MUNICIPAL SOLID WASTE MANAGEMENT IN DEVELOPING ASIAN COUNTRIES -2

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OUTLINE OF THE SUBJECT (2 WEEKS)

- Overview of municipal solid waste management in developing Asian countries
- 3R (reduce, reuse, recycle) in developing Asian Countries
- Solid waste management and climate change
- International cooperation

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RECYCLE OF NON-ORGANIC WASTE

- Waste bank in Thailand

HANDICRAFT

Plastic cleaning by informal sector

WASTEWATER FROM CLEANING OF PLASTIC IS UNTREATED

RECYCLE/RECOVERY OF ORGANIC WASTE

Composting → nutrient recovery

WINDROW COMPOSTING

SIEVING

GRINDING OF GARDEN WASTE FOR COMPOSTING

Static-pile aeration

GARDEN WASTE COMPOSTING IN BANGKOK

ANAEROBIC DIGESTION

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EM (Effective microorganism)

Integrated waste management in developing Asian countries

3Rs + Mechanical biological treatment: Phitsanulok, Thailand


CBM training for communities


Mobile awareness raising program


Mobile awareness raising program


Promoting reducing use of plastic shopping bag

Photo: Suthi Hantrakul

Mechanical - Biological Waste Treatment prior to sanitary landfill

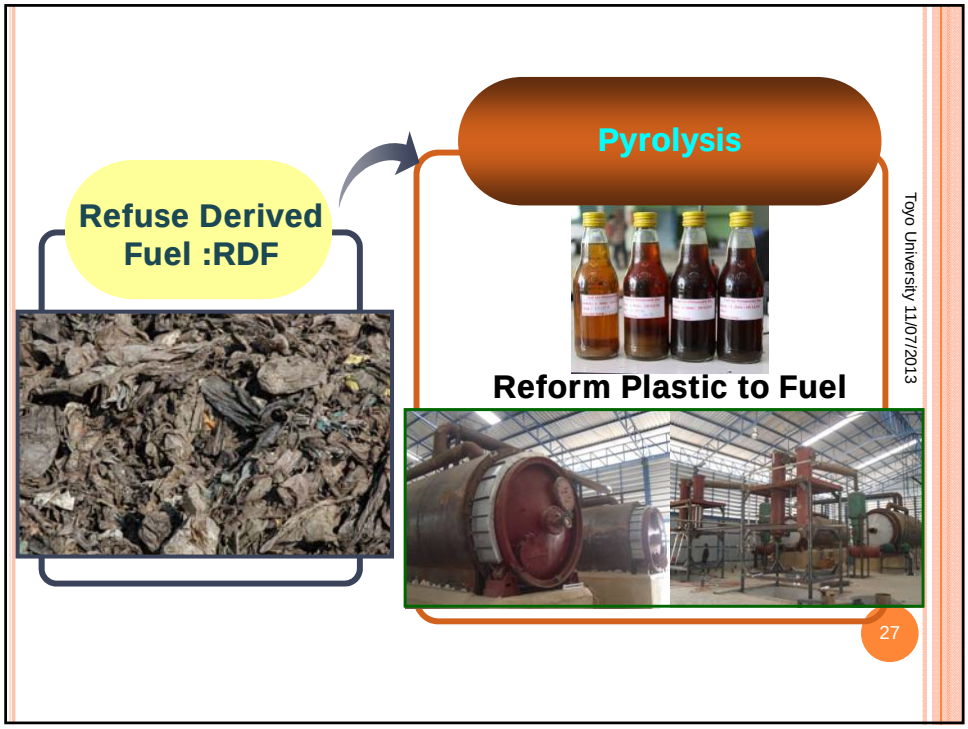
Area: 35.2 hectares


Homogenizing and forming the pile

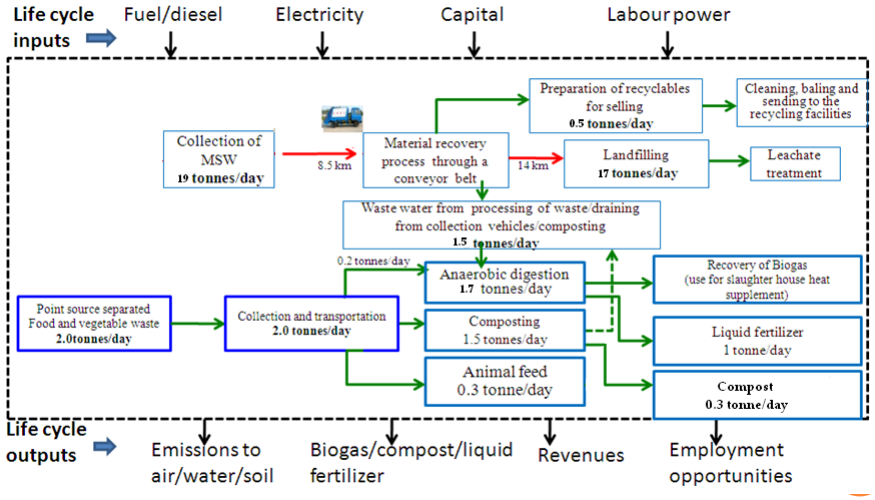

Passive composting for 9 months


Compost like product


Plastic



INTEGRATED SOLID WASTE MANAGEMENT MUANGKLANG MUNICIPALITY:



Front-end separation

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Animal feed

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VEMICOMPOSTING

ANAEROBIC DIGESTION

MUNICIPAL SOLID WASTE MANAGEMENT AND CLIMATE CHANGE

SOURCE OF GHG EMISSIONS FROM URBAN SOLID WASTE MANAGEMENT

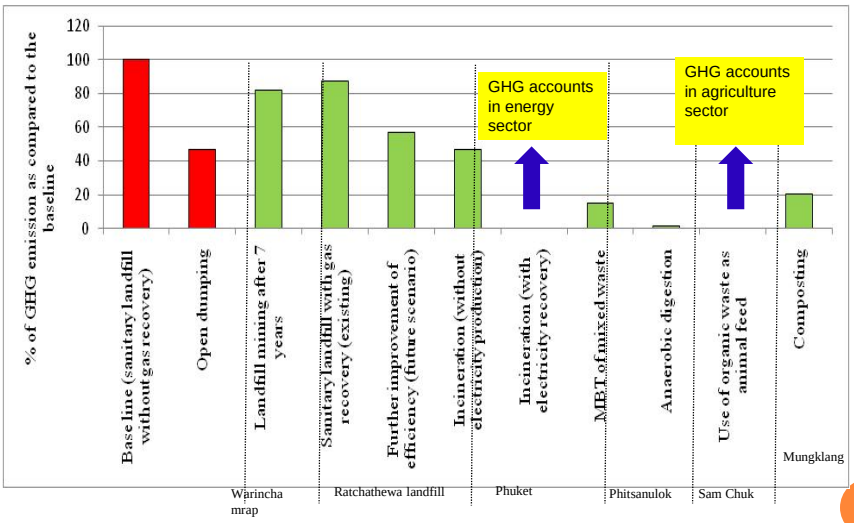
1) Methane gas emissions from landfills of organic waste
2) Emissions of carbon dioxide from burning of plastic waste and other wastes (If incineration is used for energy purpose then the emissions of CO2 of fossil origin are included in Energy sector. However, CO2 emissions (fossil origin) from incineration of waste without energy recovery are included in the Waste sector.)
3) Energy used for collection, recycling and others are reported to the energy sector.

