

## JAPAN SOCIETY OF MATERIAL CYCLES AND WASTE MANAGEMENT

### Contents

- The start of Japan's new era of "Beautiful Harmony" and the JSMCWM Newsletter
- Report on the Fifth 3R International Scientific Conference on Material Cycles and Waste Management (3RINCs) 2019 in Bangkok, Thailand
- Dissemination of Disaster Waste Management Guidelines for Asia and the Pacific at 3RINCs 2019 in Bangkok, Thailand

### The start of Japan's new era of "Beautiful Harmony" and the JSMCWM Newsletter

Japan celebrates the beginning of a new era, Reiwa — Beautiful Harmony — which started on May 1, 2019 following the end of the thirty-year Heisei era. Reiwa, Heisei (January 8, 1989–), Showa (December 25, 1926–), Taisho (July 30, 1912–) and Meiji (January 25, 1868–) are the names of some imperial eras in Japan known as *genko* or *nengo*. Japanese calendars widely use both a *genko* year and the equivalent Western year (CE).



Since the beginning of the Meiji era, *genko* have referred to periods of Japanese history that correspond to reigns of emperors. Accordingly, on May 1, 2019, Crown Prince Naruhito ascended the Chrysanthemum Throne, becoming the 126th Emperor following the voluntary abdication of Emperor Akihito on April 30. Unlike the last three *genko* changes, Reiwa has begun without the passing of the previous emperor. For this reason, Japan's celebration of Reiwa is something like the start of a new millennium, as occurred with the turning of the 20th to the 21st century.

It was reported that the name Reiwa was taken from language that appears in the *Man'yoshu*, the oldest extant collection of Japanese *waka* (poetry in classical Japanese). The official English translation of Reiwa is "Beautiful Harmony".

JSMCWM, formerly Japan Society of Waste Management Experts (JSWME), was established on March 27, 1990, in the early days of Heisei. Its history is the history of Heisei waste management itself. The first issue of the JSWME Newsletter in English, at four pages, was sent out on November 1, 1990. In it, the first President, Dr. Naomichi HIRAYAMA wrote, "The waste problem has already reached the point that natural resources have been alarmingly depleted and [the] environment severely damaged. Ever expanding human activities are causing [the] incessant increase of waste quantity as well as diversification in waste quality making its treatment and recycling a very difficult task. As such, both ... immediate actions and long term efforts in waste management are seriously sought after for better public health, urban management, environmental protection, and resource conservation."

The Newsletter was first published biannually (through issue No. 5, November 1992) and then triannually from No. 6 (March 1992) to No. 13 (July 1995). From No. 14 (October 1995) onward, it has been seasonal with occasional omissions. I myself was an acting editor from No. 4 (May 1992) to No. 35 (January 2001).

Dr. Sachio IKAWA, editor of the first issue of the Newsletter said, "We will try to send timely information on the state of waste management to the people, groups and agencies concerned with waste management outside of Japan. ... [T]his information dissemination activity [can] hopefully contribute in some manner to the solution of worldwide waste problems." Issues after No. 36 (April 2001) are electronically available. Depicting ongoing waste management issues in Japan, the Newsletters provide a concise history of policies, practices, research, activities, and the problems and troubles of waste management and material cycles in Japan — including hazardous waste problems, opposition by residents against waste management facilities, dioxins, a variety of waste management and recycling practices by the national and local governments and citizens — as well as Japan's cooperation with other countries on good practices, facility construction, and research.

During Heisei, which means "Peace Everywhere", Japan did not experience war on the archipelago.

However, the period experienced many disasters, including the Great Hanshin Awaji Earthquake (1995, Heisei 7), the Great East Japan Earthquake (2011, H23) and the Kumamoto Earthquake (2016, H28). JSMCWM has been energetically working on disaster waste management, particularly in the last decade. Accordingly, the Newsletters have periodically reported on the situation in Tohoku (which bore the worst of the 2011 disaster) and Kumamoto, as well as JSMCWM's involvement.

At the start of the new era of Reiwa, following the commitment given by the first editor, the editorial board of the Newsletter would like to report to you good news for waste management, in order to bring about "Beautiful Harmony" for Japan and the world. I hope for the support of and feedback from our dear readers.

