

# 3RINCs2021

The 7<sup>th</sup> 3R International Scientific Conference on  
Material Cycles and Waste Management

**11,15-19 March 2021, online**



INDEX

FOREWORD  
COMMITTEE  
PROGRAM SCHEDULE  
SPONSOR

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

## **Foreword of the 7th 3RINCs - 3R Concept and its Broader Target Research Areas**

3R International Scientific Conference on Material Cycles and Waste Management (3RINCs) targets resource circulation and waste management. We welcome researches focused on the application of basic academic knowledge and good examples of social implementation of each relevant technology and system.

We know the basic concept of 3R, “Reduce, Reuse & Recycle”, and the scope of its target research areas are becoming broad and expanding. Now we must think about additional aspect of “Renewable” as “3R Plus” approach. Especially when managing plastic materials, without considering “Renewable”, it is not possible to avoid GHG emissions generated from fossil resources or we cannot accomplish the technology of biodegradable application. We are facing with the expansion of 3R target items. For instance, we are dealing with food loss and one-way use of plastics as target items for “Reduce”. Given the fact that nearly a half of the amount of the food produced in the world goes to waste and food production has an impact on the environment, naturally we must think of the food loss issue. It is possible to reduce a considerable volume of single-use plastics which are disposed of after only one-time use. We also see new target items for “Reuse”, such as an expansion of the reuse market and products’ sharing systems. As for “Recycle”, in relation to the development of a decarbonized society, it will become necessary to target innovative technology development for electric vehicle’s recycling, and CCUS (Carbon Capture, Utilization and Storage) . Such movement can be developed also in Waste Management. There’s a trend to utilize recovered heat in addition to power generation in Waste-to-Energy (WtE) system. As for waste generated from frequent natural disasters, we must address disaster waste management as an ultimate issue.

All these movements are based on the goal of net zero greenhouse gas emissions. That is, new products targeting a decarbonized society will go into recycling stage in the near future. For a sustainable future society, we have to achieve a circular economy and at the same time a material cycles society. This idea is gradually spreading and we need to think about that. Since 2019, we are facing a risk of COVID-19 infection. In addition to hands-on activities of infectious waste management, we need to look at the aspect of social changes like shifting to a decentralized society and/or transforming into a digital society with the use of Information and Communication Technology (ICT). We should realize such movement and make every effort toward resource circulation and decarbonization together with proper management of chemical substances. Along with this trend, it is time that we should develop a mid-to-long term approach for that goal. The 7th 3RINCs program contains those topics for discussion.

February 17, 2021



Shinichi SAKAI, Professor at Kyoto University

Steering Committee Chairperson of the 7th 3RINCs



# COMMITTEE

## ORGANIZERS/CO-ORGANIZERS:

- Japan Society of Material Cycles and Waste Management (JSMCWM)
  - Korea Society of Waste Management (KSWM)
  - Society for Solid Waste, Chinese Society for Environmental Sciences (SSW-CSES)
  - NIES-KMUTT-KU collaboration research laboratory
- 

## SUPPORTERS:

- MOEJ (Ministry of the Environment, Government of Japan)
- JICA (Japan International Cooperation Agency)
- Solid Waste Management Association Thailand (SWAT)
- IGES (Institute for Global Environmental Strategies)
- ISWA (The International Solid Waste Association)
- UNEP (United Nations Environment Programme)
- UNCRD (United Nations Centre for Regional Development)



## 11, March 2021, Thu.

Time	Special session	General session	General session
13:30-14:00	Opening Remarks		
14:00-15:00	Plenary lecture Prof. Shinichi Sakai		
15:00-16:00	Plenary lecture Prof. Heinz-Georg Baum		
16:30-18:00	Special Symposium on Disaster Waste "Perspectives for Disaster Waste Management - Disaster, Waste management and Climate change -"		
18:15-19:15			

## 15, March 2021, Mon.

Time	Special session	General session	General session
13:00-14:30		Session A Organic waste: Thermal treatment	Session B Waste management: Situations and analysis
14:45-16:15			Session C Waste management: Case studies and practices
16:30-18:00		Session D Organic waste: Hydrothermal treatment	Session E Plastic waste: Recycling
18:00-19:00			

## 16, March 2021, Tue.

Time	Special session	General session	General session
13:00-14:30		Session F Plastic waste: Consumer behavior	Session G Hazardous material in water and soil
14:45-16:15		Session H Plastic waste: New approach	Session I Hazardous material in ash
16:30-18:00	Special session 1 Estimating Plastic Waste and Pollution for Data-driven Policy Making in Emerging Economies		
18:00-19:00			

Special Topic 1 : Plastic

Special Topic 2 : Organic waste

Special Topic 3 : Disaster waste

Special Topic 4 : COVID-19

Special Topic 5 : E-Waste ELV

## 17, March 2021, Wed.

Time	Special session	General session	General session
13:00-14:30	<b>Special session 2</b> Recovery and preparation of organic waste as alternative fuel		
14:45-16:15		<b>Session J</b> Organic waste: Biological treatment	<b>Session K</b> MFA and SFA for waste management
16:30-18:00		<b>Session L</b> Organic waste: Treatment technology and assessment	<b>Session M</b> Gas and water treatment, resource recovery
18:00-19:00			

## 18, March 2021, Thu.

Time	Special session	General session	General session
13:00-14:30		<b>Session N</b> ELV management	<b>Session O</b> LCA for waste management
14:45-16:15	<b>Special session 3</b> E-waste Management and Strategies towards Circular Economy		
16:30-18:00		<b>Session P</b> Disaster waste management	
18:00-19:00			

## 19, March 2021, Fri.

Time	Special session	General session	General session
13:00-14:30		<b>Session Q</b> E-waste management / Industrial waste management	<b>Session R</b> Waste management challenges
14:45-16:15		<b>Session S</b> Waste management with COVID-19 / Medical waste management	
16:30-18:00	<b>Special session 4</b> COVID-19 waste management		
18:00-18:30	<b>Closing</b>		
18:45-19:45			

Special Topic 1 : Plastic

Special Topic 2 : Organic waste

Special Topic 3 : Disaster waste

Special Topic 4 : COVID-19

Special Topic 5 : E-Waste ELV

## Plenary Lecture 1: March 11, 14:00 – 15:00 (JST)

### “3R Plus” Concept for Sustainable Material Cycles and Waste Management

*Dr. Shinichi Sakai (Kyoto University)*



**Dr. Shinichi SAKAI** is currently Professor of Kyoto University, Environmental Preservation Research Center, Japan. Current special fields are “Persistent chemicals control in the field of waste management and material cycles” and “System analysis of material cycles and waste management.” As a member of the editorial board of the Japan Society of Material Cycles and Waste Management (JSMCWM), he takes a role of the editor-in-chief to edit the international Journal of Material Cycles & Waste Management (JMCWM).

#### Abstract

A vision for sustainable material circulation and further advanced effort required for waste management are discussed in this plenary. The focus is “3R Plus”, thinking mainly about prevention and recycling of plastic materials and de-carbonization strategies.

First, I would like to start on an example of waste management with a reverse hierarchy that is opposite to the 3R concept. In recent years, in addition to natural disasters like earthquakes and tsunamis, large-scale floods also bring serious damage to countries around the world. Such disasters can generate large quantities of disaster waste, and we have to deal with these issues through ordinary waste management strategies that we have. For recyclable materials that contain chemical substances like persistent organic pollutants (POPs), we must decompose or stabilize them for safety resource circulation. For clean circulation, we should build a control system so that hazardous chemicals do not enter into the resource circulation loop. And to deal with COVID-19 infection that the world has been facing since 2019, it is essential to take proper management and degradative treatment for infectious waste.

