

Recycling Hazardous Waste in the Era of Deepening Economic Integration in Asia

Michikazu KOJIMA
Senior Research Fellow
Institute of Developing Economies
JETRO

Objectives of Presentation

- To review the current transboundary movement of hazardous waste and recycling.
- To consider the background of hazardous waste movement with prior notice and consent.
- To review the issues of hazardous waste management in Asia

Contents

- Background of Hazardous Trade with prior notice and consent
 - Economic Development, Globalization, and deepening economic integration in Asia
 - demand and supply of lead waste and scrap.
 - Technology for recycling hazardous waste
 - International trade of waste Ni-Cd batteries
 - Size of economy and recycling facility
 - Fuji Xerox Asia Pacific recycling program
 - Endowment
- Issues on Hazardous Waste in Asia
 - Dirty Recycling, Case Studies on problematic shipment
 - Solutions to the Issues

Economic Development in Asia

	Average GDP Growth 2000-05	GDP Growth 2006	GDP Growth 2007
Japan	1.4	2.2	2.0
S. Korea	4.6	5.0	5.0
China	9.6	11.1	11.4
Philippine	4.7	5.4	7.2
Viet Nam	7.5	8.2	8.5
Thailand	5.4	5.1	4.8
Malaysia	4.8	5.8	6.3
Indonesia	4.7	5.5	6.3

- After Asian economic crisis, Asian developing countries, especially China, growing fast.
- Not only Singapore and Brunei, but also Malaysia reach same income level as Annex VII countries of the Basel Convention.

Income Level of Selected Countries (PPP in 2005 constant Price)

Non Annex VII Countries in Asia		
	GDP per Capita in 1995	GDP per Capita in 2007
Brunei Darussalam	50309	48357 (2006)
Singapore	31739	47488
Hong Kong	28316	39953
Malaysia	9297	12631
Thailand	5908	7682
China	1553	5046
Indonesia	2816	3519
Philippine	2415	3219
Viet Nam	1214	2454
Cambodia	795	1701

Annex VII Countries		
	GDP per Capita in 1995	GDP per Capita in 2007
Japan	27551	31607
S. Korea	14717	23363
Poland	8853	15401
Mexico	9038	12071
Turkey	7945	11293
Romania	7223	10756
Bulgaria	6930	10665

Poland, Romania and Bulgaria were not member of EU nor Annex VII countries, when BAN Amendment was adopted, in 1995.

Trade Dependency Ratio ((Import + Export)/GDP)