(Hiroki HASHIZUME, Professor, School of Global Studies, Tama University)

**Report on the Fifth 3R International Scientific Conference on Material Cycles and Waste Management (3RINCs) 2019 in Bangkok, Thailand**

**1. Outline**

**1-1. Dates and Venue**

The Fifth 3R International Scientific Conference on Material Cycles and Waste Management (3RINCs) was held 27 Feb-1 Mar, 2019 at Pullman Bangkok King Power, Bangkok, Thailand.



**1-2. Organization**

**ORGANIZER:**

Solid Waste Management Association – Thailand (SWAT)

**CO-ORGANIZERS:**

- Pollution Control Department (PCD), Ministry of Natural Resources and Environment, Thailand.

- Japan Society of Material Cycles and Waste Management (JSMCWM)
- Korean Society of Waste Management (KSWM)

**1-3. Official website:**

<http://www.3rincsindia.org>

**2. Participants and sponsors**

**2-1. Participants**

|                                 |     |
|---------------------------------|-----|
| Number of 3RINCs Participants:  | 300 |
| Number of oral presentations:   | 100 |
| Number of poster presentations: | 40  |

**2-2. Sponsors**

Sponsors, Exhibitors, and Advertisers: 22

**3. Short Report on the 3RINCs Scientific Program**

To encourage excellence at this and future conferences, the International Advisory Board presented Excellent Research Awards for oral presentations and poster presentations. Excellent Research Awards for oral presentations were given to four presenters:

Megu Tsuchimura (Kyoto University, Japan): Analysis of Consumption and Disposal of Plastic Products to Discuss Plastic Waste Management in Pacific Island Countries

Soo-Jin Cho (Yonsei University, Korea): Stabilization of Mercury Contaminated Waste – Fly Ash from Municipal Solid Waste/Hospital Waste Incinerators

Zoltán Sebestyén (Hungarian Academy of Sciences, Hungary): Composition of the Liquid Phase Products of Rape Straw Formed during Torrefaction

Nopparit Sutthasil (National Institute for Environmental Studies, Japan): Methane Emission from Window Typed Mechanical Biological Treatment in Tropical Climate

Excellent Research Awards for poster presentations were given to two presenters:

Yiqun Xiong (Kyoto University, Japan): Mass Balance of Heavy Metals in One Closed Landfill Site for Incinerator Residues in Japan

Yuree Kwon (Chungnam National University, Korea): Recycling and Greenhouse Gas Reduction of Used Glass Bottles by EPR in Korea

The awards were presented at the closing ceremony. We

congratulate these researchers for their excellent presentations.



### **Special Session 1: WtE Experience in Thailand**

#### Introduction: Current Status and Issues of WtE Projects in Thailand

Special Session 1 consisted of four presentations and a discussion with the participants. It was chaired by Prof. So Sasaki – a member of the Department of Economics at Chuo University, Japan and a Visiting Scholar at Chulalongkorn University, Thailand. To begin the session, he briefly introduced the other presenters and then explained the ‘Current Status and Issues of Waste-to-Energy (WtE) Projects in Thailand’. In addition to giving background information on existing WtE projects in Thailand, he also drew lessons from one specific WtE project that has been implemented in Hat Yai City.

#### Waste-to-Energy in Phuket

Deputy Mayor Tavorn Jirapattanasophon of Phuket Municipality, a popular tourist destination, described what Phuket has learned over its twenty years of experience with Municipal Solid Waste Management (MSWM) and tourist-generated waste. He presented statistics on Phuket’s generated waste and expected waste generation. He also explained the municipality’s waste management system for treating the expected waste, private investment in WtE projects, and existing landfill capacity in Phuket.

#### Major Challenges in Development and Implementation of WtE Projects in Thailand

Mr. Patarapol Tularak, Secretary-General of the Solid Waste Management Association of Thailand, explained the major challenges faced by Thai WtE projects, discussing existing laws and regulations and offering numerical data for such projects. He also pointed out the current challenges in developing and implementing WtE projects — those issues that are arising in incorporating policy/law, statistical approaches and municipalities, which practically implement the WtE projects.

