



This project is funded by The  
European Union

## India-EU Clean Energy and Climate Partnership (CECP)

# Webinar/Stakeholder consultation on R&I study on Low Embodied Energy Building Materials in India

Date: 27/05/2022

# Agenda

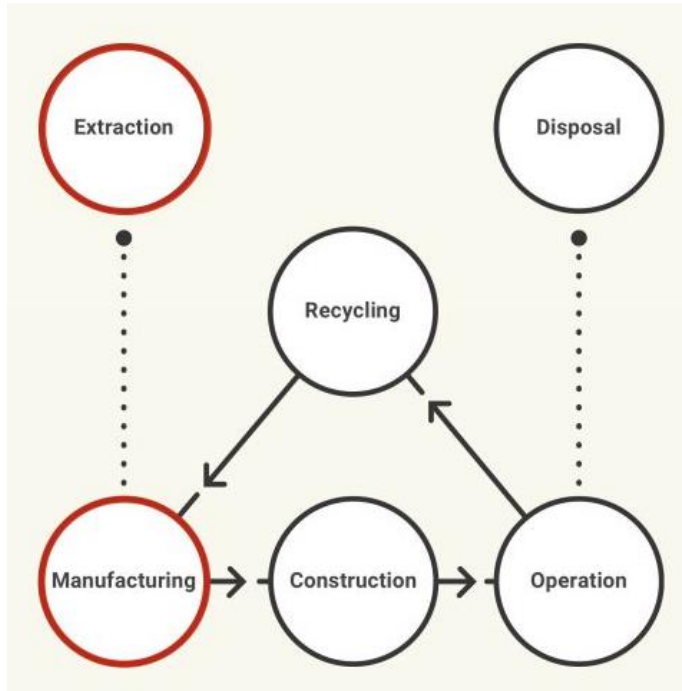
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1. Embodied energy and embodied carbon of building materials
2. Objective of the study
3. Indian initiatives covered under the study
4. European initiatives covered under the study
5. Possible alignment areas for EU-India R&I cooperation

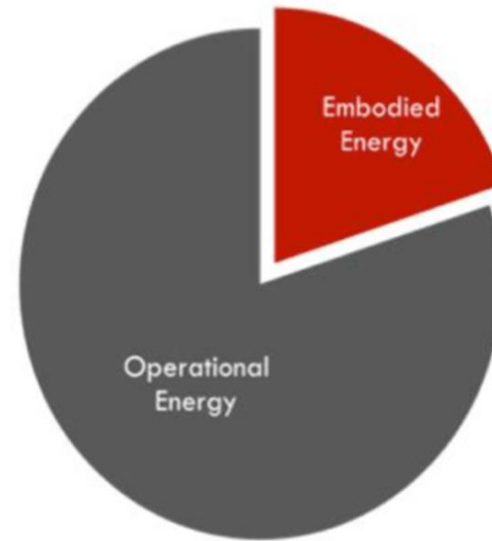


# Embodied energy

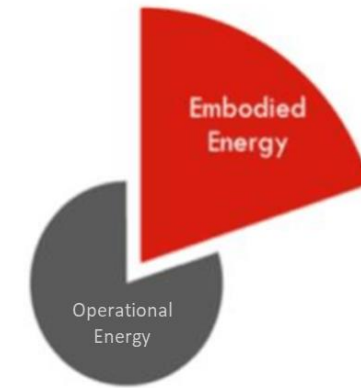
Embodied energy of a building is the energy consumed in all the processes related to its construction. These processes include mining, processing of natural resources to its delivery.



Embodied energy in building life cycle  
(Source: Green Building Advisor)



Typical Building



High Performance

Embodied vs. Operational energy for a typical and a high-performance building  
(Source: West Coast Climate Forum)

## Objective of the R&I study:

The objective is to identify possible research & innovation (R&I) cooperation between the EU and India in the area of low embodied energy building materials and circularity in construction.