In order to build a material cycles society, we must focus especially on “Reduce” among 3Rs. The most important target item is food loss. To prevent food loss and/or food waste is very meaningful and effective for conservation of precious food resources and for control of greenhouse gas (GHG) emissions caused by aerobic fermentation of organic waste. Single-use plastic is also becoming an important target item for conservation of marine ecosystem and GHG emission control. For plastic materials, we need to first take action of “Reduce”, and then “Reuse” and “Recycle,” and plus, we have to shift toward the use of renewable materials. It is also important to rebuild existing technologies and systems for resource circulation and waste management in order to realize a de-carbonized society.

Not only 3Rs, “Reduce, Reuse & Recycle”, now we must adopt the new perspective of “3R Plus”: that is, “Renewable” and “Recovery.” Especially when targeting plastic materials, without “Renewable”, it is not possible to control/ avoid GHG emissions generated from fossil resources. The world is becoming aware that circular economy is vitally necessary for social sustainability. We must establish a material cycles society with a function of circular economy.

## Plenary Lecture 2: March 11, 15:00 – 16:00 (JST)

### *It's the economy – stupid!*

### *On the relevance of economics in creating a successful circular economy*

*Dr. Heinz-Georg Baum (Fulda University of Applied Sciences)*



**Dr. Heinz-Georg Baum** is currently Professor of Fulda University of Applied Sciences, Germany. His special research fields are “Ecology and resource management”, “Economic aspects of waste and environmental management” while he covers wider teaching areas including Cost Management and Strategic management. He is a member of Schmalenbach Society for Business Administration, and Japan Society for the Promotion of Science (JSPS).

#### **Abstract**

Considerable impulses and stimuli for this presentation were given by the book „Good Economics for Hard Times“ by Banerjee / Duflo. Both are economists, working at MIT (Cambridge, MA, USA) – awarded by the Nobel Prize 2019 for their work on the field of poverty research. Their main thesis is: Regarding the current biggest problems (like inequality, poverty, degradation of the environment,...) you create better solutions, if economic expertise would given greater consideration

Are there any parallels to the topic circular economy? Although the economy is part of the term, the debate has focused less on economic issues but more on aspects like materiality, recyclability or circularity. The development towards a complete circular economy seems to be without any alternatives. This opinion is substantiated by terms like finiteness or scarcity (regarding non-renewable resources) or load limit (regarding the eco-system). On the other hand, market processes have proven their robustness towards changing or increasing scarcities. Furthermore, changed market conditions and dynamic change trigger adjustment processes and create innovations and smart solutions.

Recycling isn't – from economic point of view – an objective; but rather an instrument, a means to the very purpose. Therefore, the focus on – for example - recycling quotas per se is misleading from the outset, and – not least – often methodologically distorted. It requires information about measurement point and measurement method to be able to interpret the recycling rates. In the recent past there have been efforts to clarify the interpretation of recycling quotas. The market opportunities of secondary raw materials must be significantly improved to substitute more primary raw materials with secondary raw materials.

Every economy needs an efficient energy system – affordable, available at any time, in sufficient and stable quantity, in the right place and (more and more important) sustainable. You could have realized earlier that sustainable energy sources like hydrogen, wind or solar will be competitive after a certain period of time. In many cases renewable energy resources are already competitive now. And there are considerable further potentials for cost reductions. The economics behind are expressed by the well-known experience curve, economies of scale, competition and – as concrete instruments – auctions and certificate trading.

The planet earth's load limits are becoming a serious problem. Dealing with collective goods (commons) like water (rivers, seas, oceans), air and atmosphere, ground (dumps, forests, floor sealing) is described well in the so-called „Tragedy of the Commons: Freedom in commons brings ruin to all“.

There are many reasons to believe the main thesis of Banerjee/Duflo. Economics can advance circular economy significantly.





**Special Session 1: March 16, 16:30 – 18:00 (JST)**

***Estimating Plastic Waste and Pollution for Data-driven Policy***

***Making in Emerging Economies***

Co-organized by Institute for Global Environmental Strategies (IGES) along with the IGES Centre Collaborating with UNEP on Environmental Technologies (CCET) and Economic Research Institute for ASEAN and East Asia (ERIA)

For a long-time, data gap has been one of the major challenges for development, implementation, and monitoring of waste management and recycling policy in emerging and developing economies. Lack of data as well as cost and administrative burden of data collection, management and analysis have been a major barrier for effective waste and environmental management. At the same time, better understanding and awareness in the fate of plastics/plastic wastes in the environment through new scientific findings have renewed and strengthened policy interests over urgency to tackle marine plastic wastes as well as transition to circular economy. Moreover, the recent advancement in information technology, more widespread access to IT devices, new sensing technologies, and resulted cost reduction and lesser administrative burden provides possible revolutionary opportunities for data-driven policy making not only among developed economies but in emerging economies.

Having these trends in mind, this special session will discuss opportunities and challenges for data-driven policy making for proper plastic management and mitigation of marine plastics, especially for emerging and developing economies such as Southeast Asia and South Asia, through the recent attempts to estimate plastic waste and pollution either through more traditional way of information gathering or more advanced methods by utilizing GIS, IT technologies, sensing technologies or modeling methods.

This special session/webinar is co-organized by IGES and ERIA. ERIA is going to establish working group on data-driven policy making for marine plastic pollution management in collaboration with IGES.



## **Moderator**

Dr. Yasuhiko Hotta, Programme Director, Sustainable Consumption and Production Area, Institute for Global Environmental Strategies (IGES)

## **Programme and the panelists**

16:30 – 16:35	Introduction of the session by Dr Yasuhiko Hotta
16:35 – 16:50	Mr. Michikazu Kojima, IDE-JETRO/ERIA RKC-MPD Status of national data availability on marine plastics/plastic pollution for policy making and monitoring in ASEAN countries
16:50 – 17:05	Dr. Premakumara Jagath Dickella GAMARALALAGE, IGES Closing the Loop Project: From data gathering to city actions
17:05 – 17:20	Dr. Costas Velis, University of Leeds ISWA Plastic Pollution Calculator and other toolkits for data-driven policy making
17:20 – 17:35	Dr. Kavinda Gunasekara of the Geoinformatic Center (GIC) of the AIT Utilizing GIS and citizen science to identify hotspots along Mekong River
17:35 – 17:55	Dr. Muhamad Reza Cordova, Indonesian Institute for Sciences Monitoring marine plastic debris in the ocean and the river basin
17:55 – 18:00	Closing remarks by Dr Yasuhiko Hotta



**Special Session 2: March 17, 13:00 – 14:30 (JST)**

***Recovery and Preparation of Organic Waste  
as an Alternative Fuel***

**Organized by NIES-KMUTT-KU collaboration research laboratory**

In developing countries, organic waste is the main component, making up more than 50%. However, this organic waste is not adequately treated or disposed of. Much of this waste is disposed of by open dumping. As there is no sorting of organic waste at the source, this organic waste is contaminated with recyclable or combustible waste in the waste stream. Regarding the recovery and preparation of organic waste, in Thailand, the government and the private sector have already tried to use a mechanical separation system. However, most of them found that many factories failed to recover organic waste as an alternative fuel in both the form of biogas and RDF. In terms of RDF production, moisture is the main factor affecting separation efficiency. Therefore, reducing the organic waste moisture is beneficial to waste separation and can also increase the organic waste's heat value. However, waste dehumidification technology is still a considerable gap in developing countries.

For RDF users in Thailand, it was found that the alternative fuel substitution rate of cement plants in Thailand is relatively low compared with other cement plants in foreign countries, especially the countries in Europe. The main reasons are RDF cost and financial benefit from RDF usage. Additionally, it was found that the quality of the RDF delivered to end-users often did not meet user criteria. These criteria consist of moisture content, low calorific value, chloride content, sulfur content, and heavy metal content. These values have a direct impact on clinker quality and environmental emissions.