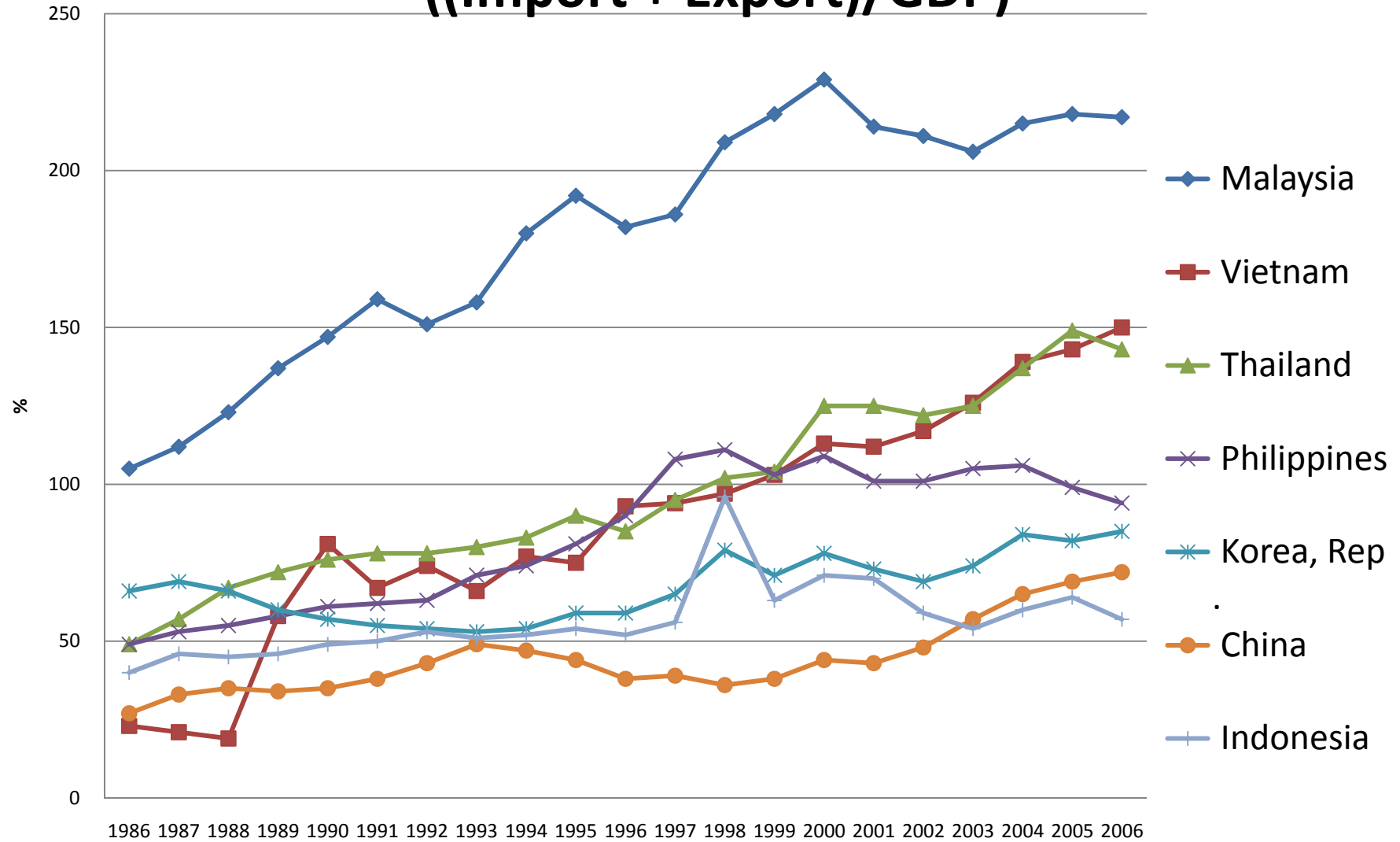
