



Technical challenges and opportunities for improvement of organic waste management in developing Asia

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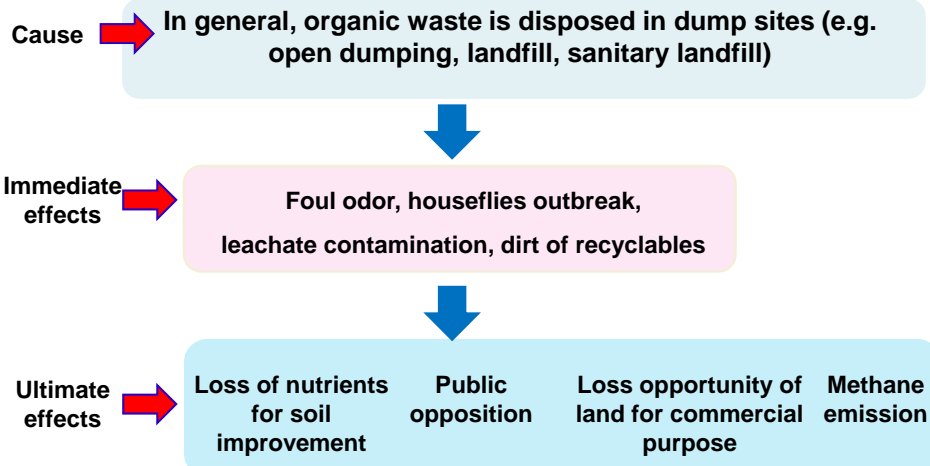
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Organic waste



Organic waste in developing Asia

- **Organic waste is the largest waste composition in developing Asia (52% food, 12% paper on average)**
- **Quantity of organic waste is increasing due to rapid growth of urban population and waste generation**
- **Organic waste does not provide direct hazards to human being but it generates public nuisance (e.g. foul odor, leachate contamination, be a food source of disease carriers)**
- **Degradation of organic waste under anaerobic condition generates a significant amount methane which contribute to global warming**

Common practice for organic waste management



GHG emissions from landfills of organic waste in developing Asia

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	5.6	3.0 - 7.4
Bangladesh	1.31		2.1 – 5.1
Thailand	0.41		5.3 - 13.5
Lao PDR	0.24**		No data
Cambodia	0.124		0.12 – 0.34

How to improve organic waste management practice in developing Asian countries?

- Reducing waste generation by promoting waste minimization, reuse and recycle
- Enhancing organic waste separation for utilization (e.g. animal feed, composting, anaerobic digestion)

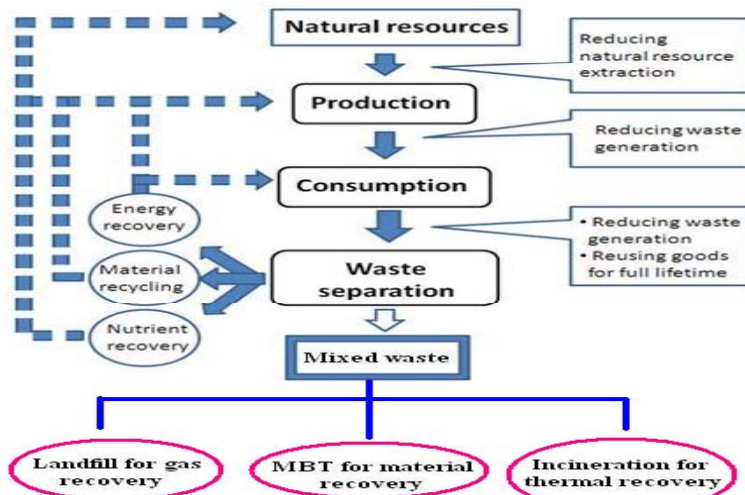


Reduce waste flow to disposal sites



Reduce cost for waste collection, transportation and disposal,
Reduce environmental impacts, avoid GHG emissions, etc

How can the 3Rs reduce GHG emissions and enhance resource efficiency?