It can be seen that the recovery of organic waste for energy utilization has many gaps in developing countries. At the same time, it seems that there are many areas for improvement as well. To keep up-to-date on technology and user perspectives of organic waste as an alternative fuel, this special session/webinar is organized by the National Institute for Environmental Studies, Japan - King Mongkut's University of Technology Thonburi, Thailand – Kasetsart University, Thailand collaboration research

laboratory for researchers/investors to see further technology development opportunities.

## **Programme**

\*Chair: Assoc. Prof. Dr. Sirintornthep Towprayoon, JGSEE-KMUTT

13:00- 13:15 Potential of RDF utilization in Thai cement industry

Mr. Tanik Itsarathorn, SCI-eco co., ltd.

13:15- 13:30 Carbon consumption during biodrying of MSW in tropical condition

Dr. Noppharit Sutthasil, NIES

13:30- 13:45 Upgrading mixed MSW with solar greenhouse biodrying system

Mr. Katitep Ngamket, JGSEE-KMUTT

13:45- 14:00 Application of geophysics for assessing the plastic content in final disposal sites

Mr. Bongkoch Chungam

14:00 - 14:30 **Panel discussion: Gaps and opportunity of using pretreated MSW in Thai energy sector**

\*Moderator: Assoc. Prof. Dr. Sirintornthep Towprayoon, JGSEE-KMUTT

- Mr. Thitipong Srimapaisarn, SCI-Eco co., ltd.
- Asst. Prof. Dr. Kanoksak Eam O Pas, Mahidol University
- Ms. Sukhumal Aranyapongpaisal, Milestones





## ***Special Session 3: March 18, 14:45 – 16:15 (JST)***

### ***E-waste Management and Strategies towards Circular Economy***

**Organized by the Korea Society of Waste Management (KSWM)**

E-waste management towards circular economy, which is the 3RINC's 2021 special topic, has become a platform in the field of electronic and electric wastes management to aware the significance and consequences of resources recovery from wastes, to discuss the scientific solutions for hazardous wastes, and to inform the new waste management in the world.

The aim of this special session is to promote the academic knowledge interchange in the field of the implementation of E-waste and the eco-friendly management of hazardous wastes. Thus, we sincerely wish all participants and audiences to share will share the knowledges and experiences among international experts and professionals to promote mutual understandings in these areas through this session.

3RINC's 2021 would like to invite all of you in Asia, Europe, America, Oceania, and Africa to explore and strengthen the network among academic and field professionals in E-waste management well as the world's concerns on the waste management.

### **Programme**

\*Chair: Prof. Han Seung Kim, Konkuk University, Chair of International Affairs of KSWM, Korea

- 1) Current efforts on recycling and management of E-waste in South Korea  
Dr. Yong-Chul Jang, Professor, Chungnam National University, Korea
- 2) Change of Concern on E-waste in Japan  
Dr. Michikazu Kojima, Chief Senior Researcher, Inter-disciplinary Studies Center, IDE-JETRO, Japan
- 3) Strategy of sustainable E-waste management in Asian countries  
Dr. Seung-Whee Rhee, Professor, Kyonggi University, Korea

Followed by QA session

## ***Special Session 4: March 19, 16:30 – 18:00 (JST)***

### ***COVID-19 Waste Management***

After 1 year since Covid-19 became a global pandemic, we need to shift from an emerging phase to a strategic phase to manage Covid-19 waste in an environmentally sound manner. While we have been maximizing uses of the existing mechanisms and infrastructure to treat Covid-19 waste so far, the world has been obtaining new expertise and knowledge as well as possible way forward to manage Covid-19 waste and possible future pandemic waste. Furthermore, Covid-19 waste management is not simply waste management only for Covid-19 as it relates to other waste streams, including plastic waste.

The special session on Covid-19 waste management focuses on how we should manage Covid-19 waste, how we should consider environmentally sound management of Covid-19 waste with other waste streams, such as plastic waste, and how we should build back better on waste management based on the lessons learned from the Covid-19 experience

#### **Programme:**

\*Session coordinator:

Mr. Shunichi Honda, Programme Officer, International Environmental Technology Centre, UNEP

1) **Video:** The Plastic Pandemic, by UNEP-COBSEA SEA circular<sup>1</sup>

2) **Keynote speech:** Ms. Monika G MacDevette, Chief, Chemicals & Health Branch, Economy Division, UNEP

#### **3) Presentations:**

- Waste management measures taken against Covid-19 in Japan:  
Ms. Yuri Kato, Deputy Director, Industrial and Hazardous Waste

---

<sup>1</sup> <https://www.sea-circular.org/>



Management Division, the Ministry of the Environment, Japan

➤ Covid-19 waste and plastic waste management:

Dr. Chettiyappan Visvanathan, Department of Energy, Environment, and Climate, School of Environment, Resources and Development, Asian Institute of Technology

➤ Covid-19 waste management in Asia:

Mr. Kazunobu Onogawa, Director, IGES Centre Collaborating with UNEP on Environmental Technologies

➤ Covid-19 waste management:

Dr. Seiji Hashimoto, Professor, and Dr. Sébastien Dente, Senior Researcher, College of Science and Engineering, Department of Civil and Environmental Engineering Ritsumeikan University

**4) Panel discussion:**

\*Moderator: Mr. Mushtaq Ahmed Memon, Regional Coordinator for Resource Efficiency, Asia & the Pacific Office, UNEP



## General Session Program

\*Each presentation consists of 10-minute oral presentation & 4-minute discussion.

15, March 2021, Mon.

### Session A : Organic waste: Thermal treatment (13:00-14:30, 15, March 2021, Mon.)

Chair: Tomonori Ishigaki (National Institute for Environmental Studies)

- A-1 Thermal Modelling of the Torrefaction Process  
*Alok Dhaundiyal, Szent István University, Hungary*
- A-2 Gas and Tar Formation Characteristics in the Gasification Process for Biomass Materials  
*Katsuya Kawamoto, Okayama University, Japan*
- A-3 Co-pyrolysis of cellulose and polyethylene: Prediction of pyrolyzate yields using response surface methodology  
*Shengyu Xie, Tohoku University, Japan*
- A-4 Calculation of Thermochemical Kinetic Parameters of Several Types of Biomass Using Friedman Isoconversional method  
*Soyoung Han, Korea Institute of Machinery and Materials, Korea*
- A-5 Sponsor Movies  
*DOWA Holdings, Hitachi Zosen, JFE Engineering, NIPPON STEEL ENGINEERING, MITSUBISHI HEAVY INDUSTRIES ENVIRONMENTAL & CHEMICAL ENGINEERING*

### Session B : Waste management: Situations and analysis (13:00-14:30, 15, March 2021, Mon.)

Chair: Kosuke Kawai (National Institute for Environmental Studies)

- B-1 A Study on Operational Consciousness of Environmental Learning Facilities from a National Survey in Japan  
*Eiichi Suzuki, The Environmental Education of KUNISAKI CLEAN CENTER & Kyoto University, Japan*
- B-2 Analysis of Factors Affecting to Waste Behavior of Public in Hanoi  
*Nguyen My Linh, Toyo University, Japan*
- B-3 Questionnaire Survey to Clarify Current Situation of Waste Banks in Surabaya, Indonesia  
*Afif Faiq Muhamad, Hokkaido University, Japan*
- B-4 Accepting attitude toward a final disposal facility of mercury wastes with increase of cognitive aversion toward mercury  
*Fumitake Takahashi, Tokyo Institute of Technology, Japan*
- B-5 Historical trend and Background of Municipal Solid Waste Incineration in China  
*Li Yuting, Kyoto University, Japan*
- B-6 Development of Internationally Common Methodology for the Sorting Analysis of Food Waste from Household Sources - Comprehension and Deviation on the Proposed Categories  
*Kohei Watanabe, Teikyo University, Japan*

