Win-win solutions for climate change and waste management: Focusing on co-benefits

Yasuhiko Hotta, Senior Policy Analyst
Janya SANG-ARUN, Policy Researcher

Presentation outline

• Solid waste management and GHGs Emissions
• GHG Emissions from waste management in GMS countries
• Climate benefits from 3R approach
• CDM
• Conclusion
SOLID WASTE MANAGEMENT AND GHG EMISSIONS

Solid waste management in GMS countries

- Open dumping and burning are common practices in many cities.
- Most of the disposal sites are not well developed.
- These practices can lead to environmental and health impacts on local residents, release GHGs to atmosphere and discourage efficient use of resources.
Source of GHG emissions from 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 Waste sector.)

3) Energy used for collection, recycling and others are also a source of GHG. And agricultural waste is categorized in emissions from agricultural, forestry and other land use.
Waste composition in GMS countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Food</th>
<th>Paper</th>
<th>Plastic</th>
<th>Metals</th>
<th>Glass</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambodia</td>
<td>66</td>
<td>3</td>
<td>14</td>
<td>1</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>China</td>
<td>50</td>
<td>15</td>
<td>10</td>
<td>3</td>
<td>3</td>
<td>19</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>60</td>
<td>15</td>
<td></td>
<td></td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>Thailand</td>
<td>64</td>
<td>8</td>
<td>17</td>
<td>2</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>49</td>
<td>2</td>
<td>16</td>
<td>6</td>
<td>7</td>
<td>20</td>
</tr>
</tbody>
</table>

GHG emissions from landfills of organic waste in GMS countries

<table>
<thead>
<tr>
<th>Country</th>
<th>GHG emissions in Million ton CO2 equivalent/year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1994</td>
</tr>
<tr>
<td>China</td>
<td>42.6</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>1.39</td>
</tr>
<tr>
<td>Thailand</td>
<td>0.41</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>0.24**</td>
</tr>
<tr>
<td>Cambodia</td>
<td>0.124</td>
</tr>
<tr>
<td>Myanmar</td>
<td>No data</td>
</tr>
</tbody>
</table>

Note: * Present estimation is based on waste generation and composition that we could obtained through secondary source of data. Lower value represents potential emissions from landfills of food and paper in shallow-unmanaged landfill and the higher value represents its emissions from deep-well managed landfills.

** 1990
CLIMATE BENEFITS OF THE 3R APPROACH

How to improve solid waste management in GMS countries with co-benefits on climate change and resource efficiency?

- Reducing waste generation by promoting waste minimization, reuse and recycle
- Enhancing organic waste separation for utilization (e.g. animal feed, composting, anaerobic digestion)
- Avoiding burning of plastic waste by establishing waste recycling business

Reduce waste flow to disposal site

Reduce cost for waste collection and disposal, Reduce environmental impact, avoid GHG emissions, etc
How can the 3Rs reduce GHG emissions and enhance resource efficiency?

Climate benefits of 3Rs in various sectors

<table>
<thead>
<tr>
<th>Sectors</th>
<th>Climate co-benefits</th>
</tr>
</thead>
</table>
| Waste                       | - Reduced methane emissions from landfill  
                              - Reduced carbon dioxide emissions from burning of plastics  |
| Energy and transport        | - Reduced emissions from energy use in the process of resource extraction, agriculture, good production and distribution, and waste transportation and treatment  
                              - Reduced emissions from fossil fuels by using energy recovered from waste  |
| Industry                    | - Reduced emissions from industrial processes by reducing product demand  
                              - Reduced emissions from chemical fertilizer production  |
| Agriculture                 | - Avoided nitrous oxide emissions from farmland by reducing use of chemical fertilizer  
                              - Increased soil carbon sequestration  |
| Land use change and forestry| - Reduced emissions from mining and deforestation  |
How much can 3Rs reduce GHG emissions?

- **Direct emissions from SWM**
  - 20-98% reduction by composting and 60-100% by anaerobic digestion of food waste (compared to landfill).

- **Indirect GHG reductions**
  - 94% by recycling of plastic.
  - 80% by recycling of steel.
  - 56-64% by using 50% recycled aluminum.
  - 22% by increasing use of recycled glass from 25% to 59%.

---

National climate change action plan and 3Rs

<table>
<thead>
<tr>
<th>Country</th>
<th>Mention of the waste sector</th>
<th>Mention of 3Rs</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>Yes</td>
<td>Yes</td>
<td>NCCCCC, 2007</td>
</tr>
<tr>
<td>Thailand</td>
<td>Yes</td>
<td>Yes</td>
<td>ONEP, 2008</td>
</tr>
<tr>
<td>Cambodia</td>
<td>No</td>
<td>No</td>
<td>MOE, 2002</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>No</td>
<td>No</td>
<td>STEA, 2000</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>No</td>
<td>No</td>
<td>MNRE, 1999</td>
</tr>
</tbody>
</table>
CDM

Clean Development Mechanism and urban waste management

- CDM is an alternative financial source, but its procedure is time consuming and requires many specific data input. Also, it is one-time/project-specific.
- Projects that have been registered to CDM
  - Composting
  - Anaerobic digestion
  - Landfill gas recovery
  - Landfill gas flaring
  - Controlled combustion
  - Refuse derived fuel (RDF)
- Market mechanism for Post 2012 is not fixed yet.
Conclusions

- 3Rs is an approach to achieve sustainable solid waste management because it could enhance resource efficiency and also avoid greenhouse gas emissions.

- National government should emphasize the 3Rs as a climate change mitigation measure, as it could contribute to GHG emission reduction from various sectors.

- There is possibility that waste utilization projects can receive additional financial revenue through the CDM, however it is a time consuming process.

Acknowledgement & publication

• This presentation is an outcome of the project financially supported by the Ministry of Environment Japan and the Asia Pacific Network for Global Change Research

• Further reading can be downloaded from http://www.iges.or.jp/en/wmr/report.html