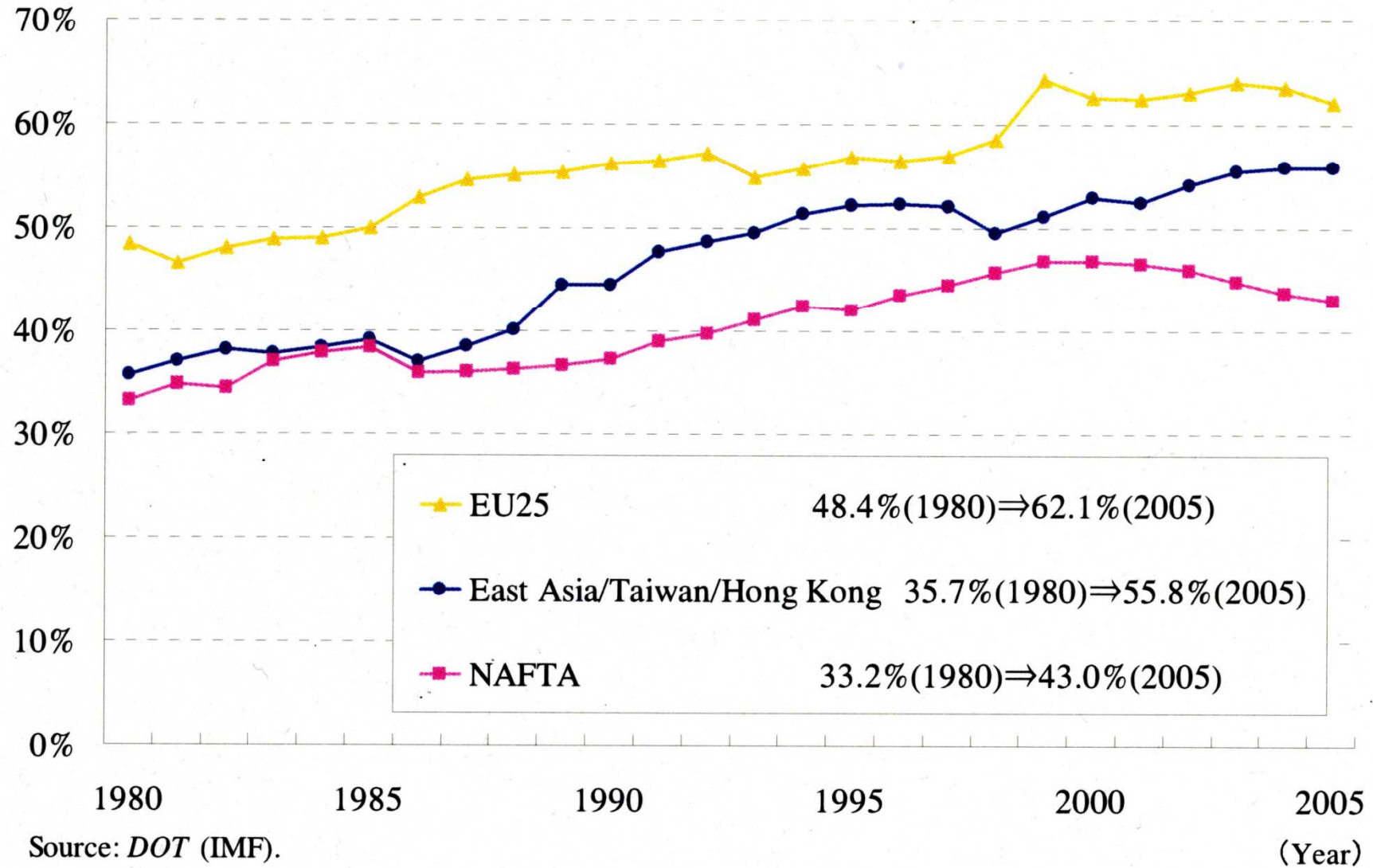


