
Improvements in the process of estimating GHG emission for waste sector in Republic of Korea

*The 8th Workshop on GHG Inventories in Asia (WGIA8), WG 4: Waste Sector
13-16 July 2010, Vientiane, Lao PDR*

June 14. 2010

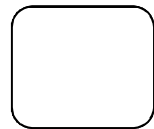
Wonseok Baek

**GHG Inventory team, Climate Environment Dept.
wsbaek@keco.or.kr**



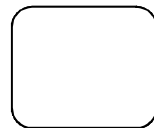


Contents



National Communication (NC)

- **Korea's Submission of NC**
- **GHG Estimation for Waste Sector**



Improvements and issues in Waste Sector

- **Important Improvements**
- **Main Issues and Future Plan**

Korea's submission of NC

Backgrounds

- Adoption of UNFCCC : July, 1992(UNCED, Brazil Lio)
- Korea's Ratification : December, 1993

- Article 4 and 12 of UNFCCC
 - : All parties shall publish and make available national inventories of anthropogenic emissions and removals

Korea's submission Status

- Initial NC : February, 1998
- Second NC : December, 2003
- Third NC : Under preparation

- Estimation of National GHG emission annually to prepare National Report
 - : Most recent work - [GHG inventory for Waste Sector in 2007](#)

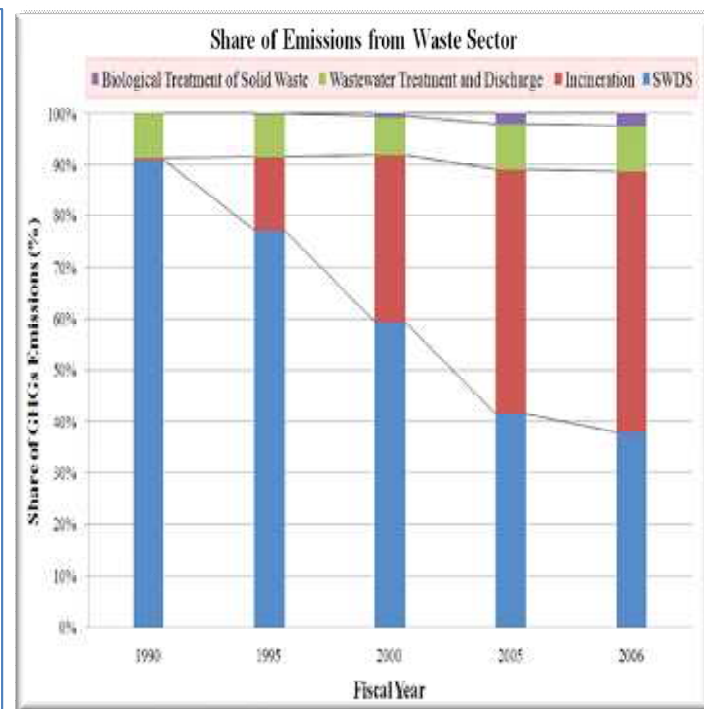
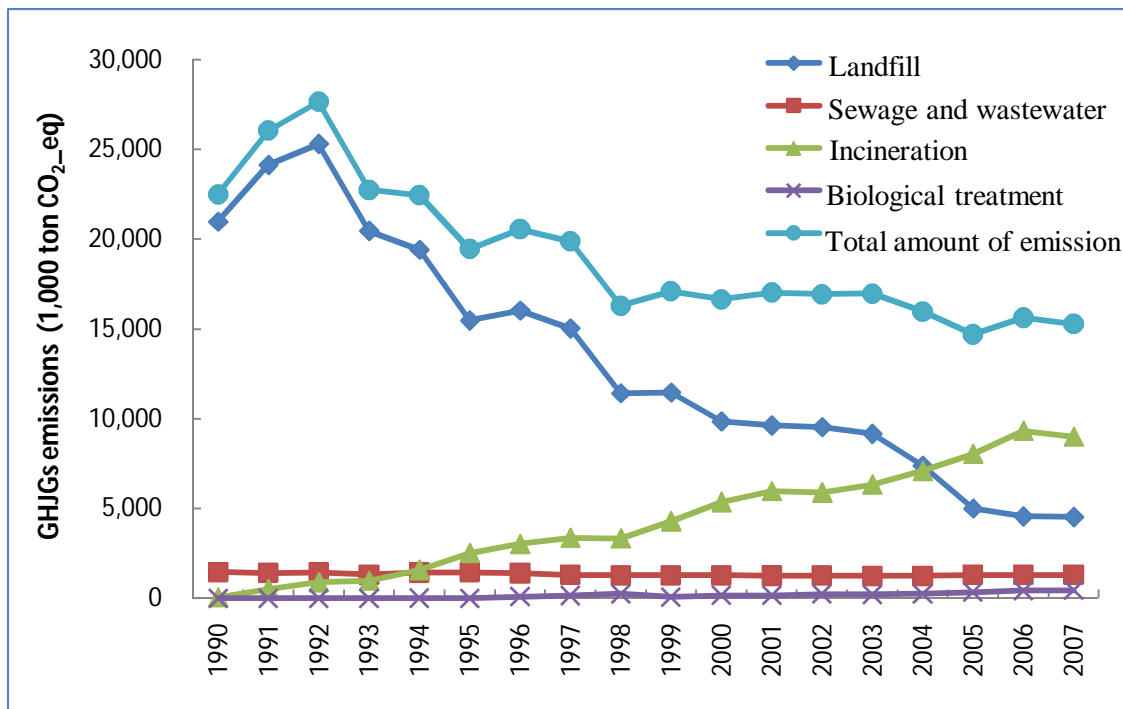
Korea's submission of NC

