Waste Management unlocking Climate Protection Potentials - Lessons from India

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German Environment Agency,
Unit III2.4 Waste Technology, Waste Technology Transfer
Around 1,500 employees in 13 locations, 7 of which are monitoring stations of our own air quality monitoring network.
# Project Overview

**Title**  
*Resource and Climate Protection through Integrated Waste Management Projects in Emerging Economies and Developing Countries – Example India*

**Commissioned by**  
*German Environment Agency (UBA)*

**Contractors**  
ifeu – Institute for Energy and Environmental Research, Germany  
Development Alternatives (DA), New Delhi, India  
ecoparadigm, Bangalore, India

**Duration**  
October 2015 – June 2018

**Aim**  
Support decision-makers in identifying the potential to reduce greenhouse gas (GHG) emissions in the Solid Waste Management (SWM) sector  

*Integrated climate- and environmental-friendly waste management*

**Method**  
*Life Cycle Assessment (LCA)* method specifically for the waste sector  

allows to include contributions of the waste sector, which in the National Inventory Reports (NIR) are accounted for in sectors like industry, energy etc.
Cities selected for the Study

Cluster 3-8 mill. inhab.
Example: Bangalore

Cluster 1-3 mill. Inhab.
Example: Bhopal

Cluster 0.1-1 mill. Inhab.
Example: Haridwar

Important selection criteria was the availability of data
198 wards in 8 zones

BANGALORE

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30 wards in 4 zones
### Summary of basic data and information

<table>
<thead>
<tr>
<th>BANGALORE</th>
<th>BHOPAL</th>
<th>HARIDWAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>State</td>
<td>Karnataka</td>
<td>Madhya Pradesh</td>
</tr>
<tr>
<td>Population 2011</td>
<td>8.5 mil.</td>
<td>1.8 mil.</td>
</tr>
<tr>
<td>Climate Zone 2)</td>
<td>tropical winter dry</td>
<td>tropical winter dry</td>
</tr>
<tr>
<td>Waste Generation (calc. basis)</td>
<td>0.5 kg/cap/d 1,460,000 t/a</td>
<td>0.4 kg/cap/d 292,000 t/a</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>HARIDWAR 1</th>
<th>BHOPAL 2</th>
<th>BANGALORE 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food /green waste</td>
<td>44%</td>
<td>46%</td>
<td>53%</td>
</tr>
<tr>
<td>Hay, straw, leaves</td>
<td>6%</td>
<td>22%</td>
<td></td>
</tr>
<tr>
<td>Paper &amp; cardboard</td>
<td>5%</td>
<td>11%</td>
<td>13%</td>
</tr>
<tr>
<td>Plastic (incl. PE)</td>
<td>8%</td>
<td>6%</td>
<td>12%</td>
</tr>
<tr>
<td>Textiles</td>
<td>10%</td>
<td>1%</td>
<td>4%</td>
</tr>
<tr>
<td>Glass</td>
<td>0.1%</td>
<td>1%</td>
<td>3%</td>
</tr>
<tr>
<td>Inert (sand, debris, fines)</td>
<td>24%</td>
<td>10%</td>
<td>5%</td>
</tr>
<tr>
<td>Metal</td>
<td>0.1%</td>
<td>2%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Wood</td>
<td>0.4%</td>
<td>0.5%</td>
<td>6%</td>
</tr>
<tr>
<td>Others</td>
<td>2%</td>
<td>0.4%</td>
<td>4%</td>
</tr>
</tbody>
</table>

1) CENSUS OF INDIA,  
2) Köppen-Geiger Classification [HTTP://KOEPPEN-GEIGER.VU-WIEN.AC.AT/PRESENT.HTM](http://KOEPPEN-GEIGER.VU-WIEN.AC.AT/PRESENT.HTM)
HARIDWAR

STATUS QUO

SWM facility

partly supported by JNNURM

SCENARIO

10 July / IFAT Africa 2019 Reduce, Reuse, Recycle, Recover: Waste Management can foster Climate Protection
GHG results – HARIDWAR

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Informal Collection?

On-site Treatment, NGOs, private Sector

BANGALORE

10 July / IFAT Africa 2019 Reduce, Reuse, Recycle, Recover: Waste Management can foster Climate Protection
Informal Collection?

