Building capacities of local governments to reduce greenhouse gas emission from municipal solid waste management in Thailand

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- IGES is a Japanese policy research institute promoting sustainable development in the Asia-Pacific region
- Have offices in Hayama, Tokyo, Kobe, Kitakyushu, Beijing and Bangkok
- The institute’s research focuses mainly on environment related policies in developing countries
- IGES employs around 90 researchers
- Two groups are working closely with solid waste management:
  - Sustainable Consumption and Production (SCP)
  - Kitakyushu Urban Center (KUC)
IGES activities on building capacity of local government on reducing greenhouse gas emission from municipal solid waste management

- Translation of IGES ‘practical guide for improved organic waste management: climate benefits through the 3Rs in developing Asian countries’ in to Thai (in collaboration with SIIT)
IGES activities (2)

- Publishing a country specific guide for sustainable urban organic waste management in Thailand: Combining food, energy, and climate co-benefits (in collaboration with SIIT)
IGES activities (3)

Organized national capacity building workshops for local governments, in collaboration with PCD and SIIT

- About 100 participants from PCD, DEQP, DLD, DEDE, Municipalities, and Universities
- Examples of best practices on municipal solid waste management in Thailand, and some examples in Cambodia and Lao DPR
- Site visit at Muangklang Municipality
- Estimation of GHG emissions using the IPCC tool
- Group’s exercise
IGES activities (4)

Plenary session
Group exercise
Site visit at Muangklang Municipality
Development of a user friendly GHG calculation tool for local governments based on a lifecycle approach

- Summary sheet
- Transport
- Composting
- Anaerobic digestion
- MBT
- Recycle
- Landfill & open dumping
- Incineration & open burning (to be included)
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.
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The baseline of organic waste utilisation is sanitary landfilling of organic waste without gas recovery.
Climate co-benefits of energy recovery from landfill gas in developing Asian cities: A case study in Bangkok

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Abstract

Landfills are the most common and cost-effective waste disposal method, and it is widely applied throughout the world. In developing countries in Asia, they are currently a trend towards constructing smaller, better-lit, gas recovery systems, with the only exception to the waste problem and the associated local environmental pollution, but also their generation through carbon credits and from the sale of electricity. This study presents a qualitative assessment of climate change benefits from landfill gas (LFG) to energy projects, based on the case of the Ministry of the Environment, Thailand and its experiences in the LFG management. The assessment found that the total GHG mitigation of the project would be 471,775 tons (66% of carbon dioxide (CO₂) equivalent) or in 10-year LFG recovery period. This amount is equal to 30% of the methane (CH₄) generated in the biogas plant, an alternative scenario was developed to analyze possible improve opportunities for GHG mitigation through LFG to energy recovery projects. This scenario assumes that LFG recovery would commence in the 10-year LFG production period and gas injection continues throughout the 25-year peak production period. In this scenario, GHG mitigation potential associated with 120,000,000 tons (CH₄) during the 30-year project period is equivalent to 45% of the CO₂ equivalent throughout the study period. The results indicate that with careful planning, there is a high potential for improving the efficiency of existing LFG recovery projects which would enhance climate co-benefits, as well as environmental benefits. However, this study also shows that even improved gas recovery systems have fairly low recovery rates, and in consequence, that extraction of GHGs from older facilities is still considerable.

Keywords

Municipal solid waste (MSW), on-site landfill, greenhouse gas (GHG), LFG to energy, life cycle assessment, Thailand

Introduction

Landfills are the most common waste disposal method throughout the world. Landfills have developed drastically during the last few decades, but have development has not yet reached all parts of the world (Tundisi et al., 2009). For example, most of the developing countries in Asia are still practicing open dumping and landfilling without gas recovery. There are simple disposal methods with well-documented adverse effects on human health and the environment, which need to be monitored. Many of the facilities are not designed for gas recovery, and there are no adequate measures to control the emitted gases. Thus, methane and carbon dioxide emissions from landfills would have substantial co-benefits for climate change mitigation, as well as reducing the world’s health risks associated with elevated methane concentrations.

There is growing interest in Asia in moving towards properly designed, constructed and managed systems in landfill gas as an important mitigation to handle waste management problems. By implementing such improvements in landfill gas (LFG) recovery systems provides the opportunity to generate renewable energy and recover a financial resource through carbon credits such as the Clean Development Mechanism (CDM). There are 57 CDM projects approved by the CDM mechanism in Asia in 2009.

Conclusion

The results indicate that with careful planning, there is a high potential for improving the efficiency of existing LFG recovery projects which would enhance climate co-benefits, as well as environmental benefits. However, this study also shows that even improved gas recovery systems have fairly low recovery rates, and in consequence, that extraction of GHGs from older landfills is still considerable.

