

Developing a Scientific Basis Towards the Steady Implementation of the 3Rs in Asia

Akiko KIDA

National Institute for Environmental
Studies(NIES)

The Japan Society of Material Cycles
and Waste Management (JSMCWM)

Four Priority Programs in NIES

■ Overview of the Second Five-Year Plan (2006-2010)

Focusing our Resources on Four Priority Programs

We have identified four areas of research on which to focus our combined resources.

Climate Change

We will use the institute's collective strength to perform research on climate change and its impact through monitoring and modeling, and create targets and scenarios that will lead us toward becoming society that ceases to induce climate change.

Sustainable Material Cycles

Our research focuses on materials and substances in order to envision a sound material cycle society. We outline the social mechanisms and technology systems that are necessary to achieve such a society based on appropriate waste management and material cycles.

Environmental Risk

We perform comprehensive research on how to assess environmental risks, such as the effects of chemical substances, invasive species, and nanoparticles on human health and ecosystems.

Asian Environment

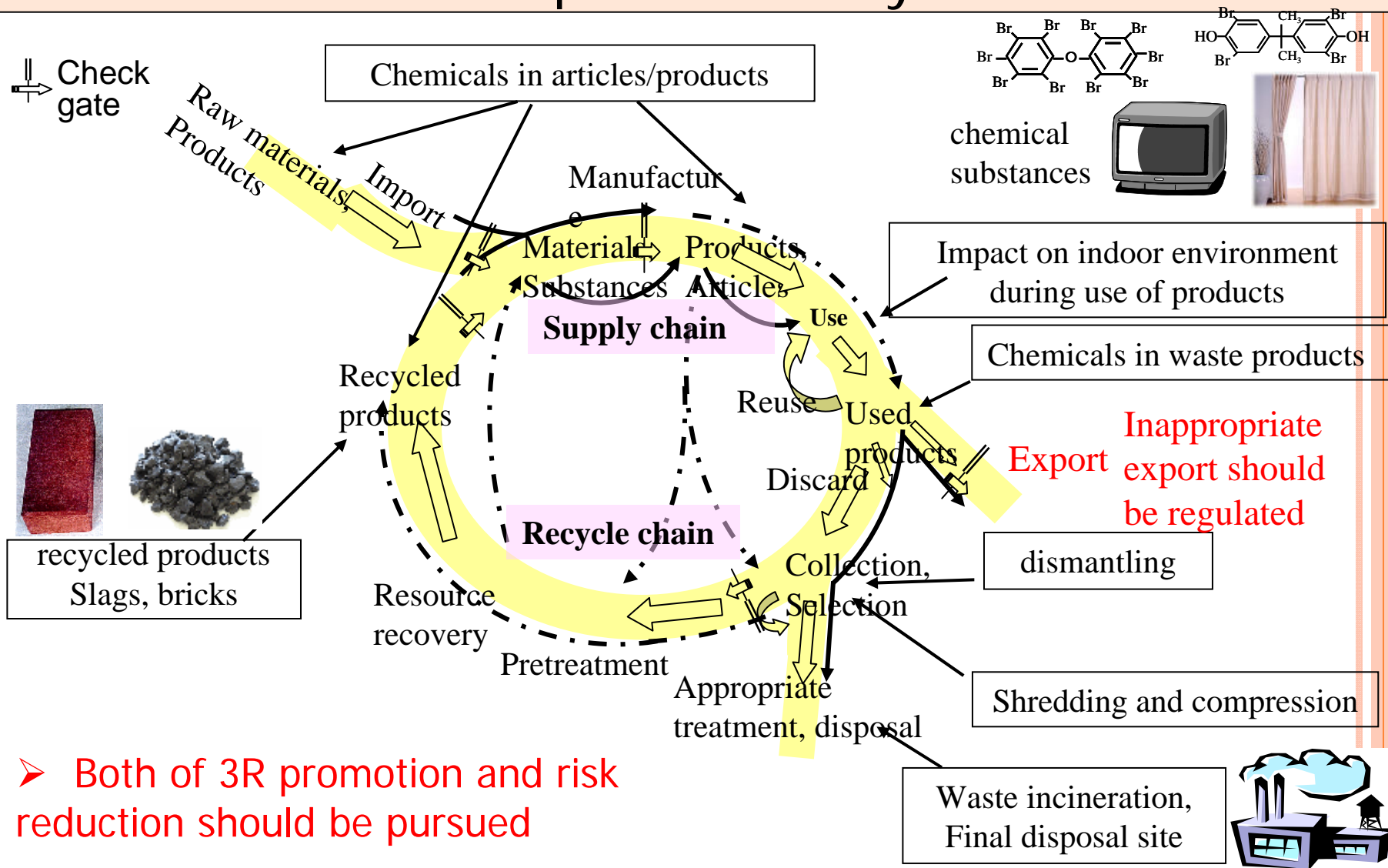
In the Asian region, with developing countries experiencing rapid economic growth, we must make a concerted effort to discover paths to sustainable development. We will establish environmental management technologies and strategies for creating a society in which it is possible to live in harmony with nature by examining the problem from various vantage points, including the atmosphere, water, material cycles, and ecosystems. The expected outcome of our research is a scientific basis for providing effective policy recommendations.

