Experience Gained through the Mutual GHG Inventory Review between Korea and Japan

Environmental Management Corporation
Department of Climate Environment
Byong-bok JIN

환경관리공단
Environmental Management Corporation

1. Korea and Japan GHG Inventory Management Workshop

Introduction

- Korea and Japan GHG Inventory Management Workshop
- Date: 2008. 10. 22 (Wed) 10:00~17:00
- Host: Environmental Management Corporation (KOR), CGER/NIES (JPN)
- Participants : **Corporate, local governments**, total of **120** people
- Main Theme

- The introduction of ' Korea and Japan' s Climate Policy announced in ' 08
- **The GHG emissions and management system of Korea and Japan**
- **Sector specific GHG emissions and calculating methods**
- The impacts of Climate Change in Korea and GHG monitoring between Korea and Japan

Time	Contents	Speaker
10:00~10:20	Registration	
10:20~10:40	Introductory session	Dr. Jaeyoon Ko Director, EMC
	- Opening address (Dr. Yongwoon Yang President, EMC)	
	- Welcoming remarks (Dr. Yukihiro NOJIRI Vice Director, CGER/NIES)	
	- Congratulatory speech (Mr. Jong-Soo Yoon Director-General, MOE, Korea)	
Session 1 : Korea & Japan's policy on climate change (Chairperson : Dr. Jong-geel Je, Research institute for City and Nature)		
10:40~11:00	Korean Government's countermeasure on climate change	Mr.Kuyeon Park Prime Minister's office
11:00~11:20	Japan's Climate Policy	Mr.Yuta Okazaki MOE, Japan
11:20~11:40	Japan's Institutional arrangement for National GHGs Inventory	Mr.Sei Kato, MOE, Japan
11:40~12:00	Korea's comprehensive management of GHGs emission factors	Mr. Chunkyoo Park MOE, Korea
Lunch(12:00~13:30)		
Session 2 : Status and estimation of GHGs emissions (Chairperson : Mr.Kiyoto Tanabe, CGER/NIES)		
13:30~14:00	GHGs emissions and estimation methods in Japan	Dr.Baasansuren Jamsranjav, CGER/NIES
14:00~14:20	GHGs emissions and estimation methods in Korea	Mr.Byong-bok Jin, EMC
14:20~14:35	GHGs emissions and estimation method(LULUCF)	Dr.Youngmo Son, KFRI
14:35~14:50	GHGs emissions and estimation method(Waste)	Mr. Cheon-Hee Bang,, EMC
Coffee Break(14:50~15:10)		
Session 3 : Management of GHGs in the atmosphere (Chairperson : Dr.Younseo Koo, Anyang Univ.)		
15:10~15:30	Understanding and Predicting regional climate change over Korea	Dr. Heejeong Baek, KMA
15:30~15:50	MonitoringGHGs in the atmosphere - Japan	Dr.Yukihiro Nojiri, CGER/NIES
15:50~16:10	Monitoring GHGs in the atmosphere - Korea	Mr.Jeongsik Kim, KMA
16:10~16:30	Effective management schemes for Greenhouse gas emissions	Dr.Seungdo Kim Hallym Univ.
16:30~17:00	Wrap-up and Closing	

환경관리공단
ENVIRONMENTAL MANAGEMENT CORPORATION

Agreement Achieved

- ❖ Understanding Korea and Japan's climate policies announced in 2008
- ❖ Established collaborative relationships between Korea and Japan on sector specific GHG inventories
- ❖ Diffusion of awareness and concern on the importance of inventory management and reliability improvement
- ❖ Confirmation of cooperation for the 7th Workshop on GHG inventories in Asia

2. The Peer Review on GHG Inventory of Waste Sector between Korea and Japan

The Peer Review on GHG Inventory of Waste Sector between Korea and Japan

- **Date**: 2008. 10. 23 (Thu) 10:00~13:00
- **Venue**: Environmental Management Corporation, Seoul office
- **Participants**: total of 14 people including experts on GHG Inventory from Japan, person in charge of Waste sector GHG Inventory from Korea
- **Objective**: Strengthening the cooperation and network between both countries in GHG inventory and guarantee reliability by mutual verification
- **Reviewed sector**: Waste Sector (landfill, incineration, waste water, biological treatment of solid waste)

