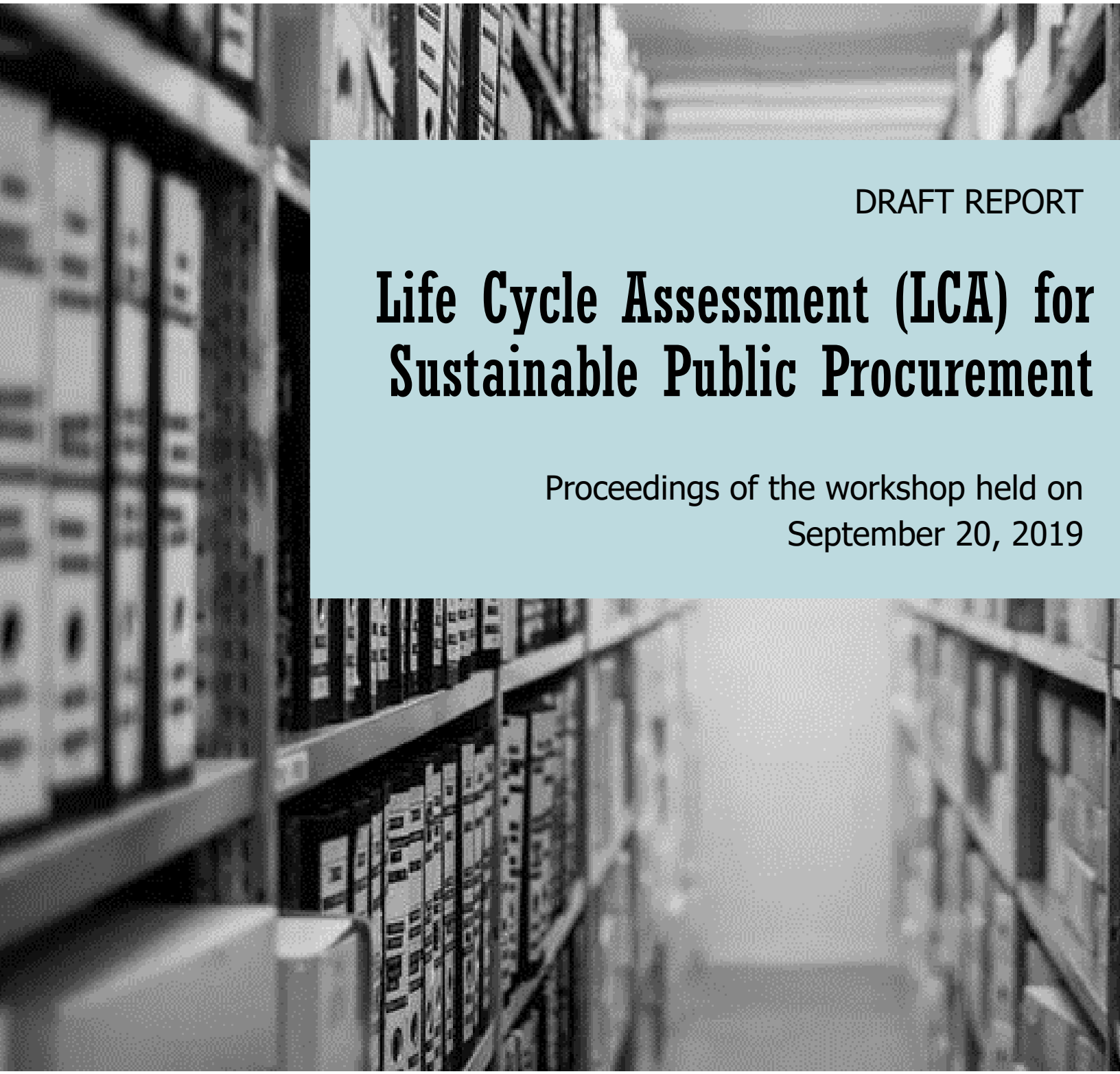

DRAFT REPORT

Life Cycle Assessment (LCA) for Sustainable Public Procurement

Proceedings of the workshop held on
September 20, 2019

Disclaimer: The document is a compilation of proceedings of the workshop on Life Cycle Assessment (LCA) for Sustainable Public Procurement (SPP) held on September 20th, 2019. This document has been prepared by Environmental Design Solutions [EDS] for United Nations Environment Programme [UNEP] under USAID led Market Integration and Transformation Program for Energy Efficiency [MAITREE] program. EDS is the implementing partner of the MAITREE program. The views and opinions of authors expressed herein do not necessarily state or reflect those of USAID or any agency thereof.