Four Project in Sustainable Material Cycles

1. Designing and evaluating material cycles systems and policy/management techniques for the near future
2. Management hazardous and valuable substances in lifecycles of materials and products
3. Developing win-win resource recycling technology for waste biomass
4. Establishing appropriate management networks and technological systems to support international material cycles

- Promotion of Domestic 3R system and appropriate International material cycles
- Risk reduction derived from material cycling system

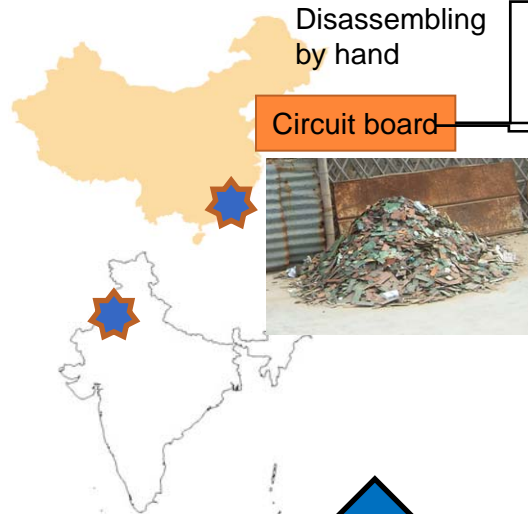
Surveys of hazardous chemicals at each stage of article/product life-cycle



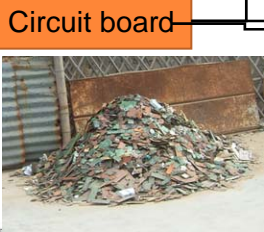
- Both of 3R promotion and risk reduction should be pursued
- For risk control checking system is effective at each stage

Evaluation of Environmental Impact of E-waste Recycling

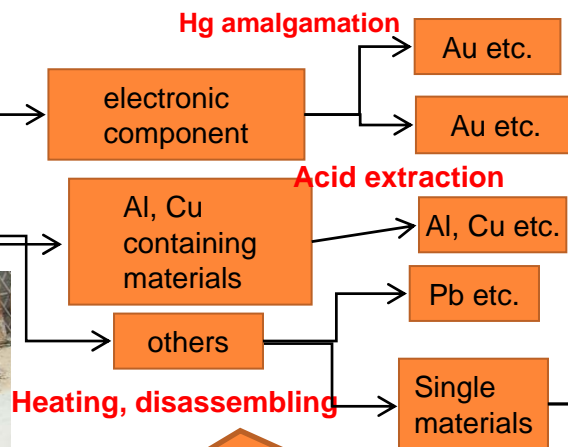
Exported case



Disassembling by hand



Circuit board



Heating, disassembling



Water pollution

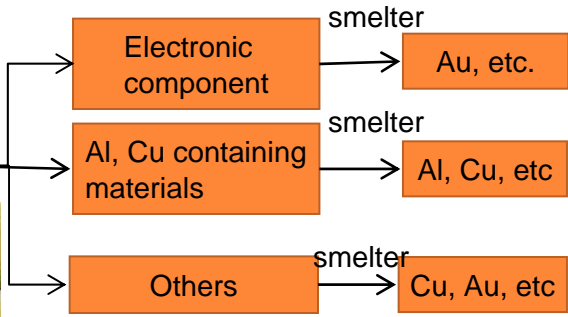
Open dumping of residues



Domestic recycling in Japan



Circuit board



Simulation test for Environmental Impact (Air and water system)



Simulated open burning test to obtain Emission factors of hazardous substances)



Leaching test to obtain for water system pollution

Checking system of hazardous substances in products/waste/recycled materials in Japan

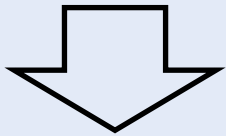
1. Products: J-moss system (content test for Hg, Cd, Pb, Cr⁶⁺, PBB, PBDE) similar to RoHS
2. Waste: hazardous waste definition (leaching test for 15 elements, 11 VOCs, PCBs, 4 pesticides; content test for Dioxins, PCBs, · · ·); Emission gas and effluent from treatment facilities are also regulated.
3. Recycled materials : safety level is desired