Estimation Process (Waste Sector)

Categories	Guidelines	Method	GHG	Country specific EFs /Parameters	Activity Data
Landfill	1996 IPCC GLs, IPCC GPG 2000	Tier 1 [Mass Balance]	CH ₄	<ul style="list-style-type: none"> • Disposed waste • DOC • Methane recovery 	<ul style="list-style-type: none"> • Data of National Waste generation and Treatment • Data of Designated Waste generation and Treatment • Environment Statistical Yearbook
Incineration		Tier 2	CO ₂ , N ₂ O	<ul style="list-style-type: none"> • Incinerated waste • CO₂ Emission factor • N₂O Emission factor 	<ul style="list-style-type: none"> • Data of National Waste generation and Treatment • Data of Designated Waste generation and Treatment • Environment Statistical Yearbook
Wastewater		Tier 2	CH ₄ , N ₂ O	<ul style="list-style-type: none"> • Discharged wastewater • Emission factor • Methane recovery rate 	<ul style="list-style-type: none"> • Sewer Statistics • Data of Industrial Wastewater generation and Treatment • Statistical Yearbook of Ministry of Health and Welfare • Population Statistics of Statistics Korea
Others (Biological Treatment)	2006 IPCC GLs	Tier 1	CH ₄ , N ₂ O	<ul style="list-style-type: none"> • Mass of organic waste treated by biological treatment 	<ul style="list-style-type: none"> • Data of National Waste generation and Treatment

Korea's submission of NC

GHG Emissions in 2007



Category	GHG emission (kton CO ₂ -eq)			Rate of increase by the year (%)
	1990	2007	Difference	
Total amount of emission	22,504	15,285	-7,219	-2.2%
Landfill	20,968	4,530	-16,438	-8.6%
Incineration	69	8,998	8,929	33.2%
Sewage and wastewater	1,468	1,308	-160	-0.7%
Biological treatment	16	449	433	29.1%