환경관리공단
Environmental Management Corporation

▪ Korea (7) :

Mr. Byongbok JIN
Ms. Eunhwa Choi.
Mr. Wonseok Baek
Mr. Chunhee Bang
Ms. Sunghee Eun
Mr. Youngsung Kwon
Mr. Seungjin Hyun

▪ Japan (7) :

Mr. Sei Kato(MoEJ)
Dr.Baasansuren JAMSRANJAV(NIES)
Mr. Kiyoto Tanabe(NIES)
Mr. Takashi MORIMOTO (MURC)
Mr. Atsushi SATO (MURC)
Mr. Takeshi ENOKI(MURC)
Mr. Hiroyuki UEDA (Suuri-Keikaku Co.Ltd.

Review Process

Development of GHG Inventory Report (English)

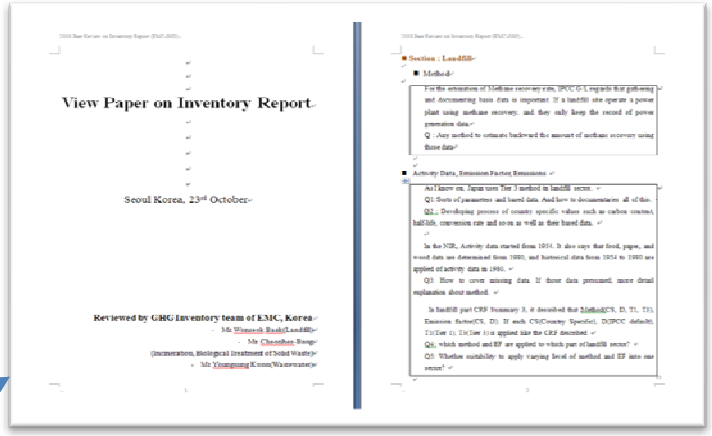
Exchange and **preview** of GHG Inventory Reports

Exchange pre-questionnaire sheet

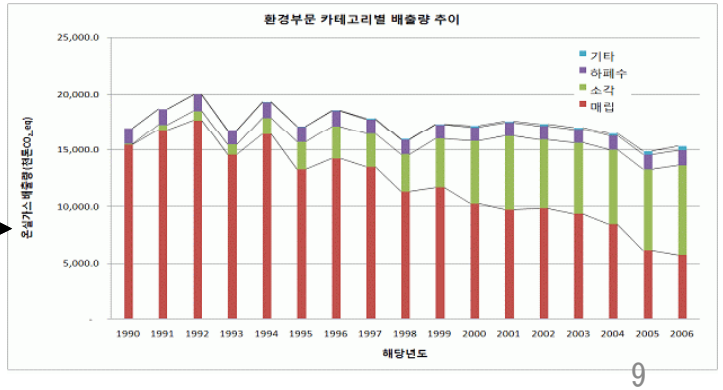
Cross-review meeting

Check the **feasibility of appliance** on GHG Inventory/Share additional info.