GHG EMISSIONS FROM SOLID WASTE MANAGEMENT

According to IPCC guidelines, GHG emissions related to waste management can be categorised into different groups

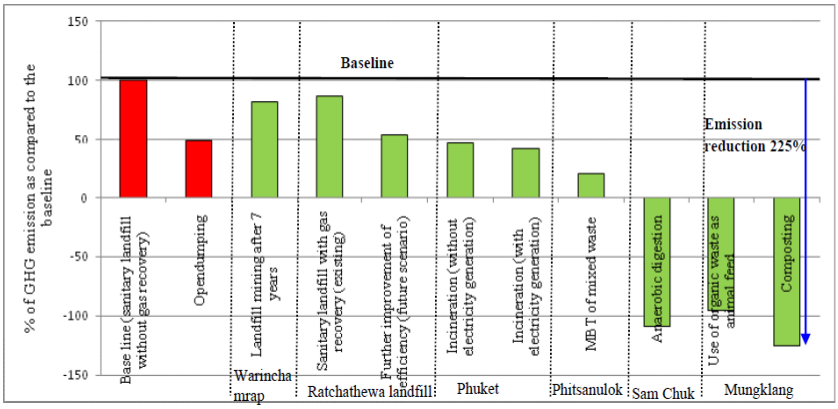
Source of GHG emission	Categorised under waste sector	Categorised under non-waste sector
• CH_4 emission from landfills/open dumping, composting of organic waste	★	
• CH_4 emission from incineration and open burning (minor)	★	
• CO_2 emission from incineration without energy recovery	★	
• CO_2 emission from incineration with energy recovery		★
• N_2O emission from combustion and composting	★	
• GHG emission from utilisation of fossil fuel for waste transportation, operational activities and grid electricity consumption for operational activities and recycling		★
• GHG emission from manure and farm waste management		★

GHG EMISSION ON THE WASTE SECTOR OF SWM IN THAILAND- NOT LCA



Baseline for mixed waste management is sanitary landfilling of mixed waste without gas recovery.
The baseline of organic waste utilisation is sanitary landfilling of organic waste without gas recovery

GHG EMISSIONS FROM SWM IN THAILAND- LCA PERSPECTIVE



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Baseline for mixed waste management is sanitary landfilling of mixed waste without gas recovery.
The baseline of organic waste utilisation is sanitary landfilling of organic waste without gas recovery

NATIONAL GHG INVENTORIES IN 1994

Country	National GHG inventories in 1994 ($MtCO_2eq.$)*	GHG emissions from the waste sector in 1994 ($MtCO_2eq.$)		Sources
		MSW	% MSW to total emissions	
China	4,081	42.6	1.04	Chinese Government, 2004
India	1,252	12.2	0.97	MoEF, 2004
Indonesia	883	8.44	0.96	MENLH, 1999
Thailand	325	0.411	0.13	MSTE, 2000
Viet Nam	154	1.39	0.90	MNRE, 2003
Malaysia	144	21.9	15.2	MOSTE, 2000
Philippines	169	4.25	2.51	IACCC, 1999
Bangladesh	76.3	1.31	1.72	MoEF, 2002
Cambodia	59.7	0.124	0.21	MOE, 2002
Laos**	24.2	0.240	0.99	STEA, 2000
Regional	**7,168**	**92.9**	**1.3**	

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* Sinks are not included. **GHG inventory in 1990.

GHG EMISSIONS FROM THE WASTE SECTOR IN DEVELOPING ASIA - MOSTLY BASED ON LANDFILL EMISSIONS

Country	GHG emissions in Million ton CO_2 equivalent/year		
	1994*	2000*	After 2000** (estimate)
China	42.6		45.4 – 113.4
India	12.2		9.4 – 23.5
Indonesia	8.44		9.6 – 24.3
Philippines	4.25		3.8 – 9.6
Viet Nam	1.39	5.60	3.0 - 7.4
Bangladesh	1.31		2.1 – 5.1
Thailand	0.41	4.89	5.3 - 13.5
Lao PDR	0.24**		No data
Cambodia	0.124		0.12 – 0.34