### Session C : Waste management: Case studies and practices (14:45-16:15, 15, March 2021, Mon.)

Chair: Kohei Watanabe (Teikyo University)

- C-1 Solid Waste Collection System in Hoi An City – The Status, Problems and Challenges  
*Dinh Cuong Le, Okayama University, Japan & University of Science, Hue University, Vietnam*
- C-2 Solid Waste Composting Financial Feasibility through Cash Flow Analysis - Case Study in Rabat Region, Morocco  
*Mohamed Hamza Cherki, Toyo University, Japan*
- C-3 Environmental Management practices in Logistics: An overview of Nacala Logistics Companies in Mozambique  
*Murarene Gabriel, Kyoto University, Japan*
- C-4 Improving waste landfilling practices in Africa: the case of Maputo  
*Paulo V. Queiroz Sousa, EX Research Institute Ltd, Japan*
- C-5 3R Policy and its Practice in Waste Management in Palestine  
*Suleiman Abu Mfarreh, Ministry of Local Government (MoLG), Palestine*
- C-6 Progress in China's Municipal Solid Waste Management and Residents' Behavior: A Case Study in Dongying City  
*Sun Jie, Kyoto University, Japan*

(to be continued)

15, March 2021, Mon. (continued)

**Session D : Organic waste: Hydrothermal treatment (16:30-18:00, 15, March 2021, Mon.)**

Chair: Shogo Kumagai (Tohoku University)

- D-1 Hydrothermal carbonization of black liquor of papermaking into activated carbon and its adsorption of Cr(VI)  
*Xiaomin Hong, Shanghai University, China*
- D-2 Effect of Hydrothermal Treatment on Co-Combustion Interactions and Mechanism of Oil Sludge Char with Biomass  
*Hao Xu, Tokyo Institute of Technology, Japan*
- D-3 Effect of combined hydrothermal treatment and water washing on coconut fiber demineralization and pyrolysis behaviour  
*Douglas Hungwe, Tokyo Institute of Technology, Japan*
- D-4 Lignin conversion to low molecular weight bio-oil over HZSM-5 in subcritical water  
*Masud Rana, Chonnam National University, Korea.*
- D-5 Study of Changing Fuel Characteristics of EFB by Hydrothermal Treatment  
*Rabin Nepal, Kongju National University, Korea*
- D-6 Sponsor Movies  
*MITSUBISHI HEAVY INDUSTRIES ENVIRONMENTAL & CHEMICAL ENGINEERING,  
NIPPON STEEL ENGINEERING, JFE Engineering, Hitachi Zosen, DOWA Holdings*

**Session E : Plastic waste: Recycling (16:30-18:00, 15, March 2021, Mon.)**

Chair: Michikazu Kojima (Institute of Developing Economies, Japan External Trade Organization)

- E-1 Sponsored presentation  
*Kawasaki Heavy Industries, Ltd.*
- E-2 An Interim Report on the Pilot Project for Recycling Urban Mined Plastics  
*Ikuyo Kikusawa, Fukuoka Asian Urban Research Center, Japan*
- E-3 Scale-up and Economic Assessment of a Split-Phase Glycolysis process for the Recycling of Flexible Polyurethane Foams Wastes  
*Ana M. Borreguero, University of Castilla-La Mancha, Spain*
- E-4 Recycling practices and material flow of PET waste in South Korea  
*Jin Hong Im, Chungnam National University, Korea*
- E-5 Sponsor Movies  
*DOWA Holdings, NIPPON STEEL ENGINEERING,  
MITSUBISHI HEAVY INDUSTRIES ENVIRONMENTAL & CHEMICAL ENGINEERING*

16, March 2021, Tue.

**Session F : Plastic waste: Consumer behavior (13:00-14:30, 16, March 2021, Tue.)**

Chair: Yasuhiko Hotta (Institute for Global Environmental Strategies)

- F-1 Material Flow of single-use plastic of food packaging generated by retailers in Taiwan  
*Hsin-Tien Lin, National Cheng Kung University, Taiwan*
- F-2 Material Composition Survey of Plastic Waste from Households in Japan  
*Junya Yano, Kyoto University, Japan*
- F-3 Estimating the Social Value of a Marine Plastics Upcycling Project  
*Aya Yoshida, National Institute for Environmental Studies, Japan*
- F-4 Plastic Waste Reduction Measures on a Consumer Level based on Determinants of Environment-Conscious Behavior  
*Reiko Sodeno, Shibaura Institute of Technology, Japan*
- F-5 Impact of Banning and Standardising of Single-Use Plastics in the Fast Food Industry  
*Thi-Kim-Chi Do, Griffith University, Australia*
- F-6 Sponsor Movies  
*Hitachi Zosen, JFE Engineering*

**Session G : Hazardous material in water and soil (13:00-14:30, 16, March 2021, Tue.)**

Chair: Shunichi Honda (UNEP)

- G-1 Biodegradable Chelator-Assisted Washing and Post-Treatment of Arsenic Contaminated Soil  
*Shafiqur Rahman, Kanazawa University, Japan*
- G-2 Degradation of perfluorooctanesulfonic acid (PFOS) through cold plasma-based wastewater treatment  
*Seunghin Oh, Jeonbuk National University, Korea*
- G-3 Cellulose-based adsorbent for arsenite removal as a waste-free operation  
*Keisuke Nakakubo, Kanazawa University, Japan*
- G-4 Selective Separation of Technetium-99 from Aqueous Matrix  
*M. Ferdous Alam, Fukushima University, Japan*
- G-5 Heat-Treatment Control during Preparation of V<sub>2</sub>O<sub>5</sub>/TiO<sub>2</sub> Catalysts for H<sub>2</sub>S Abatement  
*Jae Hwan Yang, Chungnam National University, Korea*
- G-6 Survey on per- and polyfluoroalkyl substances in leachates and treatment processes in waste landfill site  
*Yoshinori Yabuki, Research Institute of Environment, Agriculture and Fisheries Osaka Prefecture, Japan*

**Session H : Plastic waste: New approach (14:45-16:15, 16, March 2021, Tue.)**

Chair: So Sasaki (Chuo University)

- H-1 Statistics and Spatial Approach to Quantify the Unmanaged Plastic Waste Generation from the Land to DKI Jakarta River, Indonesia  
*Elprida Agustina, Institut Teknologi Bandung, Indonesia*
- H-2 Database creation and analysis of corporate initiatives regarding plastic resource circulation  
*Huang Wei Hsuan, Kyoto University, Japan*
- H-3 Detection of Microplastics in Incineration Bottom Ash  
*Zhan Yang, Tongji University, China*
- H-4 A new simple purity measurement of waste polyethylene-polypropylene mixture by IR analysis with an internal standard compound  
*Kazutoshi Ikenaga, Sojo University, Japan*
- H-5 Forecasting plastic leakage from MSW disposal in Thailand  
*Awassada Phongphiphat, King's Mongkut University of Technology Thonburi  
& Center of Excellence on Energy Technology and Environment, Thailand*

(to be continued)



16, March 2021, Tue. (continued)

**Session I : Hazardous material in ash (14:45-16:15, 16, March 2021, Tue.)**

Chair: Reiko Soden (Shibaura Institute of Technology)

- I-1 Migration of Cr-containing Ti-nanominerals from coal to coal fly ash  
*Zhao Yueyuan, Tokyo Institute of Technology, Japan*
- I-2 Characteristics of Metal(loid)s, Chlorine and Brominated Flame Retardants in Soil from MSW Open Dumping and Burning Site in Kabwe, Zambia  
*Mengmei Zhang, Kyoto University, Japan & JSPS Postdoctoral Fellow, Japan*
- I-3 Optimization of heavy metal removal method for recycling of paper sludge ash  
*Tae-Yeol Choi, Changwon National University, Korea*
- I-4 Environmental Impact Analysis of Mercury Release in Malaysia  
*Muhamad Nabil Fikri bin Abdul Hamid, Okayama University, Japan*
- I-5 Congener distribution of polychlorinated naphthalenes in municipal solid waste incineration fly ash  
*Satoshi Mizutani, Osaka City University, Japan*
- I-6 Quantification of anthropogenic mercury releases by category in China in response to Minamata Convention on Mercury  
*Habuer, Okayama University, Japan*

17, March 2021, Wed.