Figure 2-1-13 Ratio of intra-regional trade in East Asia (incl. Taiwan, Hong Kong), EU25 and NAFTA



METI(2007) "White Paper on International Economy and Trade 2007"

Globalization

- Globalization, which is along with specialization of production, creates gap of supply and demand of secondary resources. It is not usual that amount of collected waste equals to the demand of recyclable waste within the country. International trade of recyclable waste is very common to fulfill the gap between supply and demand of secondary resource.

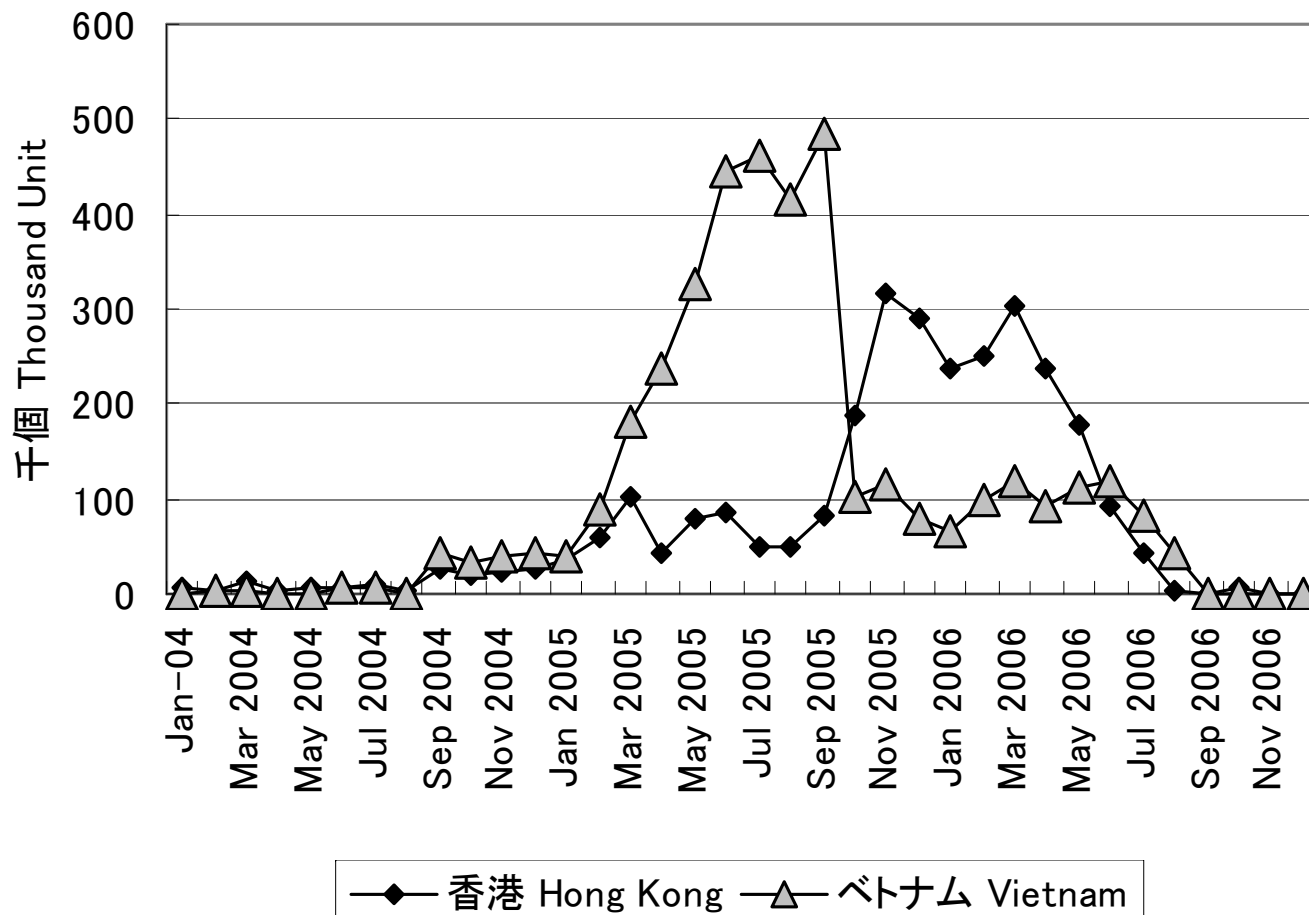
Import of Lead Acid Batteries by Japan

(Thousand unit)

	2005	2006	2007
Import (Total)	5888	6463	5683
(S. Korea)	1874	2500	2947
(China)	2688	2398	1503
Domestic Production in Japan	32663	32930	32906

The most of demand of lead is for production of lead acid batteries. Recovered lead is also used for lead acid batteries, mainly. In Japan it becomes difficult for domestic manufacturers to use all of collected lead waste, because the import of lead acid battery reach nearly 20 % of domestic production.

図1 鉛酸蓄電池の日本からの香港・ベトナム向け輸出品
Export of Lead Acid Battery from Japan to Hongkong and Vietnam



Since Fall of 2004, the export of used lead acid batteries from Japan to Hong Kong and Viet Nam had increased, under the name of secondhand. Since governments strengthened the enforcement, the export was dropped in the Fall of 2006.

