD)

Prof. Katsuya KAWAMOTO (Okayama University)

Upcoming Event: The 8th 3RINCs 2022 (Online)

The 8th 3R International Scientific Conference on Material Cycles and Waste Management (3RINCs)

The 8th 3R International Scientific Conference on Material Cycles and Waste Management (3RINCs), organized by the Japan Society of Material Cycles and Waste Management (JSMCWM), will be held online on 14 – 18 March 2022. We sincerely look forward to your participation.

Website: <https://www.3rincs.org/>

Facebook: <https://www.facebook.com/3rincs>

【Call for participants】

Registration for non-presenters:

<https://ws.formzu.net/dist/S48437532/>

Although social activity has stagnated due to the COVID-19 pandemic, many parts of the world have already begun to rebuild their economies with green recovery policies. Green recovery is also necessary in the field of waste and material cycles. Under these

circumstances, global academics, including those from the Asia-Pacific, policy makers, and business people will come together for interdisciplinary discussions.

3RINCS 2022

SPECIAL SESSIONS

FOR THE NEW ERA OF SUSTAINABLE SOCIETY

MAR 14 16:30-18:00 (JST)
Circular Economy -Transformation of Policies to Actions
 Introducing circular economy (CE) principles in production, trade, and consumption within the waste hierarchy (i.e., reduce, reuse, recycle) can provide solutions to current unsustainable production and consumption patterns. This special session will include policies, support measures, and especially the implementation of CE by the private sector. Case studies with tangible results in Thailand will be discussed.
 Dr. Chindarat Taylor

MAR 15 16:30-18:00 (JST)
2Rs – How To Promote Actions and Policy for the 2Rs (Reduce and Reuse) Towards the Circular Economy?
 The movement towards a circular economy as well as reduction of food loss and waste and a society free of disposable plastics is accelerating. New business models, consumer behaviors and lifestyles based on the 2Rs will play a key role in achieving these transitions. In this session, we will consider what changes are needed in policies, stakeholders' efforts, and infrastructure to establish the 2Rs as a business model and consumer behavior.
 Dr. Simran Talwar

MAR 16 16:30-18:00 (JST)
Decentralized Technologies, Equipment and a Techno-economic Assessment for MSW Treatment
 There is more demand for decentralized technologies and equipment for solid waste treatment in countries in order to reduce the cost of waste collection and transportation. This special session will discuss and introduce viable technologies for decentralized treatment, as well as related equipment, case practice, and techno-economic assessment when compared with a centralized mode.
 Dr. Pinjing He

MAR 17 10:30-12:00 (JST)
Material Cycles in Construction Works
 This special session introduces some of the latest and innovative achievements in the reuse and recycling of municipal and industrial wastes in construction works to explore the contributions of the construction industry to solutions and prescriptions for the technical, political, and environmental problems of material cycles and waste management.
 Dr. Takeshi Katsumi

MAR 18 14:45-16:15 (JST)
Resource Circulation Strategy for Carbon Neutrality
 Resource circulation strategy for carbon neutrality, one of the important agenda items in the 3RINCS 2022 Special Sessions, can become a platform in the field of solid waste management to raise the significance and consequences of resource recovery from waste materials, to discuss scientific solutions for carbon reduction by circular activities, and to inform new aspects of waste management worldwide.
 Mr. You Youngho

In the “Special Session” of the conference, the latest information from various countries will be shared and discussed on the following topics.

- Circular Economy - Transformation of Policies to Actions (organized by the Solid Waste Management Association Thailand (SWAT))
- 2Rs - How to Promote Actions and Policy for the 2Rs (Reduce and Reuse) Towards the Circular Economy? (organized by Institute for Global Environmental Strategies)
- Decentralized Technologies, Equipment and a Techno-Economic Assessment for MSW Treatment (organized by Special Committee on Rural Waste Management(SCRWM), Association of Urban Environmental Sanitation(CAUES))

- Material Cycles in Construction Works (organized by the JSMCWM)
- Resource Circulation Strategy for Carbon Neutrality (organized by the Korea Society of Waste Management (KSWM))

3RINCS 2022 Steering Committee (JSMCWM)

Journal of Material Cycles and Waste Management, Vol. 23, Issue 6 (November 2021)

[REVIEW, pp. 2077-2086](#)

“Insights into hazardous solid waste generation during COVID-19 pandemic and sustainable management approaches for developing countries”, Bashir Adelodun*, Fidelis Odedishemi Ajibade, Rahmat Gbemisola Ibrahim, Joshua O. Ighalo, Hashim Olalekan Bakare, Pankaj Kumar, Ebrahim M. Eid, Vinod Kumar, Golden Odey, Kyung-Sook Choi*

[REVIEW, pp. 2087-2100](#)

“A review of the medical waste management system at COVID-19 situation in Bangladesh”, Uttama Barua*, Dipita Hossain

[ORIGINAL ARTICLE pp. 2101-2111](#)

“Development of DPSIRO framework indicators for municipal solid waste management: a case of Bahir Dar City, Ethiopia”, Awoke Misganaw*, Belay Teffera

[ORIGINAL ARTICLE, pp. 2112-2119](#)

“Extraction of phosphorous from thermally treated sludge and separation of aluminum by adsorption”, Hiroyuki Harada*, Endar Hidayat, Seigo Uemoto, Keiko Fujita

[ORIGINAL ARTICLE, pp. 2120-2132](#)

“Scenario assessment of neodymium recycling in Japan based on substance flow analysis and future demand forecast”, Shinichirou Morimoto*, Hiroshi Kuroki, Hirokazu Narita, Aya Ishigaki

[ORIGINAL ARTICLE, pp. 2133-2147](#)

“Investigating Malaysian stakeholders’ perceptions of the government’s aim to replace conventional plastic bags with biodegradable and compostable bioplastic bags”, Zurina Mahadi*, Emirul Adzhar Yahya, Latifah Amin, Mashitoh Yaacob, Hukil Sino

[ORIGINAL ARTICLE, pp. 2148-2161](#)

“Application of mechanical processing operations for the recycling of nickel metal hydride batteries”, R. F. Pinheiro, L. Michielin, T. R. Martins, T. Wildgrube, E.