#### Essence of Waste Management Facility Development & Support by the Consultant: From Example of Incineration Facility in Japan

The final presentation of Special Session 1 was given by Mr. Taisuke Odera from Eight-Japan Engineering Consultants Inc. Mr. Odera explained the circumstances of consultant companies in the waste management facility development sector in Japan and Thailand, and the roles that they play.

### **Special Session 2: Disaster Waste Management**

#### Introduction of the Session and Disaster Waste Management Guideline

Special Session 2 was made up of six presentations and was introduced by Prof. Misuzu Asari of Kyoto University and Mr. Makoto Tsukiji of JSMCWM. They also explained the Disaster Waste Management Guideline in Asia and the Pacific (DWM Guideline) — which was developed in April 2016, with the purpose of assisting Asian and Pacific Island Countries (PICs), where the impact of disasters is exacerbated due to urbanization and climate change. This presentation highlighted the importance of disaster preparedness, such as creating a Risk Reduction Plan or Contingency Plan, in order to be able to respond rapidly and recover from disasters utilizing an Implementation Plan. In 2019, DWM workshops are planned in Indonesia and the Solomon Islands to develop a regional DWM guideline and collaborate with each country’s government and international organizations, such as SPREP and JICA.



#### Development of Regional Disaster Waste Management Guideline in the Pacific

Mr. Faafetai Sagapolutele from J-PRISM-II gave a brief introduction of the regional DWM guideline for the Pacific Islands Countries (PICs) and explained that PICs are vulnerable to such natural disasters as tropical cyclones, flooding, earthquakes, and tsunamis. In addition to discussing efforts to develop the regional DWM Guideline, Mr. Sagapolutele described the ongoing preparations of a disaster waste regional technical management team.

#### Future Prospective of Disaster Waste Management in Indonesia

Ms. Tunjung Puitika from Indonesia's Ministry of Environment and Forestry explained environmental policy and regulation in that Southeast Asian country. She also discussed waste management in Indonesia, focusing in particular on how to handle solid waste from disasters.

#### Generation and Characteristics of Disaster Waste Management in Indonesia

Dr. Maryono Maryono from Diponegoro University in Indonesia explained the characteristics of disaster waste in Indonesia, with reference to the disasters that occurred in Lombok, Palu, and the Sunda Strait in 2018.

#### Development of Disaster Waste Management Plan and Policies in Nepal

Dr. Sumitra Amataya from LEAD explained the current situation in Nepal and trends in disaster policymaking. She focused on the challenges faced in Nepal and the institutions that are involved in DWM planning. In addition, Dr. Amataya explained the concepts of 5R and 3E in DWM.

#### International Cooperation and Dissemination of Disaster Waste Management Guidelines

Mr. Mahesh Pradhan from the United Nations Environment Programme (UNEP) briefly explained the activities of the Joint UNEP/OCHA Environment Unit.



### **Special Session 3: 3R Policy Indicator and Its Future**

#### Introduction

SDG 11 (City) and 12 (Sustainable Consumption and Production) and Regional 3R Forum in Asia and the Pacific: How to Accelerate Implementation of SDGs in Asia and the Pacific Region

Special Session 3 included five presentations, starting with the Session Keynote by Prof. Choudhury Rudra Charan Mohanty of the United Nations Centre for

Regional Development (UNCRD). Prof. Mohanty discussed a guideline that was adopted at the 2016 Regional 3R Forum, the "Adelaide 3R Declaration towards the Promotion of Circular Economy in Achieving Resource Efficient Societies in Asia and the Pacific under the 2030 Agenda for Sustainable Development". This Declaration focuses on six important points as the way forward. These are:

- (1) The promotion of inter-municipal or city-city cooperation to create circular economic opportunities and new, green employment opportunities, and ultimately to contribute to the well-being of local communities.
- (2) The provision of necessary capacity building and support. This entails human resource development, financing, and knowledge and technical know-how for instituting circular economic development approaches.
- (3) The facilitation of environmentally-sound waste management. This includes the appropriate treatment of different kinds of waste, including disaster waste, e-waste, and medical waste.
- (4) Support for the development of a science, innovation, and technology-based culture in overall policy-setting and development agendas.
- (5) Private sector and sustainable business opportunities. 3R technologies are key enablers for creating sustainable business opportunities.
- (6) The promotion of collaborative research development and projects. This is to address resource-efficiency-related problems in industry sectors, government and international collaborative research projects for the strengthening of basic statistics, material flow and waste accounting and analysis, material and waste footprint analysis, resource productivity analysis, and bilateral/multilateral cooperation.