**Session J : Organic waste: Biological treatment (14:45-16:15, 17, March 2021, Wed.)**

Chair: Satoshi Mizutani (Osaka City University)

- J-1 Sponsored presentation  
*Hitachi Zosen Corporation*
- J-2 Sponsored presentation  
*TAKUMA Co., Ltd.*
- J-3 Performance of Anaerobic Hybrid Reactor for the Generating Biogas of the High-Strength Fresh Leachate from a Municipal Waste Transfer Station  
*Sakulrat Suttiprapa, King's Mongkut University of Technology Thonburi, Thailand*
- J-4 Immobilized microalgae based domestic wastewater treatment and biodiesel extraction from produced biomass  
*Soyean Park, Jeonbuk National University, Korea*
- J-5 Accelerated composting by applying compost product as inoculum  
*Qilong Li, Tokyo Institute of Technology, Japan*
- J-6 Effect of cold plasma pre-treatment on Waste Activated Sludge (WAS) for Biochemical Methane Potential (BMP) enhancement  
*Gerardo Oswaldo Ortiz Vanegas, Jeonbuk National University, Korea*

**Session K : MFA and SFA for waste management (14:45-16:15, 17, March 2021, Wed.)**

Chair: Junya Yano (Kyoto University)

- K-1 Estimation of Homologue-based Emissions of Short-Chain Chlorinated Paraffins in Japan  
*Junichiro Koshiba, Kyoto University, Japan*
- K-2 Resource efficiency evaluation based on MFA in Korea  
*Seungmin Ji, Chungnam national university, Korea*
- K-3 Material Inventory Analysis of Residential Buildings in Homs, Syria for Rehabilitation  
*Samer Zydia, Hiroshima University, Japan*
- K-4 Fossil Carbon Content in Wood-Based Materials Estimated by Elemental Analysis  
*Naoki Takeuchi, Kyoto University, Japan*
- K-5 Reanalysis of Production Statistics on Wood-based Materials and Wood Adhesives in Japan By Data Reconciliation Method  
*Yasuhiro Hirai, Kyoto University, Japan*
- K-6 Sponsor Movies  
*MITSUBISHI HEAVY INDUSTRIES ENVIRONMENTAL & CHEMICAL ENGINEERING,  
NIPPON STEEL ENGINEERING, DOWA Holdings*

**Session L : Organic waste: Treatment technology and assessment (16:30-18:00, 17, March 2021, Wed.)**

Chair: Katsuya Kawamoto (Okayama University)

- L-1 Assessment of nitrogen emissions from the various installation of waste treatment plants to support waste management to mitigate climate change  
*Monika Suchowska-Kisielewicz, University of Zielona Góra, Poland*
- L-2 Optimal struvite recovery from anaerobic digestate using central composite design  
*Sojeong Cheon, Jeonbuk National University, Korea*
- L-3 Feasibility Study of Biomass Waste Recycling System in University Campus  
*Peni Astrini Notodarmojo, Okayama University, Japan*
- L-4 Disposing Large Amount of Food from their Fridge? : A Case Study with Waste Composition Analysis and Questionnaire Survey in Japan  
*Hajime Yamakawa, Kyoto Prefectural University, Japan*
- L-5 Food Waste from Household Sources in Japan: Comparison of Sorting Analysis of Urban and Rural Areas  
*Tomoko Okayama, Taisho University, Japan*

(to be continued)

17, March 2021, Wed. (continued)

**Session M : Gas and water treatment, resource recovery (16:30-18:00, 17, March 2021, Wed.)**

Chair: Hideki Yoshida (Muroran Institute of Technology)

- M-1 Purification of LFG and Utilization of CO<sub>2</sub> by Extracting Calcium Hydroxide from MSWI Fly Ash  
*Kyumin Jang, Yonsei University, Korea*
- M-2 Simulation of the mineral carbonation process with metal ion separation using electrolysis of industrial wastewater  
*Wonyong Choi, Yonsei University, Korea*
- M-3 Removal and recovery of NO by MnO<sub>2</sub>/Mg-Al layered double hydroxide  
*Tanya Kurutach, Tohoku University, Japan*
- M-4 Efficient Recovery of Gold and Platinum from Waste Sources Using Dithiocarbamate-modified Cellulose  
*Foni B. Biswas, Kanazawa University, Japan & University of Chittagong, Bangladesh*
- M-5 Marine Macroalgae: Effect of Synthetic Aminopolycarboxylate Ligand on Metal (Cd and Cu) Uptake Mechanism  
*Okviyoandra Akhyar, Kanazawa University, Japan*  
*& Islamic University of Kalimantan Muhammad Arsyad Al Banjari, Indonesia*
- M-6 Influence of Nanoclay Particles on Rheological and Mechanical Properties of Polyamide 12/Waste Rubber Composites  
*Friday Nwankwo Archibong, Institut National des Sciences Appliquées Centre Val de Loire, France*



18, March 2021, Thu.

**Session N : ELV management (13:00-14:30, 18, March 2021, Thu.)**

Chair: Yuko Saito (Tohoku University)

- N-1 Sponsor Movies  
*JFE Engineering, Hitachi Zosen*
- N-2 Upscaling and Advanced Evaluation of Wet and Dry Rod-Milling Processes for Recovering of Cu, PVC, and Plasticizer from Waste Wire Harnesses  
*Harendra Kumar, Tohoku University, Japan*
- N-3 Toward the Creation of the Asian xEV Battery Recycling Zone  
*So Sasaki, Chuo University, Japan*
- N-4 A facile and environment-friendly method for leaching of Ni, Cd and Co from the spent Ni-Cd batteries over polyvinyl chloride (PVC) in subcritical water  
*Md Ishtiaq Hossain Khan, Chonnam National University, Korea*
- N-5 Motorcycle Recycling Flow in Japan: the number of End-of-Life motorcycles (ELMCs)  
*Takumi Yamane, Tokyo City University, Japan*
- N-6 Sponsored presentation  
*Ecommit Corporation*

**Session O : LCA for waste management (13:00-14:30, 18, March 2021, Thu.)**

Chair: Yasuhiro Hirai (Kyoto University)

- O-1 An approach to develop city waste management strategy in developing countries: A case study of Negombo City in Sri Lanka  
*Rajeev Kumar Singh, Institute for Global Environmental Strategies, Japan*
- O-2 Environmental Impact Scenario of Thermal Waste Treatment Based on Life Cycle Analysis in Denpasar City, Bali  
*I Wayan Koko Suryawan, Universitas Pertamina, Indonesia*
- O-3 Greenhouse Gas Reduction through Reusable Glass Bottles from a Life Cycle Perspective  
*Yuka Mukai, Kyoto University, Japan*
- O-4 A Comparison between Energy Recovery Systems for Municipal Solid Waste concerning with Energy Balance and Life Cycle CO<sub>2</sub> Emission  
*Geun-Yong Ham, National Institute for Environmental Studies, Japan*
- O-5 Strategy for Introducing Sewage Sludge Energy Utilization Systems at Sewage Treatment Plants in Major Cities in Japan: Technology Introduction Scenario  
*Kehua Wang, Ochanomizu University, Japan*
- O-6 Strategy for Introducing Sewage Sludge Energy Utilization Systems at Sewage Treatment Plants in Major Cities in Japan: Comparative Assessment  
*Toyohiko Nakakubo, Ochanomizu University, Japan*