Challenges of the 3R technology transfer for organic waste management

- **Commitment of decision makers and operators**
 - To ensure successful implementation both in short term and long term
- **Participation of residents and relevant stakeholders**
 - To ensure quality and quantity of waste inputs
- **Budget constrain**
 - To ensure continuous implementation and maintenance of the facility

Challenges (2)

- **Personnel skill and technical issue**
 - To ensure smooth operation of the facility and modifications of technology
- **Policy and legal supports**
 - Overall successful of the implementation
 - It should be included either incentive or disincentive

Opportunities for the 3R technology transfer in developing Asia

1) National policy toward the 3Rs exists

- **Waste management policy**
 - National 3R strategies, integrated solid waste management
 - Philippines, Malaysia, Viet Nam, China, Cambodia, Bangladesh, Indonesia, Thailand, etc.
- **Climate change policy**
 - Avoiding GHG emission from the waste sector
 - China, India, Indonesia, Thailand and the Philippines, etc

Opportunities (2)

- **Energy policy**
 - Alternative energy → waste-to-energy
 - Bangladesh, China, India, Indonesia, Thailand, etc
- **Agriculture policy**
 - Ecological agriculture → organic fertilizer
 - Cambodia, China, India, Indonesia, etc

Opportunities (2)

2) Potential revenues

- Carbon market is an alternative financial source, but its procedure is time consuming and costly. In addition, it requires many specific data input.
- Some governments provide feed-in-tariff to enhance the 3R implementation
 - ❖ Waste-to-energy projects in China and Thailand
- Sale of products
 - ❖ Compost, biogas, electricity, recyclables

Opportunities (3)

3) Privatisation of waste management

- Involvement of private sector is an alternative for local governments that lack of budgets and personnel skills.
- Many countries involve the private sector to waste management (e.g., Cambodia, Laos, Malaysia, Thailand)
- Supporting mechanism is required to enhance the investment of private sector
 - Access to financial source with low interest rate
 - Government supports on awareness raising and waste collection systems to ensure quality and quantity of waste input
 - Channel for marketing of products

Suggestions for technology transfer

- Technology transfer should include both **software** (e.g. public management, waste collection system) and **hardware** (technology and facility operation and maintenance)
 - Many waste management projects failed due to substandard of waste input
 - Lack of public participation on waste separation at source
 - Lack of efficient waste collection system
 - Sometimes, technology that transfer to developing countries is too advance and expensive
 - Lack of skill and budget for maintenance, thus most of its lifetime is shorter than expected

Suggestion (2)

- In developing Asia, priority of the software should be higher than the hardware
 - Increase awareness of the authority and relevant stakeholders
 - Building capacity of local authority, especially on public participation
 - Cultivate positive attitude to residents
 - Create employment opportunities and indirect income generation local stakeholders
 - Improve efficiency of waste collection and transportation system to ensure quality and quantity of waste input to the facility

Suggestion (3)

- The exporting technologies should be tested and modified according to local conditions
 - Small scale pilot test is encouraged during the beginning of technology transfer , and scaling up once it is successfully implemented
 - Close and continuous collaboration between the technology transferring country and the developing country (e.g. training, monitoring)
 - Programmatic (automatic) process may not be suitable for developing countries as it is expensive and requires high skill of personnel for maintenance
 - Recently, Chinese technology seems to be much preferable to the local governments as it is cheap and easy to operate with compare to the Japanese and European technologies

Suggestion (4)

- Technology transfer should not be used as a tool for income generation for developed countries nor sell of technology to developing countries without concerns of local condition
 - Often, >10% of total budget of technology transfer was allocated for international expert (excluding transaction cost)
 - Sometimes, the technology is not suitable for local condition and over-designed

THANK YOU FOR YOUR ATTENTION