#### 1st State of the 3Rs in Asia and the Pacific Report

Dr. Yasuhiko Hotta of the Institute for Global Environmental Strategies (IGES), Japan, gave a presentation focusing on the development of certain 3R indicators: biomass waste, marine and coastal plastic waste, extended producer responsibility (EPR) GHG emissions, and macro-level material flows. He further explained that these indicators are used to identify current conditions and suggest future directions in 3R policy.

Dr. Hotta also explained the country reports received from eleven Asian countries and from PICs. These reports were made to improve waste management, improve resource efficiency, promote green and circular economies, mitigate climate change, and to contribute to support for SDGs.

#### Challenges and Possible Future Priorities for Science and Database for 3R Policy Assessment at Regional Level

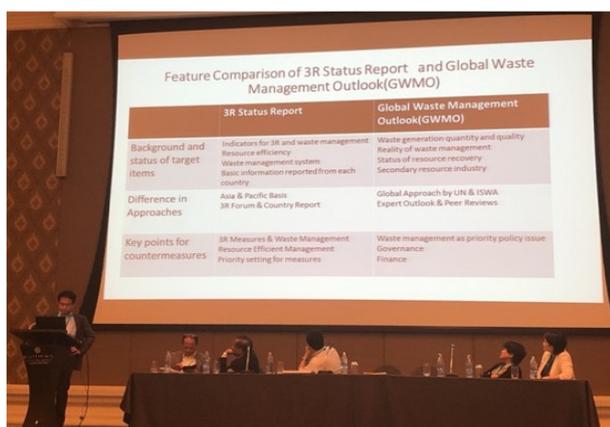
Dr. Chen Liu, also of IGES, explained the objective of improving decision-making processes and further promoting 3R policies in Asia and the Pacific. In order to facilitate this, she and Dr. Hotta gathered related data and information about the aforementioned Asian countries and PICs. Utilizing the interpretations of local experts, they assembled this data and information in a table, with the dual purpose of giving overviews of (1) the definitions and classifications used for municipal solid waste and its generation, and (2) national legislative waste management frameworks.

#### Implementing 3R Indicators in Pacific Island Countries

Ms. Ma Bella Guinto, Solid Waste Management Adviser at SPREP, spoke about waste and pollution as they are related to sustainable development. She defined waste as a product of many human activities and pointed out that the amount of waste has increased along with population growth and the accompanying demand for more products. Waste therefore needs to be managed responsibly.

#### Recapping 1st Round and Priorities for 2nd Round

Prof. Agamuthu Pariatamby of the University of Malaya gave some background on the 3R initiative and implementation in Asia and the Pacific, and Prof. Shinichi Sakai of Kyoto University spoke about the 3R Status Report. Both discussed the importance of future efforts and offered thoughts about the way forward.



#### **Special Session 4: CCETs Waste Management Guideline Development**

Special Session 4 was held on 28 February 2019, with six presentations given. The “CCET” of the session title refers to “IGES Centre Collaborating with UNEP on Environmental Technologies”. The chairperson of this session was Dr. Hotta of IGES. Outlines of the six speakers’ presentations are as follows.

#### Challenges and Key Factors in Advancing Environmentally Sound Management of Waste in Asia and the Pacific

Dr. Shunichi Honda of UNEP talked about comprehending the CCET guidelines. According to him, it is necessary to establish these guidelines for a circular economy.

#### Introduction of the CCET and Waste Management Guidelines Activity

Mr. Kazunobu Onogawa of CCET presented an outline of the IGES-UNEP collaboration, focusing in particular on its necessity, purposes, and activities. He also gave some background to the guideline development initiative.

#### Development of the Framework of CCET Guideline Series on MSSWM

Dr. Chen Liu of IGES explained the practical aspects of the guidelines, describing their background, main purpose, key concepts, content, and structure.