Apply on GHG Inventory Report and develop improvement plan

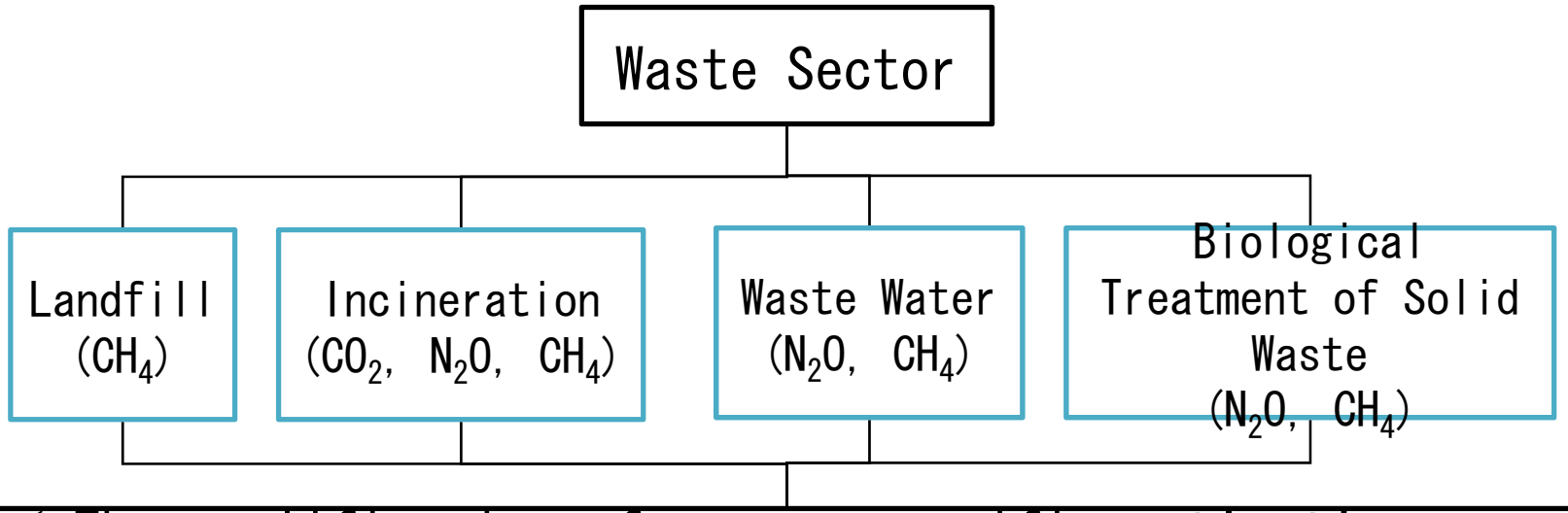


- Answers to Questions
- Comments
- Additional Inquiry



환경관리공단
Environmental Management Corporation

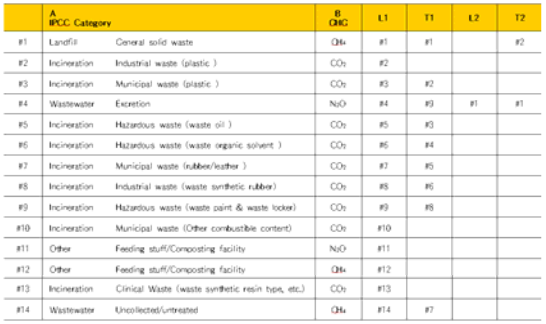
Reviewed Issues



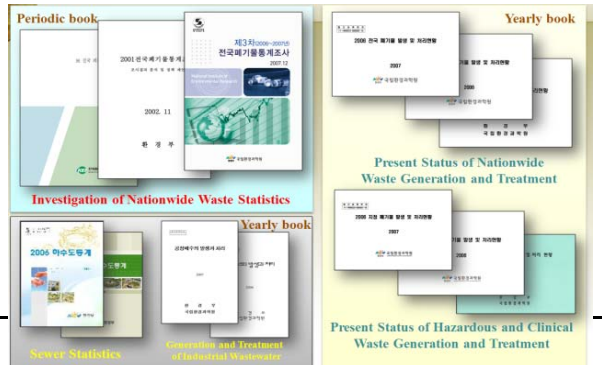
- ✓ The qualification of sector specific **estimation method**
- ✓ The suitableness of sector specific **category classification**
- ✓ The reliability of sector specific **activity data**
- ✓ The applicability of sector specific **emission factor**
- ✓ The reliability of sector specific emissions
- ✓ **Uncertainty Analysis, Category Analysis, QA/QC** etc.

Main Issues in Korea GHG Inventory (reviewed by Japan)