**Session P : Disaster waste management (16:30-18:00, 18, March 2021, Thu.)**

Chair: Misuzu Asari (Kyoto University)

- P-1 Sponsored presentation  
*MITSUBISHI HEAVY INDUSTRIES ENVIRONMENTAL & CHEMICAL ENGINEERING Co., Ltd.*
- P-2 Implementation of workflow for systematic understanding of disaster waste management  
*Haruna Masuda, Kyoto University, Japan*
- P-3 Significance of Disaster Debris Reduction for Disaster Waste Management  
*Nagahisa Hirayama, Nagoya University, Japan*
- P-4 Performance of Gravel-Tire Chips Drains in Mitigating Liquefaction  
*Yutao Hu, Kyushu University, Japan*
- P-5 Time-varying discharge model and distribution simulation of disaster waste  
*Takeshi Fujiwara, Okayama University, Japan*
- P-6 Sponsor Movies  
*DOWA Holdings, NIPPON STEEL ENGINEERING,  
MITSUBISHI HEAVY INDUSTRIES ENVIRONMENTAL & CHEMICAL ENGINEERING*

19, March 2021, Fri.

**Session Q : E-waste management / Industrial waste management (13:00-14:30, 19, March 2021, Fri.)**

Chair: Aya Yoshida (National Institute for Environmental Studies)

- Q-1 Screening survey of plastics used in WEEE for conversion to secondary raw materials  
*Yuko Saito, Tohoku University, Japan*
- Q-2 Estimating the Proper Electric Power for the Physical Shredding of the massage chair and treadmill in recycling plant  
*Jihwan Park, Korea Electronics Recycling Cooperative (KERC), Korea*
- Q-3 Resource Efficiency and Depollution – Conducting a stakeholder process to derive enhanced treatment requirements for WEEE  
*Christian Kitazume, German Environment Agency, Germany*
- Q-4 Economic assessment of building demolition methods in Hanoi, Vietnam  
*Ngoc Han Hoang, National Institute for Environmental Studies, Japan*
- Q-5 Characterization of compaction and CBR properties of recycled concrete aggregates with different fines contents for roadbed materials  
*Hong Nam Thai, Saitama University, Japan & National University of Civil Engineering, Vietnam*

**Session R : Waste management challenges (13:00-14:30, 19, March 2021, Fri.)**

Chair: Ryo Tajima (National Institute for Environmental Studies)

- R-1 ‘Zero Budget System’ A New Mechanism in Promoting Separation of Recyclables at Source in Malaysia  
*Faisal Bin Ariffin, Hokkaido University, Japan*
- R-2 Regionalization and Capacity Strengthening of Solid Waste Management Service Providers in Palestine: Lessons Learned from a Technical Assistance Project  
*Mitsuo Yoshida, Japan International Cooperation Agency (JICA), presently at International Network for Environmental and Humanitarian Cooperation (iNehc), Nonprofit Inc., Japan*
- R-3 Open Dump to Resource Recovery: Shifting Paradigms for Sustainable Solid Waste Management in Municipalities of Nepal  
*Dhundi Raj Pathak, Tribhuvan University, Nepal*
- R-4 Shifting toward Resource Management in Remote Area: A Case Study of Lake Toba, Indonesia  
*Miwa Tatsuno, Institute for Global Environmental Strategies, Japan*
- R-5 Development of a process to invoke community actions to reduce canal waste: a case in Bangkok  
*Ryo Tajima, National Institute for Environmental Studies, Japan*
- R-6 Sponsor Movies  
*Hitachi Zosen, JFE Engineering*

**Session S : Waste management with COVID-19 / Medical waste management (14:45-16:15, 19, March 2021, Fri.)**

Chair: Hajime Yamakawa (Kyoto Prefectural University)

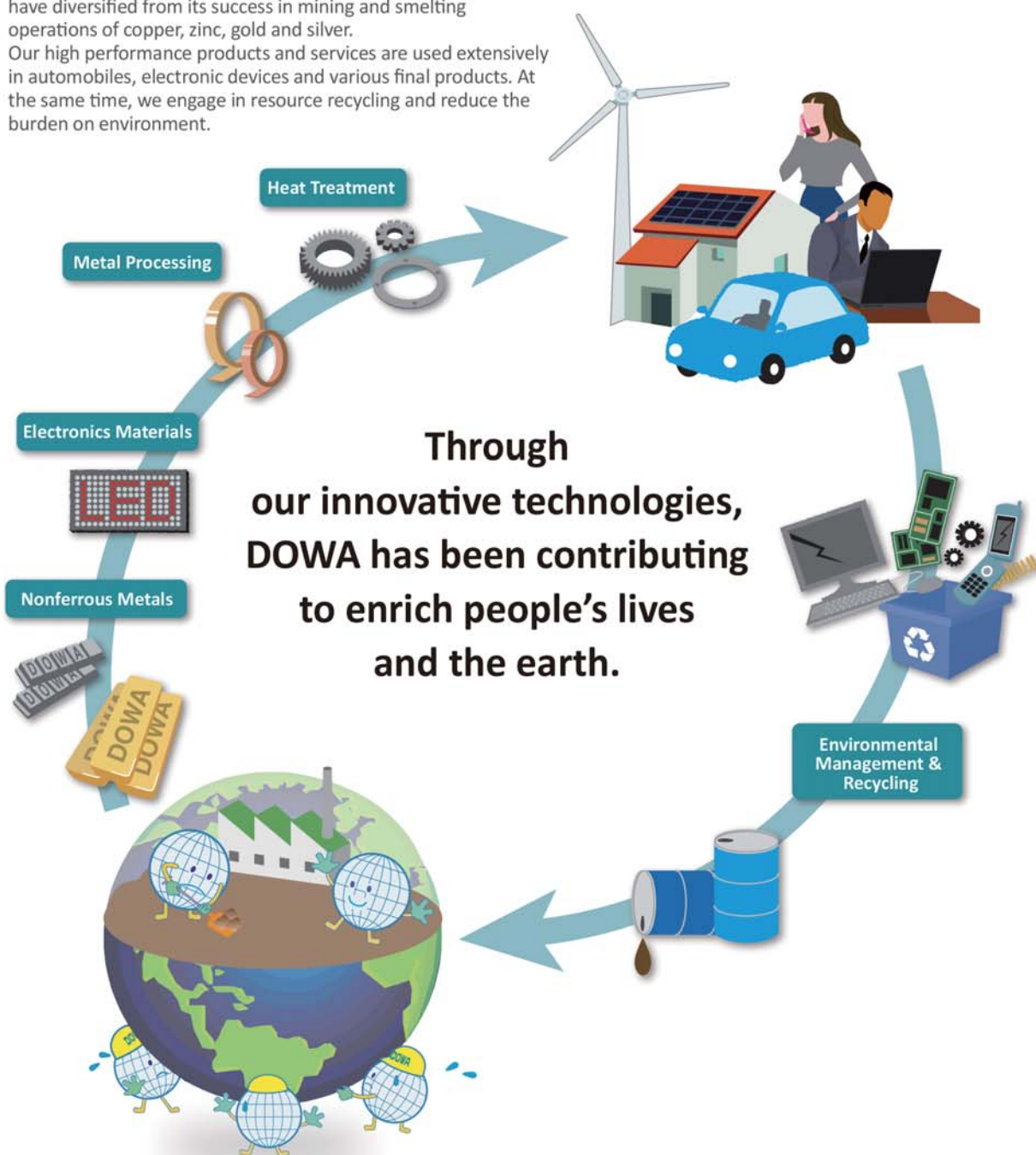
- S-1 Solid Waste Management Inside Saphan Hin Park in Thailand Under the COVID-19 Control Measures  
*Sineenart Puangmanee, Phuket Rajabhat University, Thailand*
- S-2 COVID-19 impact on household food and plastic waste generation in Bangkok  
*Chen Liu, Institute for Global Environmental Strategies, Japan*
- S-3 Repercussions of clinical waste co-incineration in municipal solid waste incinerator during COVID-19 pandemic  
*Dong-Ying Lan, Tongji University, China*
- S-4 Challenges of Healthcare Waste Management in the Gaza Strip, Palestine as a Case Study  
*Reem Abukmeil, Gaza Medical Waste Management Program, Japan International Cooperation Agency (JICA) - Palestine Office, presently at Dalhousie University of Canada, Canada*
- S-5 Improper Disposal of Medical Wastes in Clinics: An Impact of Waste Volume  
*Daisuke Sugimoto, Tokyo Institute of Technology, Japan*
- S-6 JICA's Initiatives on Waste Management during COVID-19  
*Sho Miura, Japan International Cooperation Agency, Japan*

# DOWA - Contributing to the Sustainable Society

The DOWA Group was founded in 1884.