#### Guideline Development on Mechanical Biological Treatment (MBT)

Dr. Tomonori Ishigaki of NIES, Japan explained solid waste management through the process of mechanical biological treatment, or MBT. According to him, MBT has various advantages related to resources, the environment, and finance and economics. Dr. Ishigaki also introduced key elements and good practices of MBT.

#### Guideline Development on Anaerobic Digestion for MSSWM

Dr. Andante Hadi Pandyaswargo of Waseda University, Japan presented on the use of anaerobic digestion (AD) as a MSW treatment option. She gave an outline, explaining key elements for implementation, and presented a case study of AD.

#### Guideline Development on Waste-to-Energy from MSW Incineration

Prof. Katsuya Kawamoto of Okayama University, Japan explained thermal treatment, which according to him can efficiently reduce the amount and volume of waste and can also recover energy. In addition, WtE can be an energy resource. Thus, thermal treatment and WtE are required to deal with global warming and population growth.



### **Special Session 5: Plastic Materials Cycles and Their Management**

Prof. Toshiaki Yoshioka, President of JSMCWM chaired Special Session 5, which was comprised of the following six presentations.

#### Status of Marine Plastic Debris: Issues, Challenges, and Global Initiatives

Prof. Agamathu Pariatamby of the University of Malaya in Malaysia briefly explained some of the issues presented by marine plastic debris and gave an overview of the challenges faced globally in trying to deal with it, with examples taken from peninsular Malaysia.

#### 3Rs Policy and Plastic Waste Management in Thailand

Prof. Orathai Chavalparit from Chulalongkorn University in Bangkok presented detailed information on her theme. She gave an analysis of the material flow of plastic waste in Thailand and described its law and regulations for plastic waste management. In addition, Prof. Chavalparit outlined a plan for the management of plastic waste in the future.

#### 3R Plus Concept for Plastic Materials Management

Kyoto University's Prof. Shinichi Sakai, also of MOEJ, described the latest draft of Japan's Plastics Resource Circulation Strategy.

#### 3R Challenges and Experiences on Plastic Containers and Packages

Mr. Yoshinori Suga from the Embassy of Japan,

Thailand, presented the recent actions taken by several private Japanese organizations to reduce plastic waste.

#### Marine Plastic Debris Status in Indonesia

Mr. Reza Cordova from the Indonesian Institute of Sciences gave a presentation on the challenges and issues of stranded beach debris in the oceans surrounding Indonesia. He drew some practical lessons by focusing on the observation of stranded beach debris as an indicator that can be used for research questions.

#### Comparative Analysis of Plastic Waste Management and Circular Economy Policy in ASEAN Countries

To close out the session, Dr. Hotta from IGES reported the initial findings of the analysis referred to in his presentation title, explained some challenges faced by ASEAN countries and policy trends in dealing with them, and gave some suggestions for about what is needed going forward.

#### **Technical Tour**

#### Eastern Seaboard Environmental Complex Co., Ltd. (ESBEC)

In total, about 20 members attended the Technical Tour (Option 2) on 1 March 2019, visiting Eastern Seaboard Environmental Complex Co., Ltd. (ESBEC) in Bo Win Sub-district, Si Racha District, and Chon Buri Province. ESBEC's landfill site is operated by Waste Management Siam Ltd. (WMS), which is a member of DOWA ECO-SYSTEM Co., Ltd. The site is a fully licensed (acquired ISO 14001:2015 and ISO 9001: 2015) and permitted industrial waste management site in Thailand.

First, participants learned about ESBEC and its landfill site. WMS started operations in 2001, and DOWA ECO-SYSTEM bought WMS's business in Southeast Asia and started operations in 2009. They have six business areas: (1) landfills; (2) waste water treatment; (3) blending and fuelization; (4) site services; (5) recycling and sorting; and (6) transport. Of the waste disposed on the site, 85% is industrial waste and 15% is municipal solid waste (commercial waste). Hazardous waste is not included.

After that, everyone visited the landfill site itself, where we received further information about it. In the past, it emitted an unpleasant odor. However, the surface of the site has been covered, so the smell has disappeared. Near the site, there is a reservoir and some plants. According to the staff, the landfill site was constructed as a place suitable for water treatment. Participants were attentive to the explanation given by the staff.

