Institute for Global Environmental Strategies
Sustainable consumption and production Group

Utilization of urban organic waste in GMS towards climate change mitigation

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Presentation outline

- Introduction of urban organic waste and GHG emissions
- Example of urban composting and anaerobic digestion in Cambodia and Thailand
- Challenges and obstacles of urban organic waste utilization projects
- Policy recommendation
- Conclusion

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Organic waste management and climate change

- Urban organic waste accounts for 50-70% of urban solid waste.
- Landfill of organic waste is the largest source of GHG emissions from the waste sector.
- Diversion of organic waste from landfill to composting or anaerobic digestion can avoid GHG emissions from landfill.
- Composting and anaerobic digestion may release GHGs such as methane and nitrous oxide, but its balance is lower than landfill.
- Use of compost, biosolids and biogas can help restoring soil carbon and nutrient, and avoid GHG emissions from the industrial, energy, and forestry sectors.

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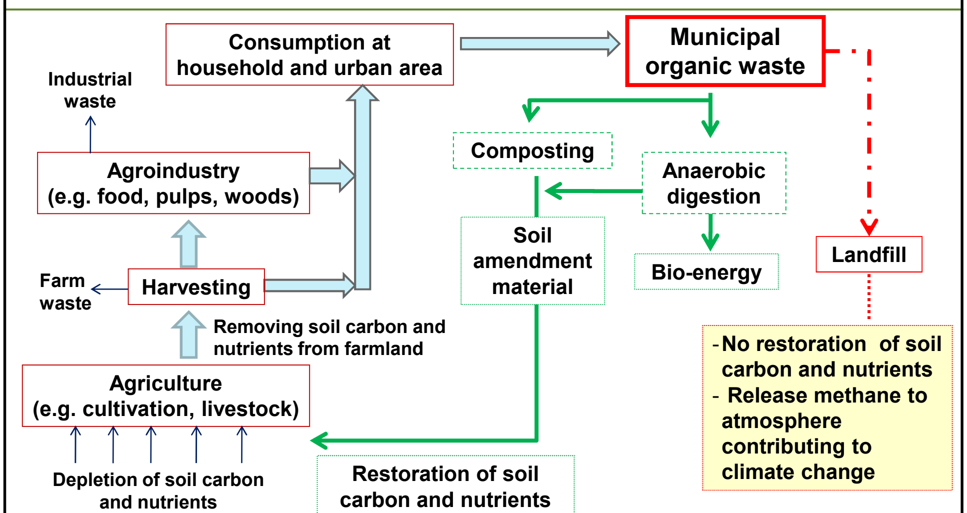
Restoration of soil carbon and nutrients through urban organic waste utilization



Overview of urban organic waste utilization in GMS countries

- Generally, urban organic waste management is open dumping in designated area. Sometimes, open burning is applied to reduce volume of waste.
- Composting of urban organic waste is being promoted in some cities, but its implementation is found only in project area.
- Therefore, it is essential to improve waste management practice and to enhance utilization of urban organic waste which can contribute to the GMS national agenda on food, energy and climate change.

Food waste separation at source should be promoted

- Food waste is the major waste composition (≥ 50%).
- Easy to be spoiled and produces smell nuisance.
- Be a food source of domestic pest and disease carriers such as houseflies, cockroach, rat, dog, etc. → health problem
- Reduce quality of recyclable materials.

Potential GHG emission reduction from food waste utilization

Utilization	Compare to poor managed shallow landfill (0.42 tCO_2eq/ton of waste)	Compare to well managed deep landfill (1.05 tCO_2eq/ton of waste)
Composting		
- poor management	0.07	0.70
- well management	0.40	1.03
Anaerobic digestion		
- poor management	0.25	0.88
- well management	0.42	1.05

Note: Methane gas generation under well managed deep landfill is higher than poor managed shallow landfill because the presence of oxygen in deep landfill is lower than the shallow landfill. However, methane emissions from the well managed deep landfill can be avoided by collecting methane gas generated for energy use or flaring.

