Tapping Resource Efficiency Potentials in India

Development Alternatives Group

Climate Change - Extractive Industries - Resource Efficiency @ COP23

8th November 2017
Shift To An Urbanized World
20th Century -- The Great Acceleration

- **Annual Extraction:**
  - Ores and minerals: 27 X
  - Fossil fuels: 12 X
  - Biomass: 4 X
  - Construction materials extracted: 34 X

- **Total material extraction:** 8 X
- **GHG emissions:** 13 X
- **Growth of population:** 3.7 X
Material Consumption by Region

Ref: SERI
Resource Metabolism – India and the World
India’s Future Material Consumption

Abiotic materials will dominate India’s future material consumption

Ref: IFEU

Raw Material Consumption By Construction Sector In India

India’s Future Material Consumption

Ref: IFEU
Drivers of Demand for Construction Materials in India:

- **Rapidly Urbanization**
- **Massive housing deficit**
  - Urban: 18 million
  - Rural: 44 million

... and *growing*

Ref: Climate Works Foundation
Which abiotic materials we need to fulfill the demand?

- **Cement**
  - Limestone, Gypsum, Fossil Fuel – *Cannot be recycled, need alternatives*

- **Concrete**
  - Cement and Aggregates – *Can be recycled*

- **Steel**
  - Domestic Mines

- **Wood**
  - Domestic Forests

- **Aluminum**
  - Domestic Mines

High Recyclability Potential
World Cement Production -- Projections

Ref: CEMBUREAU
Global CO₂ Emissions From Clinker Production

Ref: Own Calculations
Availability of Materials for Cement Production in India

**Limestone:** Post 2017, the life of available cement grade limestone reserves is approximately **35-41 years** in India (Ministry of Commerce and Industry, 2011)

**Gypsum:** No estimates available

**Fly Ash:** About **40% of fly ash** generated in India is used by cement plants. No significant increase in utilization after 2011 (CEA, 2016)

**Slag:** Comprises only **8%** of total cement production of India (Rajya Sabha Secretariat, 2011)
An Example of Resource Efficient Cement

Limestone Calcined Clay Cement LC^3

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What is LC³?

- 50% Resource Savings
- 30% less CO₂ (LCA analysis of Actual Plants)
- Similar strength (as per the tests conducted in various institutes in 3 countries)
- Uses Waste Materials
Suitable clay for LC$^3$ is a mine waste

Waste clay in Nadapa, Bhuj, Gujarat
LC\textsuperscript{3} Applications

Demonstration Building made with LC\textsuperscript{3} in DA premises in India

Building made with LC\textsuperscript{3} AAC blocks - Swiss Embassy, India

Road made with LC\textsuperscript{3} in New Delhi

Pre-Cast Slab made with LC\textsuperscript{3} - Noida

Kerb Stones made with LC\textsuperscript{3} - Jhansi

Blocks made with LC\textsuperscript{3} - Ghaziabad
GIS Data (from DA’s analysis) shows:

- Locations of cement plants
- Clay mines
- Thermal power plants
- Ports and railway stations

- Nearest clay and fly ash sources

- Options for potential LC$^3$ plants locations
Potential Impact of LC³ Technology

<table>
<thead>
<tr>
<th>Year</th>
<th>Global cement production Billion tons/year</th>
<th>Clinker factor, global average %</th>
<th>Global SCM volume Billion tones/year</th>
<th>Global CO₂ reduction Million tones/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>2.6</td>
<td>79</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>2050 Without LCC (CSI Study)</td>
<td>4.4</td>
<td>73</td>
<td>1.2</td>
<td>200</td>
</tr>
<tr>
<td>2050 With LCC (EPFL Estimate)</td>
<td>4.4</td>
<td>60</td>
<td>1.8</td>
<td>600</td>
</tr>
</tbody>
</table>

2009 Cement Roadmap
IEA (International Energy Authority)
study for CSI of WBCSD

Global potential of LC³
Δ = 400 million tonnes per yr

Can replace whole of need for Carbon Capture
in low demand scenario

> whole of CO₂ emissions of France
Challenges for LC$^3$ in India

- Standardisation of Cement so that it can be commercially produced.
- Convincing the cement Industry to adopt solutions which cut CO$_2$ emissions and resource use at the source rather than going in for end of pipe solutions such as CCS.
- Business Case for LC$^3$.
- Very few industries have technical capacities of clay calcination.
The LC³ Consortium

