The contribution of the Indo-German bilateral cooperation project on Resource Efficiency to India’s fledgling effort in promoting C&D Waste recycling

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GIZ-India
Construction industry situation in India

- Highest material consuming sector
- Already facing resource constraints, price shocks, environmental bans

Projected Growth of Building Sector In India

Indo-German “Resource Efficiency” project

- Indo-German Bilateral Cooperation between German BMUB and Indian MoEFCC
- Implemented by GIZ-India (2014-2017)
- Partners
  - German knowledge partners
    - VDI
    - ifeu
  - Indian knowledge partners
    - teri
    - Development Alternatives
- Selected Sectors
  - Mobility
  - Construction
- Indian Resource Panel
In-depth studies of CDW sector

Market study of C&D sector

Resource use in construction sector
C&D waste generation and fate in India

- About 10-30% of CDW is currently utilized as:
  - Fraction of immediate market value (metals, frames, etc.)
  - Debris for backfilling
- Rest is illegally dumped or disposed in landfill
- Myriad environmental problems (in addition to resource loss)

<table>
<thead>
<tr>
<th>City</th>
<th>Population (Census 2011)</th>
<th>CDW Generation (T/Day)</th>
<th>CDW Generation (Million T/Annum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater Mumbai</td>
<td>12,442,373</td>
<td>2,500</td>
<td>0.750</td>
</tr>
<tr>
<td>Delhi</td>
<td>16,787,941</td>
<td>4,600</td>
<td>1.380</td>
</tr>
<tr>
<td>Kolkata</td>
<td>4,496,694</td>
<td>1,600</td>
<td>0.480</td>
</tr>
<tr>
<td>Chennai</td>
<td>4,646,732</td>
<td>2,500</td>
<td>0.750</td>
</tr>
<tr>
<td>Bangalore</td>
<td>8,749,944</td>
<td>875</td>
<td>0.263</td>
</tr>
<tr>
<td>Jaipur</td>
<td>3,471,847</td>
<td>200</td>
<td>0.060</td>
</tr>
<tr>
<td>Patna</td>
<td>2,514,590</td>
<td>225</td>
<td>0.060</td>
</tr>
<tr>
<td>Ahmedabad</td>
<td>6,063,047</td>
<td>700</td>
<td>0.210</td>
</tr>
<tr>
<td>Bhopal</td>
<td>1,917,051</td>
<td>50</td>
<td>0.015</td>
</tr>
<tr>
<td>Coimbatore</td>
<td>2,618,940</td>
<td>92</td>
<td>0.028</td>
</tr>
</tbody>
</table>

Nearly 4.5 million tonnes/annum in only 10 cities!

C&D waste utilization in India

Construction and Demolition Waste Rules 2016 MoEFCC

2000 + 500 TPD Delhi plants (since 2009/2015)

300 TPD Ahmedabad plant (since 2014)

Market acceptance challenge!
Mapping CDW sites and related industry clusters in Ahmedabad

C&D waste pilot intervention in Ahmedabad

MoU between GIZ, DA and AEP* (18 May 2016)

- Support for product and process improvement
- Support for product certification and green marketing

* Amdavad Enviro Projects Pvt. Ltd.
Quality (strength) testing of products made from AEP recycled aggregates

Comparison of Compressive Strength (N/mm²) – Natural aggregate product vs C&D aggregate product

M50 grade paver blocks

Source: Trail mix designs developed at DA lab facilities and tested at IIT Delhi
Certification of C&D waste based products made by AEP

- ICMQ accredited in EU for third-party certification of a wide range of green products
- Certification as per ISO protocol
- Environmental Product Declaration (EPD) claims validation - e.g. recycled content
- “Get it Green” certification of recycled content achieved for M30 Paver Block line
Listing of certified products in GRIHA Product Catalogue

- High visibility/publicity
- High credibility
- Government recognition
- Advantage in adopting listed products

New (improved) product development at AEP

- **Upgradation of existing products**
  - 10% cost reduction of M30 grade paver block
  - Improved mix design approved and adopted by AEP

- **Development of new products**
  - M50 grade paver blocks developed
  - Application of aggregates in concrete frames and windows
  - Application of clay and silt waste in manufacture of compressed earth blocks
Savings from RE project interventions

- **AEP achieved 10% cost savings** on M30 Paver Block Line (highest selling product)
- **Annual savings from AEP design mix changes:**
  - resources: 3,000 tonnes
  - CO$_2$: 7 tonnes
- **Annual savings from AEP certified product sales:**
  - resources: 469 tonnes
  - CO$_2$: 3.7 tonnes
- **If Bangalore (2,000 TPD generation) recycles 50% of its CDW:**
  - annual resource savings: 300,000 tonnes
  - annual CO$_2$ savings: 2,400 tonnes
Capacity Development interventions: Municipalities

- Training Manual on CDW Management for Municipalities developed
- Includes complete Tendering Template as supplement
- Manual covers:
  - government regulations (CDW Rules 2016)
  - feasibility study
  - land requirements
  - financial model
  - collection, transportation, monitoring
  - tendering
  - processing and utilisation
  - public procurement

Assistance in developing CDW Plans for Bangalore, Tirupati, Mumbai, Kolkata
CDW Management Model developed for Indian Municipalities
Capacity Development workshops

Bhopal  
Ahmedabad  
Kolkata

250+ officials trained covering 50+ cities and towns!

Training Modules handed over to designated training institutes!
Capacity Development interventions: Industry

- Training Module developed for existing building industry as well as for potential entrepreneurs

- Training Module covers:
  - deconstruction and on-site reuse
  - land requirements for processing facility
  - technology and equipment
  - financial analysis of business cases
  - products made from CDW
  - certification, eco-labelling and green marketing

<table>
<thead>
<tr>
<th>Product</th>
<th>Unit</th>
<th>Virgin Product</th>
<th>Recycled Product</th>
<th>Price Difference (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blocks, Bricks and Pavers (M25)</td>
<td>Brass (100sq.ft)</td>
<td>2,500</td>
<td>2,200</td>
<td>12.00%</td>
</tr>
<tr>
<td>Kerb</td>
<td>Piece</td>
<td>40</td>
<td>35</td>
<td>12.50%</td>
</tr>
<tr>
<td>Modular Toilet</td>
<td>Piece</td>
<td>20,000</td>
<td>18,000</td>
<td>10.00%</td>
</tr>
<tr>
<td>Digester (200 L)</td>
<td>Piece</td>
<td>30,000</td>
<td>25,000</td>
<td>16.67%</td>
</tr>
<tr>
<td>Precast Wall</td>
<td>Running Metre</td>
<td>4,550</td>
<td>3,500</td>
<td>23.00%</td>
</tr>
</tbody>
</table>
Key learnings

• Decentralised or centralised C&D waste processing and utilisation should be promoted depending on the circumstances.
• Preferential public procurement is essential for business model.
• A certification system is key for market acceptance of products.
• Capacity building of all stakeholders is essential (especially in light of India Govt. deadlines).
Acknowledgements

Thank You!

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