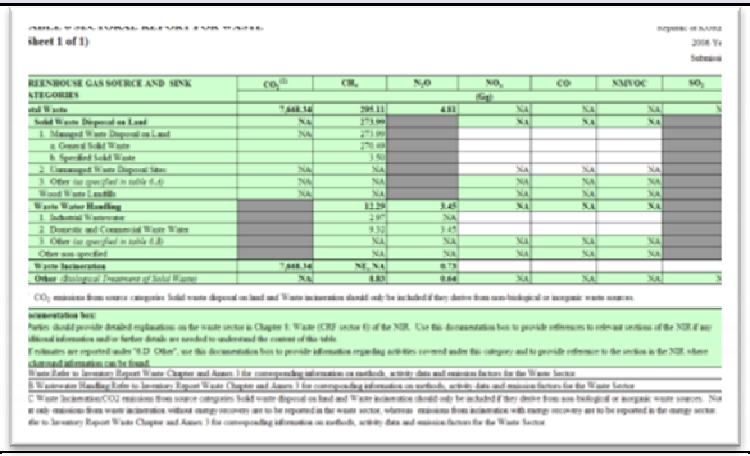
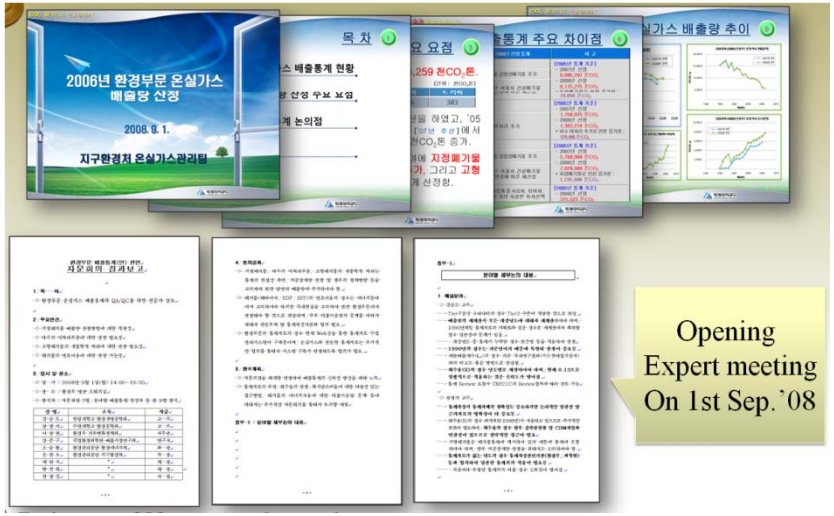
Part	Main Issue	Related Material and Conclusion
All	-Changes in waste policies (decrease of landfill, increase of incineration)	-According to the revised 2nd National Waste Management Plan, in case of municipal waste * incineration rate will raise from 16.0% in 2005 to 23.0% in 2011 * landfill rate will drop from 27.7% in 2005 to 17.0% in 2011
	-Key category of emission sources in waste sector	
	-Collection of activity data in waste sector	



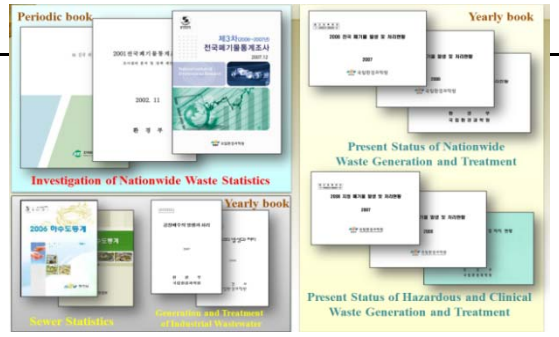
	A IPCC Category		B GHG	L1	T1	L2	T2
#1	Landfill	General solid waste	CH_4	#1	#1		#2
#2	Incineration	Industrial waste (plastic)	CO_2	#2			
#3	Incineration	Municipal waste (plastic)	CO_2	#3	#2		
#4	Wastewater	Excretion	N_2O	#4	#3	#1	#1
#5	Incineration	Hazardous waste (waste oil)	CO_2	#5	#3		
#6	Incineration	Hazardous waste (waste organic solvent)	CO_2	#6	#4		
#7	Incineration	Municipal waste (rubber/leather)	CO_2	#7	#5		
#8	Incineration	Industrial waste (waste synthetic rubber)	CO_2	#8	#6		
#9	Incineration	Hazardous waste (waste paint & waste locker)	CO_2	#9	#8		
#10	Incineration	Municipal waste (Other combustible content)	CO_2	#10			
#11	Other	Feeding stuff/Composting facility	N_2O	#11			
#12	Other	Feeding stuff/Composting facility	CH_4	#12			
#13	Incineration	Clinical Waste (waste synthetic resin type, etc.)	CO_2	#13			
#14	Wastewater	Uncollected/untreated	CH_4	#14	#7		