Export of Hazardous Waste from Japan through Prior Notice and Consent (ton)

Hazardous Waste	Destination	2005	2006	2007
Solder Scrap	Belgium	851	738	1,041
Lead Scrap (LAB)	S. Korea	4,127	16,191	46,614
Lead ash & dross	S. Korea	1,734	374	1,043
Copper Sludge	US			36
Nickel Sludge	US	54	54	54
Total		6,766	17,357	48,788

After export of “secondhand” lead acid batteries export dropped, export of waste lead acid batteries to South Korea increased, with prior notice and consent.

Export and Import of Lead Acid Batteries by S. Korea

(Thousand unit)

South Korea	2000	2005	2006	2007
Export	14245	17763	18123	20855
Import	1100	2412	2420	4118

On the other hand, South Korea exports more than 20 million unit of lead acid batteries. So they are lack of domestic supply of lead scrap.

Waste Lead Acid Batteries, Lead Scrap, Lead Dross, Lead Ash, Solder dross and ball

Import Export	S. Korea	Philippine	Singapore	Belgium
Japan	5757 (64000)			954
Taiwan	(600)			
Philippine	1000 (3000)		120	
Thailand		(870)	(120)	
Singapore	100 (7000)	6913(10000)		
Sri Lanka	(18500)			
others	(60500)	(18720)		

Note: Without () : Report from exporting countries

With (): Report from importing countries

It is not clear the reason of differences between statistics of importing and exporting countries. One of the possibilities is the gap between the actual volume of trade and the permitted maximum volume.

Technology for Recycling HW

- There are many kinds of hazardous wastes. For disposing hazardous waste, a few facilities for neutralization, solidification, incineration and landfill can handle various hazardous wastes. But if you want to recycle hazardous waste, you need many facilities, because specific hazardous waste needs specific facility to recover material.

Waste Ni-Cd, Ni-Mh Batteries

Export	Import	Japan	South Korea	France
China		254 (1191)	34 (100)	
Hong Kong		(241)		
Taiwan			(300)	
Indonesia		150 (91)		
Malaysia				196

Note: Without () : Report from exporting countries
With (): Report from importing countries

=> Loss and residues from the Factory of Ni-Cd Battery, which was waiting for export from China to Japan under prior notice and consent. Dec. 2004.



Trade of Product of Ni-Cd Batteries

Unit: number

	2000		2007	
	Export	Import	Export	Import
China	457,603	387,683	739,034	615,865
Indonesia	76,525	9	60,748	30
S. Korea	870	24,914	242	11,734

In China and Indonesia, there are factories manufacturing Ni-Cd batteries. Waste Ni-Cd batteries exported from China and Indonesia to Japan might be generated in the factories. Even in Japan, the number of recycling facility for waste Ni-Cd batteries is limited.

Size of Economy and Recycling Facility

- Scale economy can be observed in many production process, including recycling process. If size of a national economy is small, a recycling plant can not collect enough waste to operate a plant. In such case, there are two options for recycling:
 - Recycling plant operate in the country, with import of recyclable waste.
 - Recycling plant does not operate in the country, and recyclable waste are exported.

Collection Program of Batteries and Export

- In some collection programs by government and private sectors, they need to send collected waste other countries, because the treatment facility does not exist.
 - Thailand: collected battery of mobile phone are sent to Europe
 - Hong Kong: collected rechargeable battery were sent to South Korea.
- Fuji Xerox conduct voluntary collection program in Asia and Pacific countries.

Copy Machine collected by Fuji Xerox in Asia and Pacific

Australia, Indonesia, Malaysia, Philippines, New Zealand, Singapore, South Korea, Hong Kong and Thailand

Fuji Xerox is collecting discarded copy machine and toner cartridge from their customer

Thailand

Fuji Xerox established factory dismantling copy machine for recycling and toner cartridge for reuse of parts and recycling.

Most of parts are recycled in Thailand, but some of them are sent to Japan



Japan

Material recycling and proper disposal.