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1. Context

1.1. Sustainable Public Procurement

Procurement is an integral part of governance and the financial management system in a country. Public procurement wields enormous purchasing power, accounting for an average of 12 percent of gross domestic product (GDP) in Organisation for Economic Co-operation and Development (OECD) countries, and up to 30 percent of GDP in many developing countries.[1] Leveraging the purchasing power by promoting public procurement practices that are sustainable, in accordance with national policies and priorities, plays a key role in achieving Sustainable Consumption and Production (SDG 12) and in addressing the three pillars of Sustainable Development.[2]

Sustainable public procurement (SPP) is a "process whereby public organizations meet their needs for goods, services, works and utilities in a way that achieves value for money on a whole life-cycle basis in terms of generating benefits not only to the organization, but also to society and the economy, whilst significantly reducing negative impacts on the environment."[3] A sustainable public procurement strategy would ensure:

- Use of products with least environmental impact (pollution- air, water, etc.)

[1] United Nations Environment Programme. Undated. "Sustainable Procurement".
[2] The Sustainable Development Goals are a "comprehensive, far-reaching and people-centered set of universal and transformative goals and targets" that aim to end poverty, hunger and inequality, take action on climate change and the environment, improve access to health and education, build strong institutions and partnerships, and more. Over 150 world leaders adopted the SGDs in September 2015 and committed to implementing them by 2030. United Nations. 2015. "Transforming our world: the 2030 Agenda for Sustainable Development" United Nations Sustainable Development Knowledge Platform.
3 Definition adopted by the Task Force on Sustainable Public Procurement led by Switzerland (membership includes Switzerland, USA, UK, Norway, Philippines, Argentina, Ghana, Mexico, China, Czech Republic, State of Sao Paolo (Brazil), UNEP, IISD, International Labor Organization (ILO), European Commission (DG-Environment) and International Council for Local Environmental Initiatives (ICLEI) and adopted in the context of the Marrakech Process on Sustainable Production and consumption led by UNEP. and UN DESA

- Evaluation of products based on life cycle analysis and not solely on initial cost.
- Greening of the supply chain, by encouraging use of use of recycled material and parts in during manufacturing processes.
- Reduced dependency on fossil fuel and virgin materials.

1.2. India's Journey so far

In 2013, public procurement contributed to around 20-30 percent of the GDP in India[4]. Considering such a large-scale public expenditure on procurement, streamlining the procurement process in the country became imperative. The Thirteenth Finance Commission of India emphasized the need for incentivizing growth of India with lower environmental and resource footprint. In April 2012, the Union Cabinet approved the Public Procurement Bill. In August 2016, an e-platform for conducting rate contracts Government e-Marketing (GeM) was initiated. In 2017, the Procurement Policy Division (PPD) under the Department of Expenditure (DoE) revised the General Financial Rules (GFRs) and manuals for procurement of goods and services.

The journey of SPP in India began with the introduction of EcoMark in 1991, that intended to increase the awareness among consumers including the government machinery about environment friendly goods and services. Over the years, efforts have been made towards SPP by different procurement entities; such as phasing out of the incandescent lamps (2000), purchase of Bureau of Energy Efficiency (BEE) 3 star or higher products (2007), migration from CFC refrigerants to HFC (2008), amongst many others. However, these efforts are yet to replicate at a larger scale across the public procuring entities.

In April 2018, the Department of Expenditure (DoE) constituted a Task Force on Sustainable Public Procurement (SPP) comprising of members from Ministry of Environment, Forest and Climate Change (MoEFCC), Ministry of Railways (MoR), Government e-Marketplace (GeM), Bureau of Indian Standards (BIS), Bureau of Energy Efficiency (BEE). United Nations Environment Program (UNEP) is supporting the Ministry of Finance (MoF) to conduct studies for product prioritization and market assessment.

Three product categories – Paper, Cleaning Agents and Room Air-conditioners have been prioritized. U.S. Agency for International Development (USAID) led Market Integration and Transformation for Energy Efficiency (MAITREE) program is supporting UNEP with the Sustainable Public Procurement Framework with special focus on Room Air Conditioners.

[4] UNODC, 2013

A comprehensive life-cycle costing and impact assessment would aid in decision-making processes and strategic planning for procurement. Additionally, the introduction of life cycle assessment (LCA) based ecolabeling facilitates government agencies in formulating environmental and procurement policies.