H. Tanabe, D. A. Bertuol*

[ORIGINAL ARTICLE, pp. 2162-2178](#)

“Integrated density concentration and surface treatment for selective separation of plastics from a mixture”, Adilbek Baigabelov, Avimanyu Das*, Courtney Young

[ORIGINAL ARTICLE, pp. 2179-2191](#)

“Multi-objective solid waste classification and identification model based on transfer learning method”, Yuyu Chen, Jisheng Sun*, Shijun Bi, Cairu Meng, Fei Guo

[ORIGINAL ARTICLE, pp. 2192-2207](#)

“MSW stabilization in an anaerobic bioreactor landfill and evaluation of in-situ leachate treatment potential with the help of quadric model”, Anil Nain, Rajesh Kumar Lohchab*, Kulbir Singh, Mikhlesh Kumari, Jitender Kumar Saini

[ORIGINAL ARTICLE, pp. 2208-2217](#)

“Preparation of stable dispersion from ceramic polishing waste and its application as a multifunctional additive for coatings”, Shule Lin, Yanping Guo*, Rong Xie, Baoqing Li, Zilong Guo

[ORIGINAL ARTICLE, pp. 2218-2231](#)

“Modeling of manganese recovery from waste Li-ion batteries by gene expression programming”, Hossein Ebrahimzade*, Gholam Reza Khayati, Mahin Schaffie

[ORIGINAL ARTICLE, pp. 2232-2241](#)

“Rice straw-base power generation: a potential and economic cost-benefit analysis for a small power plant (10 MWe) in Vietnam”, Hoang Anh Le*, Do Ha Thu, Ngo Quang Khoi

[ORIGINAL ARTICLE, pp. 2242-2254](#)

“Crystalline phase analysis and phosphorus availability after thermochemical treatment of sewage sludge ash with sodium and potassium sulfates for fertilizer production”, Hannes Herzel*, Zeynep Aydin, Christian Adam

[ORIGINAL ARTICLE, pp. 2255-2265](#)

“Analysis and optimization on the biodegradable plate making process parameters using RSM-based Box-Behnken Design method”, C. Maheswari*, A. S. Ramya, B. Meenakshi Priya, S. Sudhakar, B. Prabhu Raj, B. Lokesh, G. Ramani

[ORIGINAL ARTICLE, pp. 2266-2277](#)

“Structural characterization and visible light activated photocatalytic ability of glass-ceramics prepared from municipal solid waste”, Irfan Khan*, Hiroshi Saito, Ahmad Salah Ali, Bofan Zhang, Shiro Kubuki

[ORIGINAL ARTICLE, pp. 2278-2296](#)

“Supporting circular economy through the use of red ceramic waste as supplementary cementitious material in structural concrete”, Talita Biz Pavesi, Abrahão Bernardo Rohden, Mônica Regina Garcez*

[ORIGINAL ARTICLE, pp. 2297-2306](#)

“Theoretical and experimental study on the triboelectric separation of ternary plastics combination using fluidized bed”, Jilan Shi, Xiaolu Zhao, Zhenxing Zhang, Xuejie Bai, Yongqiang Xu, Haifeng Wang*, Tao Zhang

[ORIGINAL ARTICLE, pp. 2307-2317](#)

“Maize straw and rice husk-derived biochars produced in a simple metal kiln: characteristics and effects on crop productivity in three fields”, Eunhwa Choi, Seunghwan Kim, Sarith Mam, Arjun Gautam, Ravi Bhandari, Jae Young Kim*

[REGIONAL CASE STUDY, pp. 2318-2335](#)

“Process modeling and economic assessment of converting municipal solid waste into solid fuel via hydrothermal processing: a case study in Vietnam”, Truong Xuan Do, Thi To Nga Phan, Tho Van Dinh Son*

Current Members of JSMCWM

Current Members of JSMCWM as of September 30, 2021	
Regular Members	1,888
Fellows	41
Seniors	83
Honorary Members	11
Students	169
Public Institutions	87
Supporting Companies	117
Supporting Individuals	1
Regular Association Citizens	3
Individual Citizens	18
Korea Society of Waste Management	20
Total	2,438

NEWSLETTER No. 100, March 2022

Published by: Toshiaki YOSHIOKA, President, Japan
Society of Material Cycles and Waste
Management

Edited by: Prof. Shin-ichi SAKAI, Chairman,
International Relations Committee

Edited and Designed by:
Prof. Hiroki HASHIZUME

Mr. Hiroyuki HOSODA

Mr. Junji ANAI

Ms. Chiaki NISHI

Dr. Shogo KUMAGAI

Translation & Proofreading:

Vanessa RAMIREZ

Michael LEVINE

Address: Buzen-ya Bldg. Shiba 5-1-9, Minato-ku,
Tokyo 108-0014, Japan

Phone: (+81) 3-3769-5099

Fax: (+81) 3-3769-1492

URL: <http://jsmcwm.or.jp/international/>

e-mail: international@jsmcwm.or.jp

The latest issue of the NEWSLETTER and recent back issues can be found at the JSMCWM webpage, noted above.

Any person can subscribe to the JSMCWM Newsletter without a membership.