# *Indian initiatives covered under this study*

- EU Resource Efficiency Initiative (EU-REI):
  - Study on fostering resource efficiency in the Indian building and construction sector
  - Strategy document on resource efficiency in construction and demolition (C&D) sector
- BEE's Energy efficient building materials directory
- IFC's India construction materials database of embodied energy and global warming potential
- IIT Roorkee's tool for estimation of embodied carbon of a building construction
- CII's GreenPro certification
- UN-Habitat's Decision Support Toolkit



# *Indian initiatives covered under this study*

- **EU Resource Efficiency Initiative (EU-REI):**
  - **The study on fostering resource efficiency in the Indian building and construction sector** proposes the following interventions -
    - Use of locally available sustainable raw materials for construction of buildings;
    - Develop transparency tools to promote sustainable materials through inventory and Environmental Product Declarations (EPDs); and
    - Inclusion of circularity concepts in green building rating systems;
  - **The strategy document on resource efficiency in construction and demolition (C&D) sector** proposes the following interventions -
    - Ministry of Housing and Urban Affairs (MoHUA) to support ULBs for C&D waste management;
    - Develop an inventory of C&D waste;
    - Develop an online platform for data agglomeration and knowledge dissemination; and
    - Develop public procurement, standards and certification to promote recycled products.



# Indian initiatives covered under this study

- **BEE's Energy efficient building materials directory (BMDI):**
  - Target to map 5,000 materials across India along with their manufacturers and suppliers
- **India construction materials database of embodied energy and global warming potential developed by IFC** captures database of 100 Indian building materials to help architects and engineers assess the environmental impact. The database is integrated in the Edge App.
- **BMTPC and IIT Roorkee work on a software tool** to estimate embodied carbon of a building construction using its Bill of Quantities (BOQ) and recommends low embodied energy alternative materials

The screenshot shows the BMDI website interface. At the top, it features the Government of India Ministry of Power logo and the Bureau of Energy Efficiency logo. The navigation bar includes links for Home, About Us, Selection Tool, How to Register?, Updates, Media Gallery, and Support, along with Login and Sign Up buttons. The main content area displays search results for 'Bricks and Blocks'. A table lists product details, including Product ID (Product0442), Company (TERI), and various energy efficiency metrics like Solar Absorbance, Specific Heat Capacity, Thermal Conductivity, Reflectance, and Density. A 'Show 10 rows' button is visible above the table. Below the table, there are 'Compare' and 'Download' buttons, and a pagination control showing 'Showing 1 to 1 of 1 entries'.

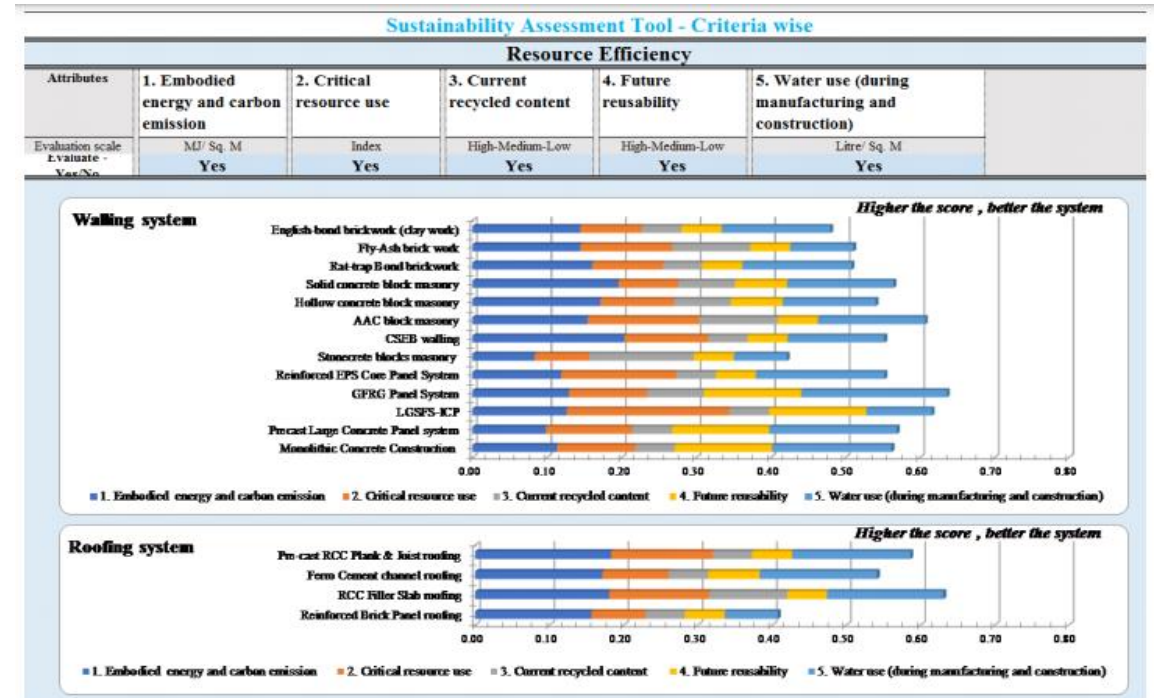
The screenshot displays the Edge App interface, which is used for estimating embodied energy and carbon. The top navigation bar includes logos for Edge, IFC, and International Finance Corporation. Below the navigation, there are tabs for 'Homes', 'Hotels', 'Retail', 'Offices', and 'Hospitals'. A 'RESULTS' section provides key performance indicators: Heat Energy Use (54,587 kWh/Month), Heat Water Use (923 m³/Month), Operational CO2 Savings (23 tCO2/Year), Embodied Energy Savings (34 MJ/m²), Base Case Utility Cost (4,228 \$/Month), Utility Costs Reduction (906.00 \$/Month), Incremental Cost (87,285 \$), and Payback in Years (8.02 Yrs). The interface also shows a 'Save' button and a 'Version 2.0.2' dropdown. A 'Materials Efficiency Measures' section allows users to select building material options from dropdown menus and indicate required thickness. A bar chart titled 'EMBEDDED ENERGY SAVINGS' shows a -6.33% saving, comparing a Base Case (1,800 MJ/m²) to an Improved Case (1,067 MJ/m²). The chart breaks down the energy consumption by building component: Floor Slabs, Roof Construction, External Walls, Internal Walls, Flooring, Windows, and Insulation. A disclaimer at the bottom states: 'Disclaimer: EDGE is designed as comparative software and is not a design tool. Therefore predicted results for energy, water and materials may vary from actuals.'