SCENARIO MBT

MSW generated by Bulk Producers?

On-site Treatment, NGOs, private Sector?
GHG results – BANGALORE

10 July / IFAT Africa 2019 Reduce, Reuse, Recycle, Recover: Waste Management can foster Climate Protection
Extrapolation for urban India

<table>
<thead>
<tr>
<th>Cluster</th>
<th>&gt; 3 million</th>
<th>1-3 million</th>
<th>0.1-1 million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of towns</td>
<td>10</td>
<td>34</td>
<td>424</td>
</tr>
<tr>
<td>Cumulated population towns</td>
<td>61,100,000</td>
<td>49,400,000</td>
<td>84,100,000</td>
</tr>
<tr>
<td>Specific GHG net results in kg CO\textsubscript{2}eq per capita:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Status quo</td>
<td>62</td>
<td>95</td>
<td>75</td>
</tr>
<tr>
<td>Scenario 2</td>
<td>-44</td>
<td>-28</td>
<td>-55</td>
</tr>
<tr>
<td>GHG mitigation potential</td>
<td>-106</td>
<td>-124</td>
<td>-130</td>
</tr>
<tr>
<td>GHG mitigation potential [t CO\textsubscript{2}eq/a]</td>
<td>-6,500,000</td>
<td>-6,100,000</td>
<td>-10,900,000</td>
</tr>
<tr>
<td>Share in % of total</td>
<td>28%</td>
<td>26%</td>
<td>47%</td>
</tr>
</tbody>
</table>

SOURCE POPULATION: CENSUS OF INDIA 2011
Specific conclusions

- India faces major challenges due to rapid growth and change in lifestyle
- Indian SWM rules provide supportive framework, but implementation remains a challenge

- Improved (source) segregation is key to advance in waste management (high recycling rates and quality products, energy yield) and to make technologies work to their best

- Waste data matters!
- Infrastructure development support by climate finance requires quantification of GHG mitigation potential

Making use of climate finance support mechanisms:

- National Appropriate Mitigation Action (NAMA) on Waste supported by the NAMA Facility under final preparation
General conclusions

● Organization of waste management on local level
● Vertical integration between local and national government
● Setting the right framework conditions for cities and waste management

● Polluter-pays-principle and financial sustainability
● Increase the costs for landfill (tax, charge...), consider product charges.....
● Support project preparation phase and infrastructure development
● Improve access to finance through banks, specialized funds
Some general conclusions

Waste management in smaller cities (>1 million inhab.?) can contribute to GHG mitigation on national scale when supported appropriately

- Appropriate affordable technology (composting, separation...)
- Involvement of local community and workers
- Support development of technical and financial proposals
- Bundling of many project proposals into a larger portfolio, maybe blending with less-risk infrastructure projects to achieve (climate) finance support and better conditions
- Technical agency/body to support capacity of cities to develop projects
- Capacity building and specialized advise in banking sector or through agency/body to improve bankability of projects
- Capacity to assess, distribute and control financial support to smaller projects from a larger portfolio
References

SOURCE OF GRAPHICS, TABLES, DIAGRAMMES AND DATA AND INFORMATION:

UBA TEXTE | 05/2019
RESOURCE AND CLIMATE PROTECTION THROUGH INTEGRATED WASTE MANAGEMENT PROJECTS IN EMERGING ECONOMIES AND DEVELOPING COUNTRIES – EXAMPLE INDIA
and
UBA TEXTE | 06/2019
ANNEX TO THE FINAL REPORT:
RESOURCE AND CLIMATE PROTECTION THROUGH INTEGRATED WASTE MANAGEMENT PROJECTS IN EMERGING ECONOMIES AND DEVELOPING COUNTRIES – EXAMPLE INDIA
Januar 2019
Regine Vogt, Andrea Stubbusch, K. Vijaya Lakshmi, Kavya Arora, Achu R. Shekhar, Krishna Chandran, K P Pravinjith, Ayeesha Khanam

https://www.umweltbundesamt.de/publikationen/resource-climate-protection-through-integrated
https://www.umweltbundesamt.de/publikationen/annex-to-the-final-report-resource-climate-
Thank you for your attention!

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