Note: * National communications to the UNFCCC, ** Author's estimation

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RECOGNITION OF 3RS FOR NATIONAL CLIMATE CHANGE MITIGATION

Country	National climate change policy	Indication to waste sector	3Rs approach to climate change
China	2007	Yes	Reduce, Recovery, Utilization
India	2007	Yes	Recycling
Indonesia	2007	Yes	5Rs for industry & 3Rs for domestic waste
Thailand	2008	Yes	3Rs
Bangladesh	2008	Yes	No
Cambodia	2000	Yes	No
Philippines	1999	One word	No
Malaysia	2000	No	No
Lao	2002	No	No
Viet Nam	2003	No	No

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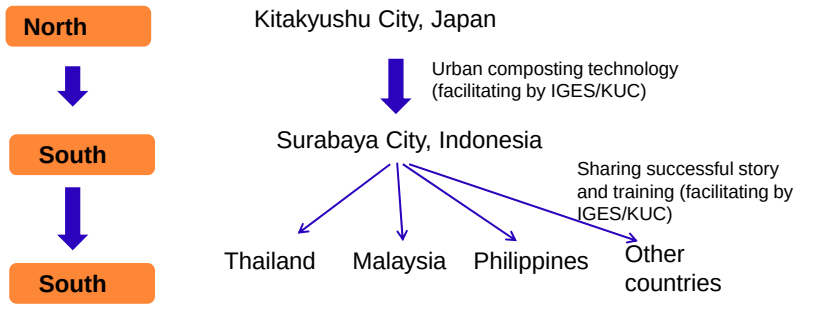
INTERNATIONAL COOPERATION

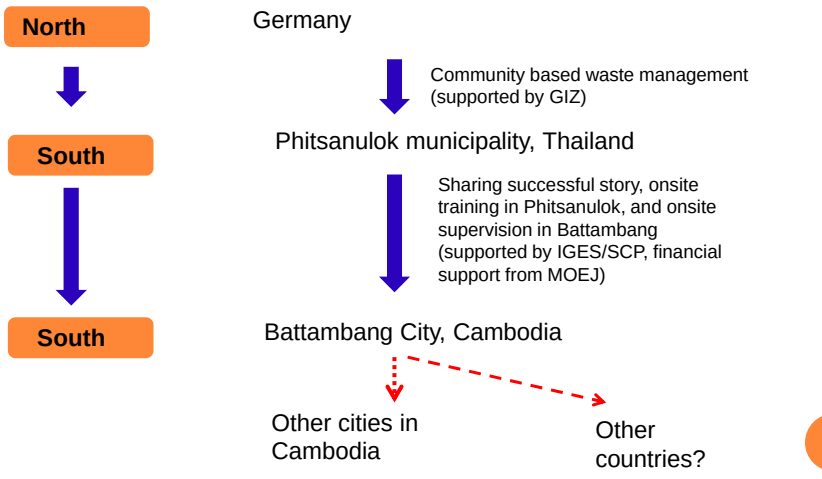
TYPE OF INTERNATIONAL COOPERATION

- Typical international cooperation was in form of North-to-South (transfer technology from developed to developing countries
- Later on, the developing countries has experienced and capacity to provide support to other cities, and thus the cooperation in the form of South-South cooperation is promoted.
- In terms of local circumstance, culture, capacity and so on, the technology transfer through South-South cooperation is easier to be adopted than the North-South cooperation

Case I: Kitakyushu City's International Cooperation for organic waste management in Surabaya city (Indonesia) and its replication in Asian cities



CASE II: PHITSANULOK MUNICIPALITY AND BATTAMBANG CITY COOPERATION ON IMPROVEMENT OF MUNICIPAL SOLID WASTE MANAGEMENT AND CLIMATE CHANGE MITIGATION