Fluorescent Lamp, LCD back light, Ni-Cd battery, Selenium Drum

Thailand

Most of the materials such as metals, glass and printed circuit board are recycled in Thailand

Copy Machine collected by Fuji Xerox in Asia and Pacific

Recovered Material	Previous in Thailand (est.)	Japan	AP Integrated System
Steel	66.4%	72.5%	62.2%
Aluminum	1.2%	1.2%	3.3%
Copper	1.4%	2.3%	1.0%
Other Metals	0.0%	0.4%	0.0%
Plastics	4.5%	3.2%	16.9%
Glass	0.5%	1.3%	0.6%
Material Recover Rate	74.0%	80.9%	84.0%
Slug	0.3%	2.2%	0.4%
Thermal	0.7%	11.1%	15.0%
Chemical		5.8%	
Recycling Rate	75.0%	100%	99.4%
Landfill/Incineration	25.0%	0%	0.6%

Endowment

- Some resource endowments have impact on the location of industries.
 - Singapore: No pulp and paper industries are located in Singapore, because water is scarce.
 - Japanese non-ferrous smelters and refineries lost their competitiveness, because cost of the mining in Japan became expensive after yen appreciation in early 1970s. They have invested in recycling technology to recover non-ferrous metals from waste.

Issues on Hazardous Waste Management in Asia

- Lack of final disposal site of hazardous waste in several countries: Cambodia, Vietnam(Temporary storage?),
- Informal or Dirty recycling
 - Informal recycling is an obstacle for formal recycler with environmental pollution control
- Lack of recycling facility
- Illegal transboundary movement of HW
- Conflict on interpretation or definition of HW between importing and exporting countries.

Dirty Recycling

- As far as I know it has not been reported that hazardous waste traded with prior consent and notice were recycled with improper technology, since end of 1990s. Smuggled hazardous waste and domestically generated waste are recycled by informal recycler.

Burning coated wire to recover copper, in Indonesia. Because volume of coated wire were small, the waste is probably domestically generated. December 2008.

Lead Recycling in Viet Nam, contaminating soil. Probably domestically generated waste LAB were recycled. December 2005.



Case Studies on Problematic Shipment (1)

- Thirteen cases of problematic shipment of hazardous and/or non-hazardous waste are examined.
 - Most of cases are related to Asian countries
- Cases were examined from following view points.
 - Are importing and exporting countries parties of the Basel Convention?
 - Is the material hazardous waste in the Basel convention or not?
 - Where is the shipment stopped?
 - Health impact and Environmental impact
- Example of Cases (1)
 - Case 1: Mercury contained hazardous waste exported from Taiwan to Cambodia, which is exported under the name of cement cake. Both were not parties of the Basel Convention.
 - Case 2: Hazardous liquid waste disposed from ships in Ivory Coast in 2006. More than ten person died. It may be not controlled by the Basel, because the waste may be generated on the ship.

Case Studies on Problematic Shipment (2)

- Example of Cases (2)
 - Case 3 : Use automobile parts exported from Japan was regarded as hazardous waste by French government. France was transit point for importing country in Africa.
 - Case 4 : Mixed waste of waste plastics and papers exported from UK to China, which was uncovered in January 2007.
- Observations
 - In all shipments of case studies, exporters did not make notification to the governments.
 - Non-hazardous wastes or goods in exporting country are regarded as hazardous waste by importing country. Clarification of the definition is needed to be improved.
 - One of the key measures is Article 3 notification in the Basel Convention.

Classification of Problematic Shipment

- Based on the case studies and the discussion of this workshop, we should understand the types among “illegal shipments” or problematic shipments.

	Characteristics	Remarks and potential measure
Type I	Hazardous waste going to dirty recycling through prior notice and consent	Not reported in this workshop. BAN amendment is an effective measure.
Type II	Hazardous waste trade without prior notice and consent	Joint enforcement and cooperation of authorities are important .
Type III	Conflict between two parties on the interpretation and definition of hazardous waste	Communication between parties, and harmonizing definition (if possible) are important. Notification based on Article 3 of the Basel Convention.