Example of urban organic waste utilization projects in Cambodia and Thailand

Market waste composting in Phnom Penh, Cambodia

Sell crops to market → Collection of organic waste from food market

5 tons/day

Transportation to composting facility

Composting

Screening

Sell compost to farmers
75 USD/ton

Use compost for cultivation

≈1.4 ton CO_2 emission reduction per day

Bangkok Composting project, Thailand

Consumption → Municipal solid waste

1,000 tons/day

Waste screening at composting plant

Fermentation in vessel

Maturity of compost

Sell compost to farmers
62.5 USD/ton

Use compost for cultivation and gardening

Sell crops product to market → Municipal solid waste

Consumption

≈455 ton CO_2 emission reduction per day

Wood waste composting in Bangkok, Thailand

Wood waste from public area

Composting plant

Investment and operation by BMA

Mixed with toilet wastewater from time to time

Compost used for greenery area

Food waste digester at Wat Pradudhammathipat School, Bangkok

School lunch

Food waste in school

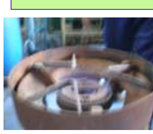
Food waste digester

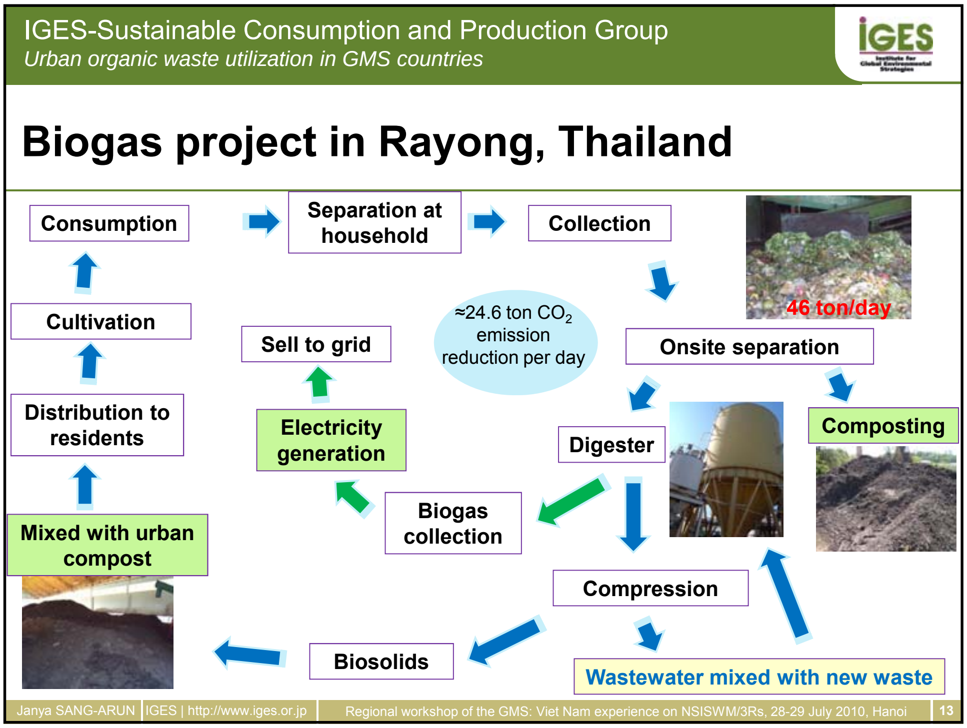
Effluent is collected by a school technical officer