Standard for waste and soil

10 times less strict
to ES

Same as environmental standard
(ES) for water system

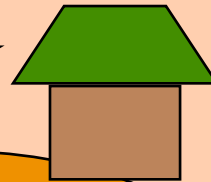
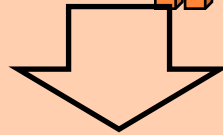
Waste



Landfill

Criteria for disposal
of waste

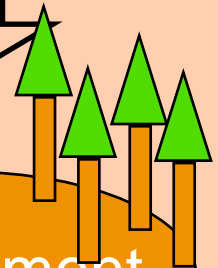
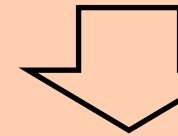
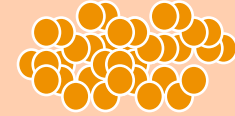
Secondary product
derived from waste



Environment

Standard for
utilization

Contaminated
Soil



Environment

Environmental
standard

Criteria of hazardous waste for landfilling by Leaching test

	Japan	Germany	France	Swiss	Netherland	USA,Canada
Unit	mg/L	mg/kg	mg/kg	mg/L	mg/kg	mg/L
R-Hg	ND(0.005)					
T-Hg	0.005	0.1	10	0.01	0.08	0.2
Cd	0.3	5	50	0.1	0.1	1
Pb	0.3	20	100	1	25	5
Cr ⁶⁺	1.5	5	10	0.1		
As	0.3	10	10	1	8	5
Se	0.3				1.5	
CN	1	10	10	0.1	1.5	
Ba					110	100
Sn						5
Sb					0.6	1
Cu		100		0.5	10	
Zn		100	500	10	40	
Ni		20	100	2	10	
Co				0.5	30	
Cl		100000			12000	
SO4		50000			18000	
F		500		10	140	
Ag					4	
Cr ³⁺			100	2		
pH		4~13	4~13	6~12	3~13	

Different Leaching test

	Japan	Germany	France	Swiss	Netherland	USA,Canada
Name	JLT	DIN 38414	AFNOR X31-210	TVA	NEN7343	TCLP
Concept: Evaluate release from waste	contacting with rain					contacting with acetic acid generated from garbage degradation
Type	Single batch or serial batch			Tank leaching	Column	Single batch
Sample size	0.5~5mm	<10mm	< 4mm		< 3mm	< 9.5mm
Sample weight (g)	> 50	100	100~200	100~200		100
Leachant	DW (pH: 5.8~6.3)	DW	DW	DW satulated with CO2	DW	CH3COONa(pH4.93), or CH3COOH(pH2.88)
Liquid/solid ratio	10	10	10	10	10	20
Contact time(hr)	6	24	16	24	500	18

Standard for Recycled Materials by leaching test

	Japan	Germany	France	Swiss	Netherland
	mg/l	mg/l	mg/kg	mg/l	mg·m ⁻² /100 year
T-Hg	0.0005	0.001	0.2	0.005	4.5
Cd	0.01	0.005	1	0.01	12
Pb	0.01	0.05	10	0.1	1275
Cr ⁶⁺	0.05	0.05	1.5	0.01	1500
As	0.01		2	0.01	435
Se	0.01				15
CN		0.02		0.01	15 (遊離CN)
Ba				0.5	6300
Sn				0.2	300
Sb					39
Cu		0.3		0.2	540
Zn		0.3		1	2100
Ni		0.04		0.2	525
Co				0.05	300
pH		7~13		6~12	

Hazardousness testing method applied in Asian Countries

TCLP test method (USA)

Malaysia, India, Thailand, Philippines, Indonesia,
Vietnam, . .

Japanese or EU countries method

South Korea

Situation: Importing and Exporting countries have
different evaluation method and criteria for
hazardousness of waste and secondary products .

→ Problems : a waste is defined as hazardous,
but the same waste is defined as not hazardous

Hazardousness testing method applied in Asian Countries

TCLP test method (USA)

Malaysia, India, Thailand, Philippines, Indonesia, Vietnam, . .

Japanese or EU countries method

South Korea

Situation: Importing and Exporting countries have different evaluation method and criteria for hazardousness of waste and secondary products .