Main Issues in Korea GHG Inventory (reviewed by Japan)

Part	Main Issue	Related Material and Conclusion
All	- CRF in Waste Sector	
	- Review process and methodology used by the 3rd party experts	

Main Issues in Korea GHG Inventory (reviewed by Japan)

Part	Main Issue	Related Material and Conclusion
Landfill	- FOD method should be applied when landfill is the key category	- The results of key category analysis points out that the application of FOD method is required, while currently in process
	- Explanation on qualification of Korea's landfills than to the landfill defined for management in IPCC	- In 2006, Korea has designed and operated 227 landfills equipped with liner system
	- Explanation of methods used for annual collection of weight ratio data and related information	
	- Possibility of overestimation on methane recovery	- The data reflected in 2007 Inventory are results from investigation of landfill gas from resource recovery facilities

Main Issues in Korea GHG Inventory (reviewed by Japan)

Part	Main Issue	Related Material and Conclusion
Incineration	- Estimation and reporting of "Memo Item"	- Searching for methods using TMS
	- **Reporting of emissions from energy recovery facilities** (always report in energy sector)	- Needs discussion with energy sector authority
	- Reason of increase of non-biogenic waste incineration	- Increase of industrial waste incineration and change of policies (landfill -> incineration)
	- Difficulties of **distinguishing biogenic and non-biogenic** appeared in some cases, and there solutions	- In case there are no options, default value from IPCC is used, while enhancement of accuracy is required

Main Issues in Korea GHG Inventory (reviewed by Japan)

Part	Main Issue	Related Material and Conclusion
Wastewater	- Methane recovery method and usage	- explanation of methane gas produced in anaerobic digester system which are in airtight conditions
	- Request of wastewater emission factor background information	- Ministry of Environment, Korea developed CH4 emission factors in 2000 and 2002 for 11 iindustries - In 2010, additional development required will be conducted

Main Issues in Japan GHG Inventory (reviewed by Korea)

Part	Main Issue	Related Material and Conclusion
All	- Future improvement plans of Japan GHG Inventory	- Until Phase 2 ends(2012), there are 30~40 issues to enhance but difficult to solve
Landfill	- Method used to calculate **recovery from electricity production**	- Use of simple formula is possible (electricity production->calorific value->methane gas) and the data of electricity production and efficiency is suitable for reliable basis
	- Request for information of **process on developing country specific values** and related sources	- Half-life of specific compositions(except sludge) is solely developed and used (related thesis provided) - Country specific value of content of carbon is used from composition analysis conducted in 2004 - MCF value of aerobic landfill is 0.5, anaerobic 1.0
	- Explanation of estimation method used for inventory years consist of unavailable	- Activity data of 1954 to 1979 is applied from 1980 (in this period of time, uncertainty of population and GDP is

Main Issues in Japan GHG Inventory (reviewed by Korea)

Part	Main Issue	Related Material and Conclusion
Incineration	- Possibility of **double-counting** of waste used for **heat recovery and electricity production**	- In Japan, regardless of energy recovery, all reported in waste sector incineration thus no possibility of double-counting
	- Reason of not estimating other (except waste oil) hazardous waste	- Definition of waste oil includes waste organic solvent etc.
	- **Estimation of emissions from pyrolysis and plasma type incineration**	- Amount of pyrolysis and plasma type incineration and furnace are insufficient to apply an emission factor separately
	- Reference used for emission estimation	- In Japan, the authority in charge of waste statistics compile the data suitable for emission statistics

Main Issues in Japan GHG Inventory (reviewed by Korea)

Part	Main Issue	Related Material and Conclusion
Wastewater	- Method of estimating organic removal by sludge	- In Japan, organic removal by sludge is not applied
	- Inclusion of methane recovery in total methane emission	- Methane recovery is estimated for reference but not included in total methane emission
	- Development of sector specific industrial waste emission factors	- In Japan, the development of sector specific emission factors for industrial wastewater is not active