Used at a sugar cane farm

Biogas collection

Use biogas for cooking school lunch

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Biogas project in Rayong, Thailand
Consumption
Separation at household
Collection
46 ton/day
Cultivation
Sell to grid
≈24.6 ton CO_2 emission reduction per day
Onsite separation
Distribution to residents
Electricity generation
Digester
Composting
Biogas collection
Mixed with urban compost
Compression
Biosolids
Wastewater mixed with new waste
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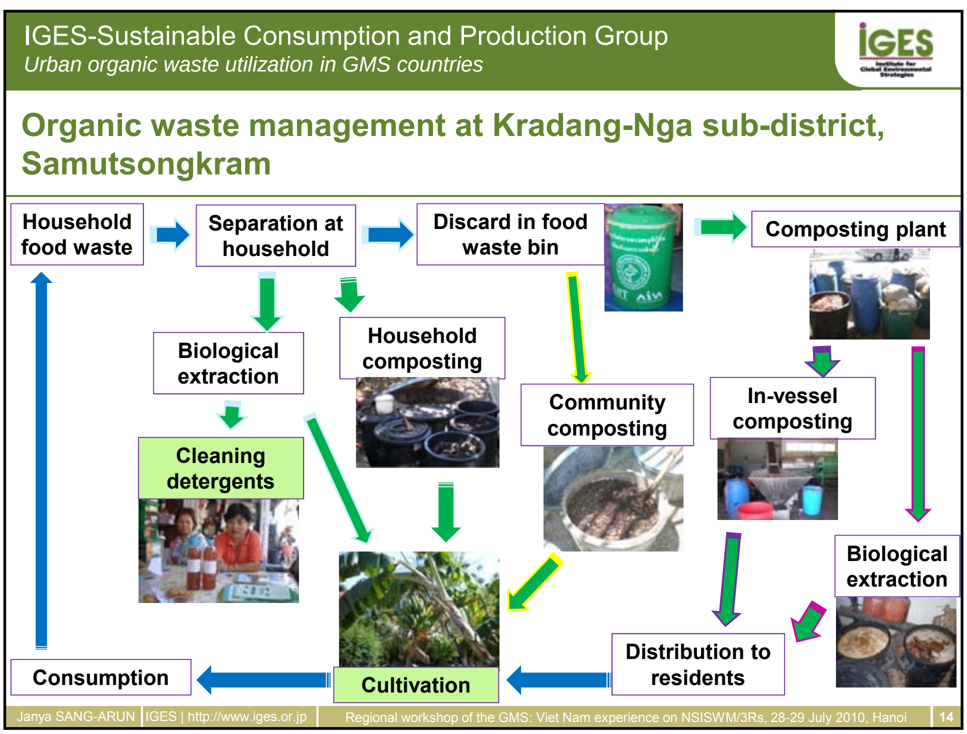
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Organic waste management at Kradang-Nga sub-district, Samutsongkram
Household food waste
Separation at household
Discard in food waste bin
Composting plant
Biological extraction
Household composting
Community composting
In-vessel composting
Cleaning detergents
Biological extraction
Consumption
Cultivation
Distribution to residents
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Challenges and obstacles disrupting scale up and extension of urban organic waste utilization projects

Challenges	Composting at Phnom Penh	Composting at Bangkok	Biogas at Rayong
Capital investment	√	√	√
Maintenance and operation cost	√	√	√
Quantity of waste input	√	√	√
Quality of waste input	√	√	√
Efficiency of waste separation	√	√	√
Cooperation with residents and communities	√	-	√
Cooperation with waste collector	√	-	√
Cooperation between local governments and facility operator	√	√	√
Quality of products	√	√	√
Dependent on marketing of products	√	-	-
Change in policy	√	-	√
Termination of contract	-	√	√

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Policy recommendations

- Increase accessibility to capital investment.
- Strong support by local governments: land, budget, policy, etc.
- Starting with small scale but preparing for extension and scaling up.
- Active cooperation among relevant stakeholders: facility operator, local government, waste collector, and residents.
- Starting separation at source program with large waste generators such as market, restaurants, hotel, schools.
- Improving waste collection system suited with waste separation program.
- Conducting stakeholder consultation from time to time to identify problems and solutions for better management.
- Improving market compatibility through quality control of waste input and product output.

Conclusions

- Urban organic waste utilization project can generate multiple benefits to various stakeholders includes reduce waste flow to landfill, improve sanitary condition of the city, produce compost for farmers, generate biogas for energy use, creating job for both skillful and skill less labors, etc.
- Urban organic waste utilization should be promoted in this region, however modification to suit with local condition are recommended.
- External supports may be required for infrastructure development, institutional setting and starting up of activities.
- Benefits sharing among stakeholders are a key of success especially where local governments have only little money for this activity.

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