We comprise five main operating companies and its businesses have diversified from its success in mining and smelting operations of copper, zinc, gold and silver.

Our high performance products and services are used extensively in automobiles, electronic devices and various final products. At the same time, we engage in resource recycling and reduce the burden on environment.



[www.dowa.co.jp](http://www.dowa.co.jp)

**DOWA**



# Hitachi Zosen is committed to tackling global environmental challenges



Technology for People, the Earth, and the Future

Hitachi Zosen Corporation

SUSTAINABLE DEVELOPMENT GOALS







[www.jfe-eng.co.jp](http://www.jfe-eng.co.jp)

Creating the Foundation for Life  
"Ni·na·u"\* the Foundation for Life

# Waste to Energy

JFE Engineering is the only company in Japan capable of providing a total solution for urban environments, ranging from water and sewage treatment to waste treatment and recycling. Our technology of controlling "heat" and "water", developed through decades of steelmaking and shipbuilding, creates a safe and prosperous urban environment.

\* "Ni·na·u" is a Japanese word meaning supporting and remaining responsible.  
We aim to provide solutions with our engineering and manufacturing know-how.



**JFE Engineering Corporation**

2-1, Suehiro-cho, Tsurumi-ku, Yokohama 230-8611, Japan  
TEL:+81-45-505-7876 FAX:+81-45-505-7657





## **We turn your Waste to Energy with our State-of-Art Technology**

- ✓ **Over 500 References Worldwide**
- ✓ **One of the highest Electricity Generation Efficiency**
- ✓ **Compliance to the strictest Emission Standard**



**NIPPON STEEL  
ENGINEERING**



# TOWA Technology Corporation

will work toward development of sustainable society with conviction.

## Promotion of 3Rs in waste management

We support to promote the development of sustainable society. Our core business mainly consists of three areas: providing support for municipalities to establish waste management system in the context of Material-Cycling Society; providing consultation for the national government to develop institutional frameworks concerning 3Rs and waste management policy; and providing support for risk management on hazardous chemical substances.



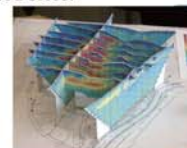
## Consultation to help promote Environmentally Sound Management of Waste and development of Material-Cycling Society

Waste management has recently become a global-scale environmental issue to tackle with. With the aim to support developing Material-Cycling Society and to minimize the environmental impacts through environmentally sound management of waste, we propose appropriate waste treatment technologies taking into account both software and hardware sides.



## Investigation and restoration for soil contamination

Our high level analyses with extensive experiences can uncover the geological and groundwater status of contaminated sites. According to clients' preferences, we can either offer advices at a pinpoint request or a comprehensive program including investigation and remediation of contaminated sites.



**TOWA Technology Corporation**

Head office: Hirose Kitamachi 3-11, Naka-ku, Hiroshima city, Hiroshima  
Tokyo branch: Saga 1-2-1, Koto-ku, Tokyo

TEL. +81-82-297-8700  
TEL. +81-3-6240-3412



# HI, WE ARE ECOMMIT.

## OUR COMMITMENT TOWARDS CIRCULAR SOCIETY.

1. To offer economical alternatives other than discarding used items.
2. To offer the solution to rescue the valuables out of waste both for us and for everyone.
3. Seek for transformation and enlightenment of market behavior hand in hand with the partners who share the same value.



ecommit Co.,Ltd  
2-30 Kandacho,Satsuma-Sendai City,Kagoshima

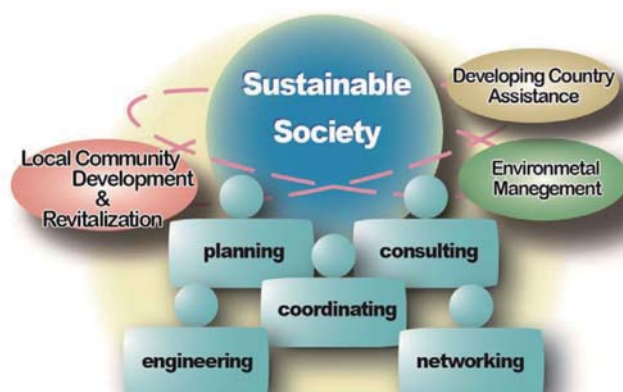






#### Project Areas

- Sound material-cycle Society, 3R
- Municipal Solid Waste / Waste Minimization
- Hazardous Waste (E-waste)
- JCM / Global Warming
- Environmental Cooperation
- Environmental Management
- Product Recycling
- Renewable Energy
- Biomass Waste Utilization
- Air Quality
- Water



EXRI was founded in 1971 when various environmental problems had surfaced to affect people's everyday life in the world. Since then, we have been providing optimal solutions for issues related to the 'Environment and Energy' and 'Urban Space/ Regional Community.' Our mission is to keep contributing to the society we live in by offering effective solutions to our society's most pressing issues, such as taking actions against global warming, building an environmentally sound-material cycle society, realizing sustainable local community/urban infrastructure, and promoting community development with decentralization of authority and public participation.

Chairman  
President

Masato OHNO  
Hiroshi NAITO



**EX Research Institute Ltd.**

Environmental and Regional Planning, Research and Consulting



#### About Us

EX Research Institute Ltd.  
HeadOffice: 17-22 Takada 2-chome,  
Toshima-ku, Tokyo 171-0033, Japan  
Phone: +81-3-5956-7500  
Fax: +81-3-5956-7520

EXRI ASIA Co., Ltd.  
Office: 218 Soi Petkasem, 63/4,  
Bangkok, Bangkok, Thailand  
Phone: +66-2-421-5618  
Fax: +66-2-421-5414  
E-Mail: s.takagi@exri.co.jp

EXRI Consulting Philippines, Inc.(EXPH)  
Office: 2/F 153 Kamias Road  
extension, Kamias, Quezon City  
1102, Philippines  
Phone: +63-2-436-7360,  
+63-2-925-3621  
Fax: +63-2-436-7372  
E-Mail: business.exph@gmail.com

<http://www.exri.co.jp/>



 **Kawasaki**  
Powering your potential



**Powering  
your  
potential**

The Kawasaki Group Mission is to be a "Global Kawasaki," working as one for the good of the planet; the Kawasaki brand is about paving the way to new possibilities for customers and society; to sum it up, "Powering your potential."

**Kawasaki Heavy Industries, Ltd.** [global.kawasaki.com](http://global.kawasaki.com)



To create a healthy environment  
and life for future generations  
through our innovative thinking.

A blurred image of a parasol, likely a golf umbrella, is positioned behind the main headline. The parasol's handle and shaft are visible, and its canopy is spread out, creating a sense of motion or a soft focus effect against the blue background.