Supported by

Lead by

Partners in India

Partner in Cuba

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C&D waste generation has a direct correlation with population

Projected C&D waste generation in urban India is estimated to be 2700 million tons in 2041
Supporting Medium Scale Industries for C&D Waste

DA and GIZ supported a local C&D processing enterprise ‘Ahemdabad Enviro Projects Ltd. In product development and green certification

Enterprise achieved 10% cost savings on M30 paver block line (highest selling product) from product research conducted by Development Alternatives
Training Urban Local Bodies on C&D

- 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
Training Urban Local Bodies and Industries on C&D Waste

Bhopal

Ahmedabad

Kolkata

Separate workshops for municipalities and entrepreneurs
40 ULBs from across 3 states inducted on C&D waste management rules and best practices for its management
Life cycle analysis of C&D waste processing V/s natural stone processing suggest that 21% of CO$_2$ savings can be achieved from processing 1 ton of C&D waste.

*(LCA conducted using actual plant data from C&D waste enterprise and a stone crushing enterprise)*

Enterprise in Ahmedabad saves 300 Tons of virgin aggregates per day by recycling CDW; This translates to savings of **60,000 tonnes of natural resources** and 120 tons of CO$_2$ *(considering 200 days of working in a year)*
Challenges for C&D Waste in India

- Limited knowledge of most of the ULBs in India on productive management of C&D waste.
- Selling C&D waste products is difficult for entrepreneurs due to weak market demand.
- Very few players in the domestic market with experience of C&D waste processing.
- Limited capacities of labs and recognized institutes to test and certify resource efficiency and quality of a green product.
- Limited awareness of potential entrepreneurs about business viability of C&D waste processing.
Enabling Policies for Resource Efficiency in India

**National Mineral Policy:**
Includes zero-waste mining as a national goal

**National Housing and Habitat Policy, 2007 & Pradhan Mantri Aawas Yojna, 2017:**
Emphasize on Ecological Design Standards for Building Components, Materials and Construction Methods

**Waste Management Rules; Fly ash Notification; Clean India Mission; IS Codes for waste utilisation:**
Promotes EPR and polluter pays principal and enforces use of industrial wastes

**Make in India Campaign & Zero Effect-Zero-Defect Scheme:**
Provide assistance to energy efficient, water efficient and pollution control technologies through Technology Acquisition and Development Fund (TADF)

**Eco Labeling Scheme; GRIHA Product Certification; LEED India:**
Provide credibility and consumer acceptance to green products

Ref: InRP
Barriers for Resource Efficiency in India

✓ Product standardisation.

✓ Viable business models and fiscal measures to fill the viability gaps.

✓ Limited awareness and technical capacities of stakeholders on resource efficiency.

✓ Limited market for resource efficient products and technologies.

✓ Limited science based evidences on Resource Efficiency status of India.

✓ No national policy on resource efficiency.

✓ Institutionalization of Resource Efficiency at National Level.
Addressing the Barriers - India Resources Panel (InRP)

- InRP is the first National Resource Panel in the world
- Consist of 9 eminent experts on RE from Government, Industry and Civil Society
- Nodal point for resource efficiency policy recommendations and formulation at national and state level based on evidence based scientific studies
Policy Brief on RE Developed by InRP

Accepted as Strategy Paper on RE by NITI Aayog (India’s National Planning Commission)
Recommendations of Strategy Paper

Promotion - Eco-labelling standards, technology development, green public procurement, RE industrial cluster development and awareness

Regulation, economic instruments – viability gap funding, policy reforms across life cycle stages

Institutional development – capacity development, institutional set-up and strengthening, database and indicators, resource index as a part of economic survey

What can be done

- Commissioning technical studies at city, state and national levels to influence policies and standards
- Awareness Campaigns, Trainings, workshops for all stakeholders at national and state level.
- Resource Efficient technology transfer to under-developed/developing countries
- Resource Efficient Technology sourcing from other countries
Resource Efficiency Project

“Fostering Resource Efficiency and Sustainable Management of Secondary Raw Materials”

As part of the International Climate Initiative (IKI) by BMUB

With the support of MoEF&CC

Implemented by: giz
of the Federal Republic of Germany

Knowledge Partners
ifeu teri Development Alternatives

Consultant adelphi
Development Alternatives Group Headquarters: 2007
Building constructed with compressed earth blocks and fly ash bricks, using products of TARA technology
Thank you
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