After visiting ESBECC, we had lunch near the Gulf of Thailand waterfront. There is a lot of seafood in Thai cuisine and many dishes are spicy. Everything was delicious, and perhaps our red, glowing skin looked youthful thanks to what we ate!

After lunch, we visited a famous temple in Chon Buri, Wihan Thep Sathit Phra Ki Ti Chaloe. It was typical of Thailand, with gold color used in many parts. We were able to experience a bit of Thai culture.



(Misuzu Asari, Associate professor, Kyoto University Graduate School of Global Environmental Studies)

**Dissemination of Disaster Waste Management Guidelines for Asia and the Pacific at 3RINCs 2019 in Bangkok, Thailand**

The 3R International Conference (3RINCs) is a scientific conference aimed at serving as a platform for academic activities to promote 3R society. The conference is intended to strengthen mutual ties among participants and to support interdisciplinary discussions. 3RINCs has been held every year for the past five years, starting in Japan and followed by Korea, Vietnam, and India. The fifth conference was hosted by the Solid Waste Management Association Thailand and held from February 27th to March 1st, 2019 in Bangkok, Thailand. Fourteen general sessions and five Special Sessions took place during the first two days, and a technical tour was carried out on the last day.

On February 27th, the editing team of the Disaster Waste Management Guideline for Asia and the Pacific (DWM Guideline) under JSMCWM presented a Special Session on Disaster Waste Management, which was co-chaired by Prof. Toshiaki YOSHIOKA of Tohoku University and Prof. Sadhan Kumar GHOSH of Jadavpur University. The program included:

- Introduction of the session and disaster waste

- management guideline: Misuzu ASARI;
- Development of regional disaster waste management guideline in the Pacific: Faafetai SAGAPOLUTELE;
- Future prospective of “Disaster Waste Management in Indonesia”: Tunjung PUITIKA;
- Generation and characteristics of disaster waste in Indonesia: Maryono MARYONO;
- Development of disaster waste management plan and policies in Nepal: Sumitra AMATAYA; and
- International cooperation and dissemination of disaster waste management guidelines: Mahesh PRADHAN.

First, Prof. Misuzu ASARI of Kyoto University reminded us that Asia and the Pacific regions are the most disaster-prone areas in the world, and that floods have been occurring frequently over the last few years. She also explained that flooding is one of the most dangerous and destructive natural disasters affecting the globe, possibly due to the impact of climate change and urbanization. Emphasizing that this situation highlights the need to develop policies and plans for disaster waste management in these regions, she then said that the Ministry of the Environment, Japan (MOEJ) has developed the DWM Guideline to enhance preparedness and response to natural disasters as well as to support relevant stakeholders in these regions in tackling these problems with practical DWM action plans.

Second, Mr. Faafetai SAGAPOLUTELE of J-PRISM-II, JICA, gave a presentation on the Regional Disaster Waste Management Guidelines for Pacific Island Countries (PICs), which were an outcome of two sub-regional consultations (in October 2018 in Samoa for Southern PICs and February 2019 in Palau for Northern PICs). He spoke about the coordination and administration on DWM in PICs, and explained the specific measures to be taken during the four phases of disaster management, namely prevention, preparedness, response, and recovery.

Ms. Tunjung PUIKITA of the Ministry of Environment and Forestry, Indonesia, spoke about the legal framework for environmental policy and regulation in Indonesia, including waste management and disaster waste management. She mentioned that Indonesia is vulnerable to disasters such as volcanic eruptions, high rainfall accompanied by floods, landslides, earthquakes, and tsunamis due to its geological and geographical conditions. The government is planning to develop a Guideline for Solid Waste Derived from Disaster, to which MOEJ would like to contribute through a

workshop based on the DWM Guideline. Following this presentation, Dr. Maryono MARYONO of Diponegoro University introduced the results of studies on the types and proportions of disaster waste generated by the Lombok Earthquake (2018), Palu-Donggala Earthquake and Tsunami (2018), and Sunda Strait Tsunami (2018).