# *Keep the Earth Sky-blue*

In our home country, people are living a safe and peaceful life.  
However, problems such as climatic aberration and aging infrastructure are  
emerging. If we look around the world, we are facing a series of issues  
that threaten our daily lives, such as global warming,  
exhaustion of natural resources, deletion of water resources,  
and forest destruction, among others.

Here is the role we wish to play.  
We will work hand-in-hand with our customers and exchange in-depth  
discussions to provide the best solution. With our technology  
and innovative thinking, we will remove people's  
concerns and anxieties about the future.  
We are committed to securing not only our "present" life,  
but also our "future" life, and to contributing to our society and  
community with our manufacturing (monozukuri)  
capabilities and environmental technology.

We, Kobelco Eco-Solutions, strive to create a sustainable,  
healthy environment and life for future generations,  
and to secure a society that lives in harmony with the earth.

**KOBELCO ECO-SOLUTIONS CO., LTD.**





## Limited Resources For Children



KUNINAKA  
ENVIRONMENTAL  
GROUP





## Primary Services: Planning, Development, Consulting, Designing, Construction, Installation, Sales, Operation & Maintenance

Main Products: Air Pollution Control Equipment, Municipal Solid Waste (MSW) Treatment Systems, Heat Recovery Equipment, Sludge Treatment System, Waste Recycling Equipment, Vacuum-Sealed MSW Conveyance and Transship Systems, MSW TransshipSystem (to reduce the volume of the garbage brought from resident, whose final destination will be landfill), Crushers, Dryers, Electrochlorination Systems, Biomass Gasification & Carbonization Plants and other Relative Environmental Equipment

MOVE THE WORLD FORWARD  **MITSUBISHI  
HEAVY  
INDUSTRIES  
GROUP**



4-2, Minatomirai 4-chome, Nishi-ku, Yokohama, 220-0012, Japan Tel: +81-45-227-1280 Fax: +81-45-227-1293  
[www.mhiec.co.jp/](http://www.mhiec.co.jp/)

**TAKUMA**

## Power of Waste

Waste is no longer garbage.



TAKUMA Co., Ltd.  
[www.takuma.co.jp](http://www.takuma.co.jp)

Head Office / 2-2-33 Kinrakuji-cho, Amagasaki, Hyogo 660-0806, Japan  
TEL +81-6-6483-2631 • FAX +81-6-6483-2637  
Email: [efwinternational@takuma.co.jp](mailto:efwinternational@takuma.co.jp)

# KONOIKE



2021  
150

**Working with society to create  
a 'thriving planet Earth' and 'bright future'**





**For Earth, For Life**  
**Kubota**

**Business Field** (Plant, Instruments, O&M, etc. ) :

• **Waste Treatment**

Waste Incinerator, Shredder

• **Water Treatment**

Water Purification, Sewage, Night Soil, Leachate

**KUBOTA ENVIRONMENTAL SERVICE CO., LTD.**

**Head Office** 2-1-3, Kyobashi, Chuo-ku, Tokyo, 104-8307 Japan TEL:+81-3-6281-9910 FAX:+81-3-3272-5250

— **URL : <http://www.kubota-ksk.co.jp/>** —



# ShinMaywa



[www.shinmaywa.co.jp/english/](http://www.shinmaywa.co.jp/english/)

For a better tomorrow.

ShinMaywa makes the world  
a more comfortable and convenient place.



Environmental Systems Department,  
Industrial Machinery Systems Division

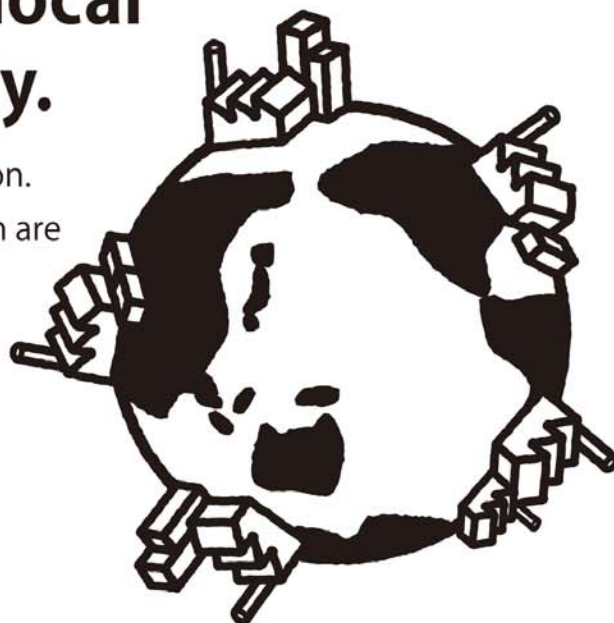
**ShinMaywa Industries, Ltd.**

5-16-5 Higashiueno, Taito-ku, Tokyo 110-8620, Japan  
Phone : +81-3-3842-6332

**Forward thinking and full commitment for sustainable environment and resources.**

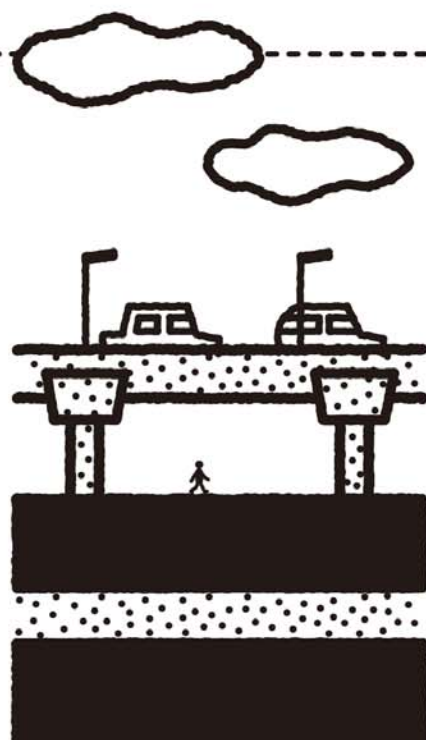
## **Local production for local consumption, globally.**

Cement is essential to infrastructure construction. Our cement plants located along the Pacific Rim are helping growth and development of each region and country.



**TAIHEIYO CEMENT**

[www.taiheiyo-cement.co.jp/english](http://www.taiheiyo-cement.co.jp/english)



## **Over your head, under your feet.**

We have, for instance, highway networks extending above surface roads, or sewage systems that stretch under the ground.

Cement is always there to support the life of people and society with firm foundation.



**TAIHEIYO CEMENT**

[www.taiheiyo-cement.co.jp/english](http://www.taiheiyo-cement.co.jp/english)





## Innovative solutions for the society

- Global Engineering Consultants in Japan -



### Our Comprehensive Experiences

#### Collection

- Transportation  
(including Transfer Station)
- Public campaign
- 3R  
(reduce, reuse, recycle)

#### Intermediate Treatment

- Recycling plant  
(composting)
- Incinerator

#### Final Disposal

- Sanitary landfill
- Safety closure

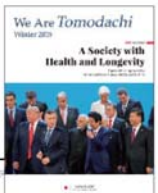
We provide cutting-edge advisory and consulting services for master plan studies, feasibility studies (including financial schemes), in design, construction supervision, and O&M phases.



*Clean Dhaka Project is featured in the Japan Gov, the Official Website of the Government of Japan <https://www.japan.go.jp/>*



JAPANGOV  
THE GOVERNMENT OF JAPAN



## Yachiyo Engineering Co., Ltd.

International Division: CS Tower, 5-20-8, Asakusabashi, Taito-ku, Tokyo, 111-8648, Japan

Phone: +81-3-5822-2740 / FAX: +81-3-5822-2791 / E-mail: [intl@yachiyo-eng.co.jp](mailto:intl@yachiyo-eng.co.jp) URL: <https://www.yachiyo-eng.co.jp/>