Reflect of Results

1 Recalculation of Methane Recovery (R)

Before

- Recovery rate(R=13%) developed regarding characteristics of landfill in 1997 were applied unconditionally on every inventory year
- Necessity of reflecting increase of resource recovery facility and technology advance of methane gas
- Accurate translation and application of 2006 IPCC G/L are required
  - -default value : 0
  - -Application relying on written reference

After

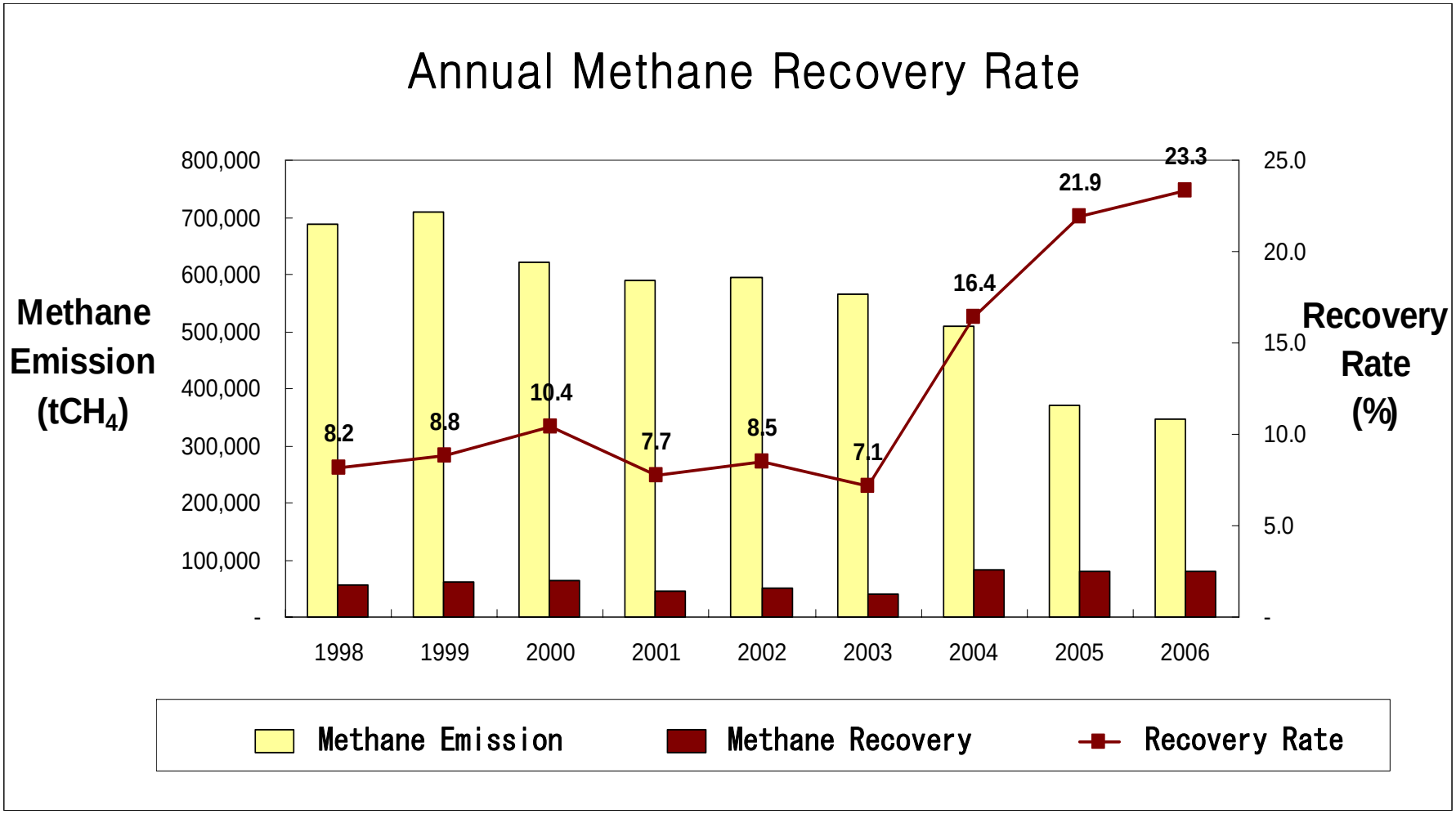
- Total investigation of methane gas recovery from landfill resource recovery facility operating in Korea
  - Facility : 15
    (Electricity production: 11, Gas production: 4)
  - Review data : LFG flux, CH4 concentration, monitored data
- Recalculation of annual methane recovery and recovery rate
- Update plan of methane recovery will be conducted annually