*Matcha green tea was served for the participants who kindly responded to the questionnaire on DWM.*

Dr. Sumitra AMATAYA of LEAD, Nepal presented the current solid waste management and disaster waste management, and future DWM plans in Nepal. She pointed out that although Nepal is one of the most disaster-prone countries in the world due to its topography and climate, there are no references to DWM in the Nepalese legal framework, although it supports disaster risk reduction policies. The challenges associated with past disasters included: having no proper plan on debris/disaster management, uncoordinated and weak 3R practice, and a lack of coordination between the government and other stakeholders on disaster waste management. She also explained that a draft DWM policy recommendation, strategy, and an action plan for the Nepalese government were developed with financial support from UNEP/IETC.

Lastly, Dr. Mahesh PRADHAN of UNEP/IETC gave a presentation about activities related to DWM by international organizations, including the UN Environment/OCHA Joint Environmental Unit, the Environmental Emergencies Center, and the UNISDR International Recovery Platform. He presented a pilot project in the Philippines on disaster waste management policy, institutions, human resources, and awareness at the municipal scale.

In general, all work for DWM in Asian and the Pacific regions reported at this Special Session were ongoing processes. The active discussions at the session and during the conference were very fruitful. In particular

for the editing team of the DWM Guideline, this experience and exchange of views on DWM will allow them to improve the DWM Guideline, which will assist the countries in Asia and the Pacific to develop disaster waste measures.



3R International Conference (3RINCS) 2019



Co-chairs and the presenters of the Special Session on Disaster Waste Management

(Mayumi TAMIYA, Researcher, Global Environmental Division, TOWA Technology Corporation)

## Upcoming Events

### **The 30<sup>th</sup> Annual Conference of Japan Society of Material Cycles and Waste Management**

Date: September 19-21, 2019

Venue: Tohoku University, Japan

<https://jsmcwm.or.jp/international/>

**Journal of Material Cycles and  
Waste Management, Vol. 21, Issue 3  
(May 2019)**

[REVIEW, pp. 415-422](#)

“Application and development of methanotrophs in environmental engineering”, Seon-yeong Park, Chang-gyun Kim\*

[ORIGINAL ARTICLE, pp. 423-432](#)

“Quantity changes in *Pseudomonas* species in dairy manure during anaerobic digestion at mesophilic and thermophilic temperatures”, Masahiro Iwasaki, Guangdou Qi, Yumiko Endo, Zhifei Pan, Takaki Yamashiro, Fetra Jules Andriamanohiarisoamanana, Ikko Ihara, Kazutaka Umetsu\*

[ORIGINAL ARTICLE, pp. 433-456](#)

“A system dynamics model for evaluating food waste management in Hong Kong, China”, C. K. M. Lee, K. K. H. Ng\*, C. K. Kwong, S. T. Tay

[ORIGINAL ARTICLE, pp. 457-468](#)

“Remediation of multi-metal contaminated soil using biochars from rice husk and maple leaves”, Zahra Derakhshan-Nejad, Myung Chae Jung\*

[ORIGINAL ARTICLE, pp. 469-477](#)

“Adsorption of copper ions by fly ash modified through microwave-assisted hydrothermal process”, Qili Qiu, Xuguang Jiang\*, Guojun Lv, Zhiliang Chen, Shengyong Lu, Mingjiang Ni, Jianhua Yan, Xuliang Lin, Huibo Song, Junjun Cao

[ORIGINAL ARTICLE, pp.478-487](#)

“The use of waste diversion indices on the analysis of Canadian waste management models”, Conglian Pan, Damien Bolingbroke, Kelvin Tsun Wai Ng\*, Amy Richter, Hoang Lan Vu

[ORIGINAL ARTICLE, pp. 488-502](#)

“Mechanical properties of ecological high ductility cementitious composites produced with recycled crumb rubber and recycled asphalt concrete”, Lijuan Chai, Liping Guo\*, Bo Chen, Yanhui Xu, Cong Ding

[ORIGINAL ARTICLE, pp. 503-524](#)

“Effect of sintering temperature on mechanical and thermophysical properties of biowaste-added fired clay bricks”, Farah Anjum, Abdul Ghaffar\*, Yasir Jamil, Muhammad Irfan Majeed