The differences of hazardous waste under control

Importing country	Regard as HW under the Basel		Regard as non-hazardous waste
Exporting Country	No notification	Notified as HW under Article 3 or 4.	No Notification
Regard as HW	No differences	No conflict	Potential Conflict
Regard as non-HW	Potential Conflict	Potential conflict, if the notification is not clear.	No differences

Solutions to the Issues

	Domestic Measures	Trade Measures
Lack of Final Disposal Site	Investment in Final Disposal Site	
Informal and Dirty Recycling	Stricter enforcement of environmental regulation, support for investment in pollution control , and controlling distribution channel of HW	Stricter enforcement of controlling trade to dirty recycler. If HW were supplied from developed countries under prior notice and consent, BAN amendment would be an effective measure.
Lack of Recycling Facility	Support for establishment of recycling facility	Export of HW, or allowing import for initial operation
Illegal transboundary movement	Stricter enforcement of regulation to recycler in importing country , and establishing alternative recycling system in exporting countries	Stricter enforcement of trade regulation.
Conflict on interpretation and definition		Mutual understanding among countries,

References

- GDP per capita data : World Bank, World Development Indicators Online, <http://www.worldbank.org/>
- Hazardous Waste Trade Data in 2005: compiled from data set obtained from the secretariat, as of May 29, 2008.
- UN Project Link “Link Global Economic Outlook, October 2008”
- Kojima, Michikazu, Aya Yoshida and others (2007) “International Trade of Hazardous Waste : Review of Seized Cases” (in Japanese)

APPENDIX

Status on Ban Amedment

	GDP Per Capita (PPP, 2007 current price)	Annex VII countries	Import Prohibition	BAN Amendment
Singapore	50304			
Hong Kong (China)	42322		Ban on HW from Annex VII	
Japan	33525	OECD		
South Korea	24712	OECD		
Malaysia	13380			Ratified in 2001
Thailand	8138			
China	5345		Total Ban	Ratified in 2001
Philippines	3410			
Indonesia	3728		Total Ban	Ratified in 2005
Viet Nam	2600		Total Ban	
Cambodia	1802			

World Bank, Worldwide Governance Indicators (%)

Non Annex VII Countries in Asia		
	Government Effectiveness in 2007	Control of Corruption in 2007
Brunei Darussalam	78	64
Singapore	100	96
Hong Kong	94	92
Malaysia	83	62
Thailand	62	44
China	61	31
Indonesia	42	27
Philippine	56	22
Viet Nam	41	28
Cambodia	21	8

Annex VII Countries		
	Government Effectiveness in 2007	Control of Corruption in 2007
Japan	89	85
S. Korea	86	68
Poland	67	61
Mexico	60	49
Turkey	64	59
Romania	53	56
Bulgaria	59	53

Source:
<http://info.worldbank.org/governance/wgi/index.asp>

Hazardous Waste Import by EU Countries (2005, ton)

Import Export	Belgium	Germany	France	Italy	Netherland
Austria	1053	281807	18511	73292	
Belgium		207995	201397	70018	137743
Switzerland	5232	140923	300315	288105	26303
Germany	236396		111359	383315	102940
France	186173	114818	29210	215569	42410
G Britain	5306	56595	14340	123	5136
Ireland	10778	214419	810	30	3463
Italy	2923	646707	17115		248
Luxembourg	14493	84114	192995		1245
Netherland	320637	621532	33296	300005	
Total	805643	2569800	928649	1334860	331133

Trade of Hazardous Waste Import by Asian Countries (2005, ton)

Import Export	Japan	South Korea	Philippine	Malaysia	Singapore
Japan		64000		*241872	
S. Korea					
China	1191	100			
Hong Kong	242				
Taiwan		900			
Philippine	1248	4450			
Thailand	460	480	870		135
Malaysia	1683				26
Singapore	477	7000	10000	64774	
Indonesia	91				
Others	23	91500	18720		

Note: *: Blast Furnace Slag, which is not regarded as Hazardous Waste in Japan, and which is excluded from Hazardous Waste in Malaysia since 2006.