Improvements and Issues in Waste Sector

Issues by Emission Source

Note: Comparison with 2nd NC

Categories	Improvement	Weakness	Remark
Landfill	<ul style="list-style-type: none"> • Estimation of Emission from Unmanaged Landfill • Development and Application of Country-Specific value for DOC, R 	<ul style="list-style-type: none"> • Need for improving estimation method (Application of FOD Method) 	<ul style="list-style-type: none"> • Developing Methane generation rate constant(K) through measurement
Incineration	<ul style="list-style-type: none"> • Updates of activity data for '90~'95 	<ul style="list-style-type: none"> • Need for estimating CH₄ emission 	<ul style="list-style-type: none"> • Developing Methane Emission Factor through measurement
Wastewater	<ul style="list-style-type: none"> • Estimation of Emission from Untreated/Uncollected Wastewater 	<ul style="list-style-type: none"> • Need for estimating N₂O emissions from domestic and industrial wastewater 	<ul style="list-style-type: none"> • Developing N₂O Emission Factor through measurement to apply 2006 IPCC guideline
Others (Biological Treatment)	<ul style="list-style-type: none"> • Estimation of Emission from Biological Treatment of Solid Waste 	<ul style="list-style-type: none"> • Need for activity data for '90~'93 	<ul style="list-style-type: none"> • Review of national Statistics or assumption of data

Important Improvements

1

Estimation of Emission from Unmanaged Landfills

Before

- All landfill were assumed as managed landfills
 - Managed landfills(MCF : 1.0)



After

■ Classification of landfills into 3 types

Classification	- type ¹	- type ²	- type ³
Landfill Characteristics	Sanitary	Unsanitary	
Landfill Height	-	More than 5m	Less than 5m
MCF	1.0	0.8	0.4

¹ - type(anaerobic sanitary landfill sites)

: Landfill sites that promote waste disposal based on various plans such as landfill sectioning, use cover materials, and carry out mechanical compression and leveling and have landfill gas collection/treatment facilities and leachate elimination facilities

² - type(unsanitary landfill sites with landfill depth of more than 5m)

: Landfill sites with landfill height of more than 5m without satisfying the sanitary landfill requirements

³ - type(unsanitary landfill sites with landfill depth of less than 5m)

: Landfill sites with landfill height of less than 5m without satisfying the sanitary landfill requirements

Important Improvements

2

Improvement of Degradable Organic Carbon(DOC)

Before

Issue

- DOC factor applied in 2th NC
 - The source is uncertain.
 - Need to reflect composition change of waste statistics



Method

- Development of country specific EF
 - Results from 3 major authorities in charge of waste : MOE, KECO, SLC
 - 2006 IPCC GLs default value
 - Factor used in 2th NC

After

Result

- Recalculate and determine reliable data by establishing DOC waste material standard
- Divide the standard material into 12 type
 - Priority : MOE > KECO > IPCC or factor used in 2th NC

Important Improvements

3

Recalculation of Methane Recovery (R)

Before

- Recovery rate(R=13%) : developed regarding characteristics of landfill in 1997 were applied unconditionally on every year
- Necessity of reflecting increase of resource recovery
- Accurate translation and application of 2006 IPCC G/L are required
 - Default value : 0.0
 - 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

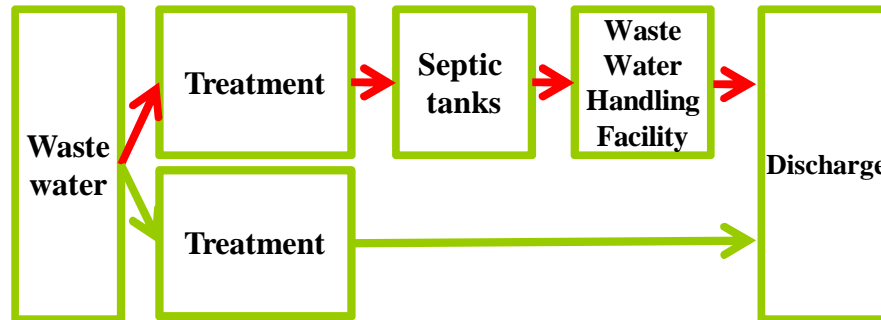
Important Improvements

4 Estimation of Emission from Untreated/Uncollected Wastewater

Before

After

○ Estimate emission from treated wastewater only



■ Estimate emission from Untreated/Uncollected Wastewater

$$\text{CH}_4 \text{ Emission} = \text{AD} \times \text{EF}$$

Where, AD : Untreated/uncollected wastewater
 × inflow BOD density
 EF : CH₄ Emission Factor