[ORIGINAL ARTICLE, pp. 525-538](#)

“Metal valorization from the waste produced in the manufacturing of Co/Mo catalysts: leaching and

selective precipitation”, Mohammed F. Hamza, Jean-Claude Roux, Eric Guibal\*

[ORIGINAL ARTICLE, pp. 539-546](#)

“A process of carbon enrichment of bottom slag ash for value-added applications”, Priyanka P. Jatav, Sonali P. Tajane\*, S. A. Mandavgane, S. B. Gaidhani

[ORIGINAL ARTICLE, pp. 547-555](#)

“Engineering performance evaluation of mortar with EOS (electric arc furnace oxidizing slag) as fine aggregate”, Seung-Jun Kwon, Han-Seung Lee, Keun-Hyeok Yang, Hee-Seob Lim\*

[ORIGINAL ARTICLE, pp. 556-572](#)

“By-products of bioenergy systems (anaerobic digestion and gasification) as sources of plant nutrients: scope of processed application and effect on soil and crop”, Sampriti Katakai\*, Samarendra Hazarika, D. C. Baruah

[ORIGINAL ARTICLE, pp. 573-584](#)

“Performance evaluation of a bottom liner incorporated up-flow anaerobic sludge blanket reactor start-up for food waste”, R. T. K. Ariyawansa, B. F. A. Basnayake\*, A. K. Karunarathna, R. H. M. Karunarathna

[ORIGINAL ARTICLE, pp.585-593](#)

“Solid waste characterization and its recycling potential: Akure municipal dumpsite, Southwestern, Nigeria”, Olugbenga O. Elemile, Mynepalli K. C. Sridhar, Opeyemi E. Oluwatuyi\*

[ORIGINAL ARTICLE, pp.594-605](#)

“Can waste foundry sand fully replace structural concrete sand?” Maria Mavroulidou\*, David Lawrence

[ORIGINAL ARTICLE, pp. 606-623](#)

“Life-cycle assessment of municipal solid-waste management strategies in Tricity region of India”, Rishi Rana, Rajiv Ganguly\*, Ashok Kumar Gupta

[ORIGINAL ARTICLE, pp. 624-632](#)

“Fast pyrolysis of Vietnamese waste biomass: relationship between biomass composition, reaction conditions, and pyrolysis products, and a strategy to use a biomass mixture as feedstock for bio-oil production”, Thanh Long Duong, Dong Truc Nguyen, Huynh Hung My Nguyen, Binh Minh Quoc Phan, Huu Luong Nguyen, Thuan Minh Huynh\*

[ORIGINAL ARTICLE, pp. 633-641](#)

“Thermal processing of waste tires with heavy oil residue in the presence of Tayzhuzgen zeolite”, Kairat Burkhanbekov\*, Yermek Aubakirov, Zheneta Tashmukhambetova, Tleutay Abildin

[ORIGINAL ARTICLE, pp. 642-651](#)

“Influence of flow rate and particle size on local equilibrium in column percolation tests using crushed masonry”, Nicole Bandow\*, Michael Finkel, Peter Grathwohl, Ute Kalbe

[ORIGINAL ARTICLE, pp. 652-658](#)

“Immobilization of heavy metal using dithiocarbamate agent”, Lei Zheng\*, Wei Wang, Zifu Li, Lingling Zhang, Shikun Cheng

[ORIGINAL ARTICLE, pp. 659-665](#)

“A promising strategy for the utilization of waste nitrile gloves: cost-effective adsorbent synthesis”, Kinyas Polat\*, Elif Ant Bursalı

[ORIGINAL ARTICLE, pp. 666-677](#)

“Anaerobic co-digestion of tannery wastes using two stage anaerobic sequencing batch reactor: focus on process performance of hydrolytic–acidogenic step”, Shifare Berhe\*, Seyoum Leta

[REGIONAL CASE STUDY, pp. 678-690](#)

“Food waste management current practices and sustainable future approaches: a Saudi Arabian perspectives [sic]”, Nuhu Dalhat Mu’azu\*, Nawaf I. Blaisi, Ammar A. Naji, Isam Mohammed Abdel-Magid, Ali AlQahtany

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