Key words: Municipal Solid Waste (MSW), Waste-to-Energy, Life Cycle Assessment (LCA), Thailand, Asia

Evaluation of Environmental and Economic Attributes of Waste-to-Energy Technologies in Megacities in Asia

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Abstract

Accumulated Municipal Solid Waste (MSW) generation rate in megacities has become a crucial problem in both the development and long-term sustainability. Waste-to-energy technologies seem to be an important option to address this problem, and also offer various additional benefits. This paper presents the quantitative assessment of environmental and economic attributes of two major waste-to-energy technologies: landfill gas to energy (LFG-to-energy) recovery and incineration, by using some practical examples in Thailand. Net GHG emissions, net resource consumption and net life cycle cost (LCC) were used as the basic indicators to measure the environmental and economic implications of these technologies. A Life Cycle Assessment (LCA) perspective. The analysis finds that at the current efficiency levels, both LFG-to-energy recovery projects and incineration contribute for GHG mitigation and fossil resource savings as compared to the Business-as-Usual (BAU) practice. However, financial returns from these projects are very low and not sufficient to compensate for the costs or make the projects economically attractive. This paper argues that substantial improvements can be made by enhancing the efficiencies of production by adopting sound designs and better management practices. Such improvements would expand the overall contribution for GHG mitigation, resource savings and financial returns to the local societies.

Key words: Municipal Solid Waste (MSW), Waste-to-Energy, Life Cycle Assessment (LCA), Thailand, Asia

Introduction

The rapid growth of globalization and urbanization has created a major problem for the management of solid waste in megacities, which is becoming increasingly more challenging. Rapidly growing populations have increased the generation of Municipal Solid Waste (MSW) in megacities, causing more and more crucial both for the daily management and long-term sustainability of the environment. The urbanization of the city’s population is set to continue to 2050 the world’s population is projected to be about 8 billion, of which nearly 7 billion will live in urban areas. By 2011, there will be 28 mega cities, 27 of them in the developing world. Two thirds of them are situated in developing countries in South East Asia, (2010, Mills et al., 2010). At present, MSW generation in Asia surpasses 1 million metric tons per day.
IGES on-going activities in Thailand

- MRV project funded by MOEJ
- National capacity building workshop for local governments (late 2013)
- Pilot project implementation at Phitsanulok Municipality (composting of 0.5 t/day; 500,000 THB)
- Seeking collaboration with Thailand on MRV development and potential on Joint Credit Mechanism
IGES on-going activities in Thailand

- Capacity building on MRV towards a Low Carbon Municipality in Nonthaburi (funded by MoEJ) and Phitsanulok Municipality (funded by APN)
- National capacity building workshop for local governments (late 2013)
- Pilot project implementation at Phitsanulok Municipality (composting of 0.5 t/day; 650,000 THB)
- Seeking collaboration with Thailand on MRV development and potential on Joint Credit Mechanism
Waste flow at Phitsanulok Municipality

Before 3R implementation

142 ton/day of waste for landfill (100%)

3R implementation

76 ton/day of waste for collection by municipality (53.5%)

MBT 100%

27.4 ton/day of inert waste (19.3%)

64% reduction

2.6% MBT cover

11.6% Energy

5.1% landfill

- 46.5% waste reduction by reducing use of plastic bag, use reusable packaging, selling recyclable wastes, composting, etc.
GHG emissions from municipal solid waste management in Phitsanulok Municipality

→ 78 t/d of waste
→ 87% emission reduction (LCA), or
→ 84% emission reduction on the waste sector (avoided landfill)

GHG emissions (tCO₂eq/yr)

Transportation: 750
Operation: 264
MBT: 3341
Pyrolysis: 69
Conventional sanitary landfill: 21438

-54%
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
IGES-SCP
Capacity building for Thailand

Promoting composting of food waste from markets and hotels

- Phitsanulok has long experience on household composting but not yet scaling up to markets and hotels
- At the same time, Phitsanulok Municipality will keep data record to serve the development of MRV system and estimation of GHG emission reduction
- Later on, Phitsanulok Municipality can serve as a model city for climate change mitigation from municipal solid waste and provide training to other cities both on the waste management and MRV system

Photo: Phiangpen Sriwiroj
New funding opportunities: CCAC Waste initiatives

- Climate Change and Clean Air Coalition (CCAC) was formed in February 2012
- Focus on reducing the short-lived climate pollutants (SLCPs) such as methane and black carbon
- Focus on the city level but requires national supports. Both governmental levels should apply to a CCAC member’s countries – Asia → Bangladesh, Korea, Japan
- However, the current scheme is not so strict thus the city like Penang and Ho Chi Minh are selected as pilot cities that will receive funding.
- The funding of about 80,000 - 100,000 USD per city is available for city assessment, development of work plan for reducing SLCP emission, city visit, capacity building, etc. However, this money will be spent through City lead (implementing agency)
- Japan provides 2.5 million USD to the CCAC trust fund: 1 million USD will be used for waste initiatives in Asia
- IGES is a non-state member of CCAC
Thank you very much for your attention

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for further information, progress and publications.