→ Problems : a waste is defined as hazardous, or not hazardous in different countries

Coping with international movement of waste, we need to negotiate hazardousness evaluation

Activities of Japan Society for Material Cycles and Waste Management

Japan Society of Waste Management Experts was established in 1990. The Society re-established as "Japan Society for Materials and Waste Management" to express 3R policy clearly



- ☆ International session in Annual Conference
- ☆ **Journal of Material cycles and Waste Management**
- ☆ Newsletter (http://jsmcwm.or.jp/international/english_newsletter.html)
- ☆ International Committee (Secretariat of SWAPI)
- ☆ Standardization of testing method (authorized in the society)

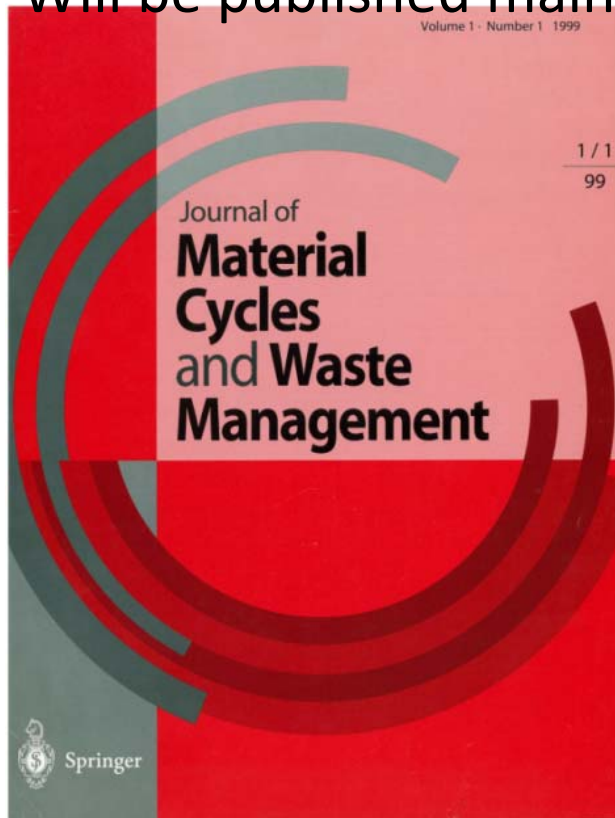
Current Members

Regular Members	:	2,946
Students	:	275
Non-Japanese Member	:	86
Public Institutions	:	99
Supporting Members	:	134
Individuals of NPOs	:	7
Total	:	3,547

Journal of Material Cycles and Waste Management

<http://jsmcwm.or.jp/international/index.html>

- Biannual Publication since 1999
- Quarterly publication start from 2001
- Joint publication with Korea Society of Waste Management start
- Contained in “Web of Science” → Impact factor will be given 2-3 years later
- Will be published mainly in electronic version



143 articles
published

Submitted from

- India
- Malaysia
- China
- S Korea
- Thailand
- Iran
- Kuwait
- USA
- Sweden
- Germany

14

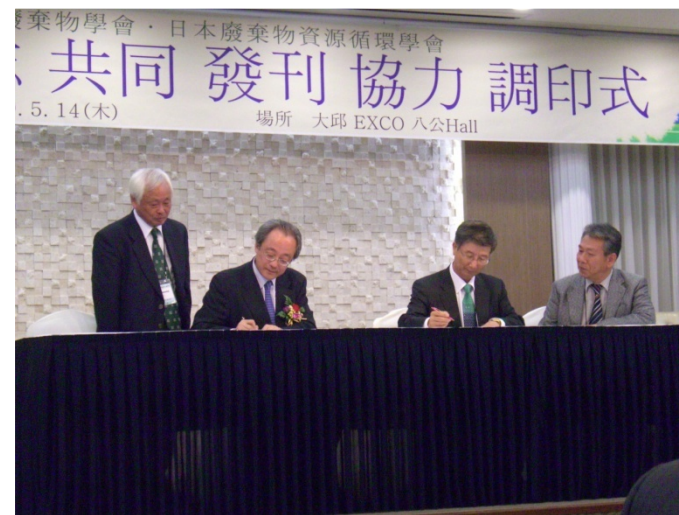
Journal of Material Cycles and Waste Management

“The aim of the Journal of Material Cycles and Waste Management is to develop solutions and prescriptions for material cycles. The focus of the journal is twofold: research in technical, political, and environmental problems of material cycles and waste management; and information that contributes to the development of an interdisciplinary science of material cycles and waste management.”

Recent special issue

- Korean special issue (2009.7)
- Asia & Pacific Waste Management
- 4th i-CIPEC(Combustion, Incineration/Pyrolysis and Emission Control)
- APLAS (Landfill Research)
- Chemical Feedstock Recycling

Toward International Journal in Asia



Signing ceremony of Agreement on Joint publication with Korea Society of Waste Management

Thank you for your attention !

Welcome to Join the Japan Society of Material
Cycles and Waste Management
Welcome to submit articles of fruitful research
results on the 3R and waste management to
the Journal