# Indian initiatives covered under this study

- **CII's GreenPro certification assesses environmental impacts of construction materials** based on a life cycle approach – covers 4,572 products under 29 categories and is adopted by 164 companies
- **UN-Habitat's Decision Support Toolkit (DST)** helps developers, practitioners and policy-makers to integrate sustainability concepts in the planning and design of social housing projects in India.
  - A Sustainability Assessment Tool (SAT) within DST has the capability to measure the relative performance of building materials.
  - The performance is measured against:
    - Embodied energy and carbon emissions
    - Critical resource use
    - Current recycled content
    - Future reusability
    - Water use



# *EU initiatives covered under this study*

- Buildings as Material Banks (BAMB) under Horizon 2020 -
  - Materials passports that consist of a set of data describing defined characteristics of materials
  - Reversible Building Design framework that enables re-use and recovery of building materials.
  - New business models for material circularity based on reverse logistics
- Cradle-to-Cradle Certification
- Level(s) - The European framework for sustainable buildings helps measuring the performance of buildings along their life cycle on – environmental aspects, health and comfort, life cycle cost and potential future risks to performance.
- Horizon2020 projects focusing on novel materials including Eco-binder, Sus-Con and Biobuild
- EU Green Public Procurement (GPP)





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# EU initiatives covered under this study

- **Cradle-to-Cradle Certification** developed by the European Advisory Council to recognize more sustainable products made for the circular economy.
- **The ECO-BINDER (under Horizon 2020) project:** **Low embodied energy** concrete-based construction materials and pre-fabricated building envelope components was developed under this project.
- Other projects such as **The SUS-CON project**, **The BIOBUILD** project involved in developing low embodied energy-based insulation materials.



The image shows a Cradle to Cradle Certified CM Product Scorecard. The top left features the Cradle to Cradle logo with 'CERTIFIED' and 'CM' text, and a 'BRONZE' label below it. The top right is a blue box with the text 'CRADLE TO CRADLE CERTIFIED<sup>CM</sup> PRODUCT SCORECARD'. Below this is a table with columns for 'QUALITY CATEGORY', 'BASIC', 'BRONZE', 'SILVER', 'GOLD', and 'PLATINUM'. The 'BRONZE' column is highlighted in orange. The 'GOLD' column is highlighted in yellow. Checkmarks are present in the 'BRONZE' column for 'MATERIAL HEALTH', 'RENEWABLE ENERGY & CARBON MANAGEMENT', 'WATER STEWARDSHIP', and 'SOCIAL FAIRNESS', and in the 'GOLD' column for 'MATERIAL REUTILIZATION' and 'OVERALL CERTIFICATION LEVEL'.