환경관리공단 Environmental Management Corporation

Methane Recovery(R)

Year	Methane Emission (tCH_4/yr)	Methane Recovery (tCH_4/yr)	Recovery Rate (%)	Notes
1998	686,873	56,305	8.2	CH4 Emission: IPCC GPG 2000 applied
1999	709,393	62,490	8.8	
2000	621,787	64,511	10.4	
2001	589,249	45,547	7.7	
2002	595,965	50,789	8.5	
2003	566,256	40,346	7.1	
2004	510,086	83,584	16.4	Recovery increase occurred by completion of stabilization construction of Sudokwon Landfill
2005	370,809	81,319	21.9	Landfill gas decrease occurred by ban on direct disposal of landfill of food waste
2006	345,453	80,626	23.3	

Methane Recovery (R)



** Methane Emission : Mass Balance method used

2 Other Issue

➢ Change of method of emission estimation in landfill

Mass Balance Method	First Order Decay Method
● 2000 IPCC GPG ● Final gasification occurred on current year	● 2006 IPCC G/L ● Long-term process of gasification ● Application of time function (First-order-decay)

➢ Estimation of past landfill of waste for FOD Method application

Internal Improvements

1. Investigation on characteristics of past landfills for recalculation of annual MCF factor
2. Improvement of Degradable Organic Carbon(DOC)

Issue

- DOC factor applied in current Inventory Report
  -Need to reflect composition change of waste statistics

Method

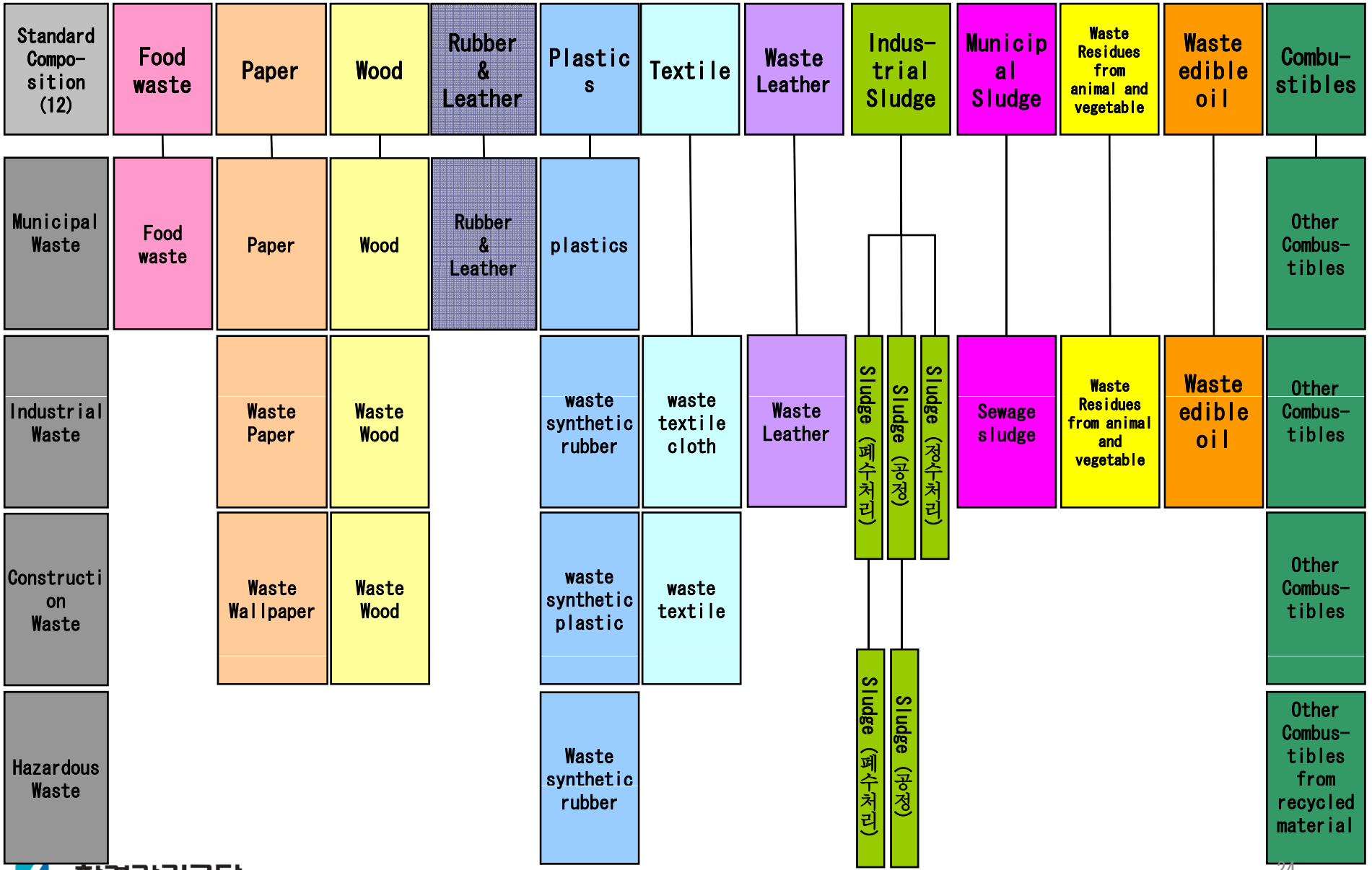
- Development of country specific emission factors
  - Results from 3 major authorities in charge of waste : MOEK, EMC, SLC
  - 2006 IPCC GLs default value
  - Factor used in former National Inventory Reports