5 Estimation of Emission from Biological Treatment of Solid Waste

Before

After

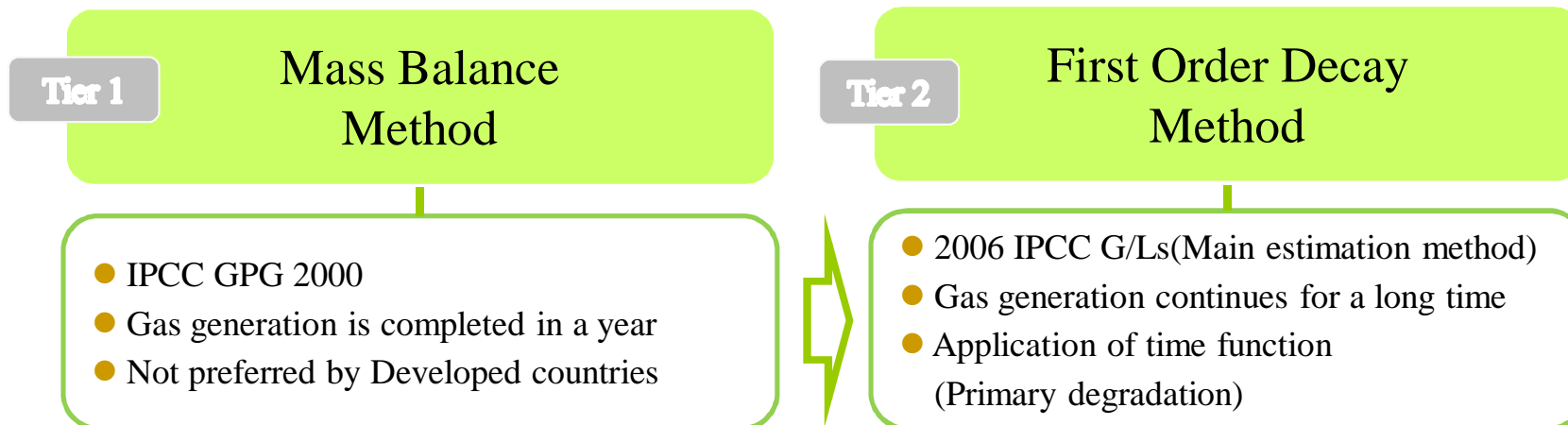
○ Not estimated

■ Estimate emission from biological treatment of solid waste

Biological Treatment Facility	GHG	Estimation Method
Feed-stuff/ Composting	CH ₄ , N ₂ O	2006 IPCC GLs

Main issues and future plan

Problems and Solution regarding Estimation Method Change



Categories	Problems	Plan
Emission	<ul style="list-style-type: none"> • Significant difference in emission estimated 	<ul style="list-style-type: none"> • Searching for examples of developed countries
Activity data	<ul style="list-style-type: none"> • Need for assumption of landfill volume for more than past 50 years <ul style="list-style-type: none"> - Decision on assumption Method - Decision on starting year of activity data 	<ul style="list-style-type: none"> • Application of assumption method of IPCC guideline • Expert review on starting year
EF /Parameter	<ul style="list-style-type: none"> • Choice btw Methane generation rate(k) for waste composition or bulk <ul style="list-style-type: none"> - Significant difference in emissions - Landfill waste volume to apply Bulk k <ol style="list-style-type: none"> 1) Landfill waste=Combustible+ Incombustible 2) Landfill waste=Combustible 	<ul style="list-style-type: none"> • Development of country specific Bulk k • Expert review on how to apply Bulk k



Thank you