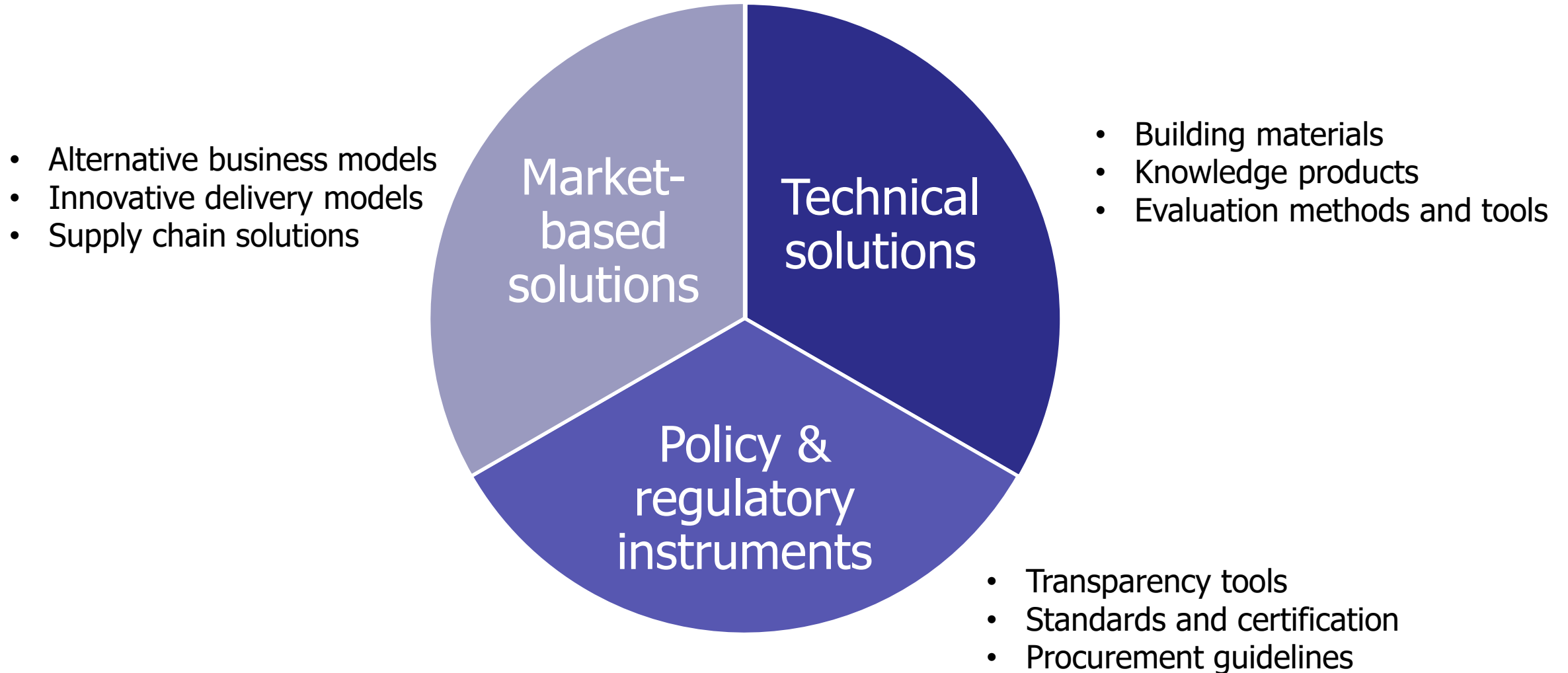
QUALITY CATEGORY	BASIC	BRONZE	SILVER	GOLD	PLATINUM
MATERIAL HEALTH		✓		✓	
MATERIAL REUTILIZATION			✓	✓	
RENEWABLE ENERGY & CARBON MANAGEMENT		✓		✓	
WATER STEWARDSHIP			✓	✓	
SOCIAL FAIRNESS				✓	
OVERALL CERTIFICATION LEVEL		✓		✓	

# ***EU initiatives covered under this study***

- **EU Green Public Procurement (GPP)** is a process which the public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle.
- EU GPP criteria is **specifically related to office buildings and is a voluntary instrument.**
- Among a number criteria involved, the following focus directly on embodied energy and circularity:
  - Require to **submit Life Cycle Analysis (LCA) report**
  - Require **use of at least a minimum percentage of reused and/ or recycled materials**
  - Require **Environmental Product Declarations (EPDs)** for the main construction materials
  - Foresight for **on-site material management**
  - **Maximum embodied carbon limits for new and leased buildings**
  - **Early design carbon limits** for infrastructure projects
  - **Use of low carbon cement and concrete**
  - Require calculation of **project carbon footprint**
  - Require **reducing transportation and/or zero emission transport of bulk/ heavy materials to/ from and around the construction site**
  - **Mandatory assessment of renovation vs knock-down and rebuild comparison**



# Possible areas of R&I cooperation between EU and India



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*Thank You*