Results

- Recalculate and determine reliable data by establishing DOC waste material standard
- Divide the standard material into 12 types
  - Priority : MOEK > EMC > IPCC or factors used in former National Inventory Reports

환경관리공단 Environmental Management Corporation

DOC : Standard Material of DOC Landfill Waste for recalculation



DOC : Rearrangement of DOC Reference by Standard Material

Standard Material		Total carbon content (dry, %)	Fossil carbon rate[1] (dry, %)	DOC		Water content (%)	Reference
				dry (%)	wet (%)		
Combustibles	Food waste	43 (36~47)	-	43 (36~47)	12 (10~16)	71 (62~80)	MOEK
	Paper	42 (41~44)	1	41 (40~43)	32 (30~35)	22 (18~25)	MOEK
	Wood	47 (46~49)	-	47 (46~49)	37 (32~41)	22 (14~32)	MOEK
	Rubber & Leather	59 (51~72)	20	39 (31~52)	37 (29~49)	3 (2~5)	EMC
	Plastics	75 (73~76)	100	-	-	16 (6~30)	MOEK
	Textile	51 (50~51)	20	31 (30~31)	25 (14~27)	21 (8~34)	MOEK
	Waste Leather	51 (50~52)	-	51 (50~52)	48 (47~50)	6 (5~7)	MOEK
	Industrial Sludge	-	-	-	9	-	IPCC
	Municipal Sludge	-	-	-	5	-	IPCC
	Waste Residue	41	-	-	11	72	Default value
	Waste edible oil	67	-	-	67	-	Default value
	Others	40 (38~43)	-	40 (38~43)	23 (17~27)	43 (31~55)	EMC
Incombustibles	- Municipal Waste : briquet ashes, metal & glass, sand & soil, etc. - Industrial Waste : fly ash, bottom ash, dust, waste sand, waste metal, waste plaster, waste catalysts, waste absorbent, glass & ceramics, inorganic sludge, etc. - Construction Waste : construction sludge, waste metals, waste glass						

※ Reference 1 : 2006 IPCC GLs

Assessment of Cross-review Meeting

- ❖ Comprehensive review conducted in collection of activity data from both countries, category classification, development of EFs, estimation methods and process
- ❖ Critics appeared on overall issues considered internally
- ❖ Deep discussion held by experts of inventory on waste sector, which leads to establish future plans efficiently
- ❖ Results achieved will be reflected in 2009 Inventory