Initiatives towards city to city cooperation between Thailand and Cambodia

- IGES conducted a national training workshop on promoting urban organic waste utilization for climate change mitigation in Battambang City in August 2011
  - Introducing experiences in many cities in developing Asia
  - The Ministry of Environment of Cambodia requested for pilot project implementation in Cambodia
  - Battambang City showed an interest in implementing the pilot project
- IGES invited an NGO (COMPED) to the national training workshop on the same topic in Thailand in January 2012
- IGES and COMPED visited a few good practices of solid waste management in Thailand in January 2012
- COMPED selected Phitsanulok as a model city for Cambodia in February 2012

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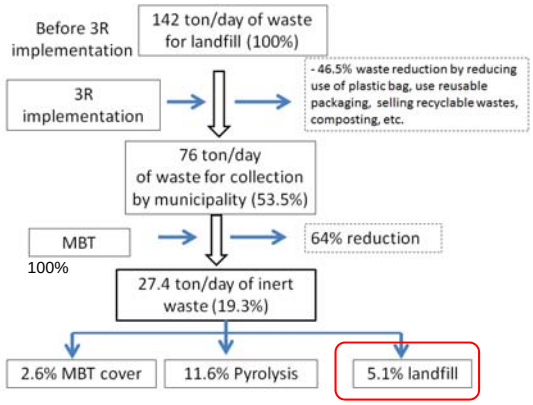
Achievement towards zero waste policy of Phitsanulok Municipality

- Apply the 3Rs concepts, public participation, and polluter pay principle to achieve zero waste landfill
- Apply mechanical biological pre-treatment for reducing quantity of waste to final disposal and separation of plastic waste for energy recovery



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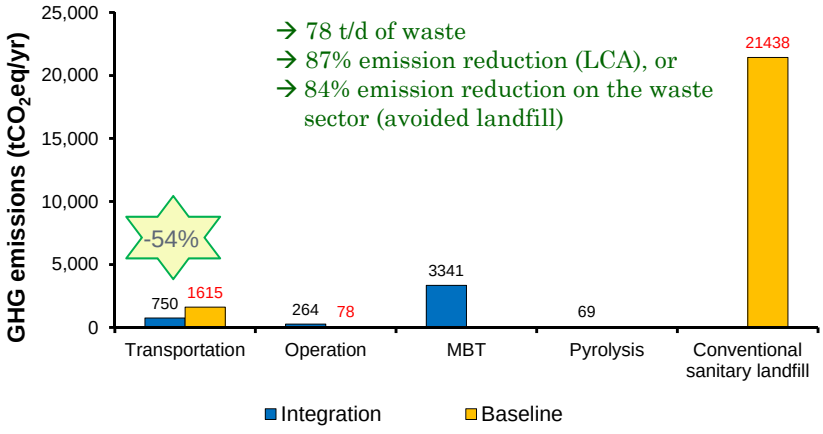
GHG EMISSIONS FROM MUNICIPAL SOLID WASTE MANAGEMENT IN PHITSANULOK MUNICIPALITY



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WASTE MANAGEMENT PROBLEM IN BATTAMBANG CITY (I)

About 80-100 m³ of waste is open dumping and sometimes burning is practiced

High percentage of organic waste (>70%)

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Waste management problem in Battambang City (II)

High risk of heavy metal contamination to paddy fields

Waste management problem in Battambang City (III)

Less land efficiency thus new land is required for landfilling

Waste management problem in Battambang City (IV)

Less than 1 ton/day of organic waste is composting

↓ **goal**

Increase organic waste to composting facility and reduce waste to landfill

INTENSIVE TRAINING COURSE FOR ENCOURAGING PUBLIC PARTICIPATION ON SOLID WASTE MANAGEMENT

- Ministry of Environment of Japan provided financial supports
- IGES and Phitsanulok Municipality conducted an intensive training course in Phitsanulok Municipality in July 2012
- 22 participants from the City, markets, waste collection company, composting facility (NGO) and residents
- Public participation, waste separation at source, composting, and greenhouse gas emission reduction

Project implementation in Battambang

- Trained stakeholders formed a working group in Battambang City
- Active discussion to formulate the working plan according to the local conditions (partial financial support from UNESCAP)
- Drafting a local directive on waste separation at source for composting based on multi-stakeholders discussion, questionnaires surveys with vendors and residents in surroundng communities
- Implement the projects in three main markets and surrounding communities
- Awareness raising campaign by the City (involvement of university students)

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Follow-up and on-site supervision by IGES and Phitsanulok Municipality




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COMMENTING ON THE DRAFT OF DIRECTIVE FOR WASTE SEPARATION AT SOURCE

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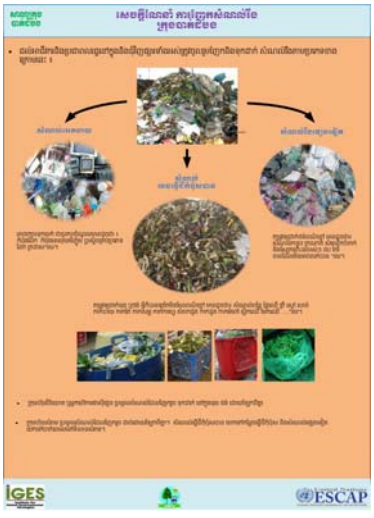
EXAMPLES OF CONTENT IN THE DIRECTIVE: ASKING MARKET'S VENDORS AND RESIDENTS TO SEPARATE COMPOSTABLE WASTE AND PUT IN PLASTIC BAG OR SEPARATED CONTAINERS



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INCREASE NUMBERS OF BINS FOR WASTE SEPARATION BY WASTE COLLECTION COMPANY

- Arrange waste and improvement of collection points and storage area
- Collecting compostable waste and non-compostable waste separately

CHALLENGES

- First public participation project in Cambodia
- Communication with and changing behaviours of all vendors and surrounding communities
- Stolen of waste bins
- Economic impacts on waste collection company

KEYS TO SUCCESS

- High administrative commitment from the City and support from the provincial government → Aiming for the national award on Clean City
- Confident of trained stakeholders
- Active cooperation from all stakeholders: City (high administrator), NGO (COMPED), waste collection company (CINTRI), market's operator and trained residents
- Strong commitment of the stakeholders (city, market operator, waste collection company, composting operator, trained residents)
- Regular onsite monitoring and supervision by IGES and Phitsanulok Municipality
- Financial support from Ministry of Environment of Japan and UNESCAP

ごみ OR 車？

HOME WORK & TEST (1)

1. Please search on internet or newspaper and select a case study of waste reduction and reuse from 1-2 cities in developing countries list their policies or activities on waste reduction and reuse (3 scores)

City name: ……..Country……..
List of activities on 3Rs (waste reduction, reuse and recycle)
a) ……..
b) ……..
c) ……..
d) ……..

2. How much you generate waste on average per day? How you can reduce your waste generation rate? (3 scores)
Current waste generation ……kg/day
List of activities that you intend to do for reducing waste generation
a) ……..
b) ……..
c) ……..
d) ……..

HOME WORK & TEST (2)

1. Please read the article '**sustainable management of organic waste: the need for coordinated action at national and local levels':** http://pub.iges.or.jp/modules/envirolib/upload/4099/attach/PB_21E_final.pdf

- Please list what you have learnt from this article (at least 6 issues with brief explanation for each in English; 3 scores)

2. Please read the article '気候変動に配慮した廃棄物管理に向けて:統合型都市廃棄物管理の可能性'

http://pub.iges.or.jp/modules/envirolib/upload/4156/attach/PB_24_J_0116.pdf

- Please list what you have learnt from this article. (at least 6 issues with brief explanation for each in English; 3 scores)