1.3. Workshop on Life Cycle Assessment (LCA) for SPP

LCA approach enables evaluation of the full range of environmental effects attributed to products and services. It can be a powerful tool for procurement, by providing a holistic environmental basis for decision-making. Independently certified LCA-based labels have proven to be an important basis for assessing the relative environmental merits of competing products in many countries.

Aim: Sensitize decision makers in the government on different aspects of life cycle assessment (LCA). It especially aims at highlighting the benefit of LCA based evaluation for public procurement.

Audience: This workshop was meant for decision makers and organizations looking at reducing their environmental impact through sustainable LCA based decision-making. Over 60 experts participated in the workshop; which included government officials from the Ministry of Finance (MoF), Ministry of Environment Forest and Climate Change (MoEF&CC), Ministry of Railways (MoR), officials from government's digital ecommerce portal for procurement and selling of goods and services i.e. Government e-MarketPlace (GeM). The workshop also hosted representatives from trade and industry associations such as FICCI and CII, research and not for profit institutions such as NEERI, TERI and CLASP, and product certification bodies such as UL, LCA experts such as ThinkStep and many more.

Organized by: USAID led MAITREE program in partnership with UNEP

When and where: September 20th, 2019, New Delhi, India

Outcome: The workshop provided a comprehensive overview of LCA and facilitate engagement between policy makers, experts, and industry to assist in developing a vision for Sustainable Public Procurement in India. The workshop included discussions on the key aspects of LCA and the global as well as Indian industry experience. The key findings and next steps have been highlighted in the following chapter.

2. Workshop Proceedings

2.1 Key findings and way forward

The next steps of the workshop have been summarized below:

1. **SPP Implementation Framework**

   Through GeM, there is now an efficient and effective process for processing over ten million tenders every month. However, the system requires orientation towards India's sustainable development goals (SDG) and enable SMEs and women entrepreneurs. One of the immediate next milestones would be to develop a comprehensive SPP implementation framework that integrates life cycle assessment in current procurement practice with a vision to have a good gross domestic product (GDP). A study of existing national and international evidence-based policies that can be applied and adapted to India, would aid in this process.

2. **Integrate Existing Ecolabels and Standards**

   An ecolabel measures a product's holistic environmental impact, adopting a life cycle approach. The ECOMARK in India covers building products, cleaning products, cosmetics, food, forest products, packaging, textiles and electrical appliances. The ecolabelling program for air-conditioners is in progress. Integrating existing ecolabels and standards within sustainable public procurement will enable standardization and streamline efforts of product certifications. In the future, updated criteria can easily be enforced through update in ecolabel benchmarking, instead of revising individual product specific requirements.

3. **Strategic Market Research Studies**

   Strategic studies are required to assess industry readiness for LCA based evaluation for procurement. This is in progress for the prioritized products (room air conditioners, paper and cleaning agents). EDS, is carrying out the preliminary study for room air-conditioners. CII is carrying out the same for paper and cleaning agents.

4. **Scaling up through pilot product**

   Considering the complexities around LCA, there is a need for a pilot product scale-up initiative. Pilot product identification is required. Lessons learnt from pilot implementation would help address issues when mainstreaming LCA for all public procurement products.

5. Success Stories for LCA based evaluations

   One of the roadblocks towards acceptance of LCA is a lack of published and contextual success stories for LCA. The building construction industry is one such industry, where through green building rating systems, whole building life cycle assessments and environmental product declarations for building materials is gaining momentum. More such success stories are required for scaling up and building acceptance for LCA based evaluation.

6. **Strategic Partnerships to institutionalize LCA**

   Regular training workshops for government officials on LCA is required for capacity building of implementing agencies. Platforms that create enabling environment for strategic discussions between stakeholders such as government officials, industry, LCA experts, consultants, certification bodies, manufacturers and product suppliers will be required to institutionalize LCA. Endorsements from champions and prominent personalities is one of the ways to also build awareness and create acceptance for LCA.

2.2 Agenda

	Inaugural Session	
09:30 -09:35	Welcome Remarks and Context	**Mr. Atul Bagai** *Head, UN Environment Country Office, India*
09:35 -09:45	Opening Address	**Mr. Michael Satin** *Director, Clean Energy & Environment, USAID India*
09:45 –09:55	Special Address	**Mr. Sanjay Prasad,** *Joint Secretary, Dept. of Expenditure, MoF*
09:55 –10:15	Keynote Address	**Mr. Anil Jain,** *Special Secretary, MoEFCC*
10:15 -10:25	LCA for Sustainable Public Procurement	**Mr. Mushtaq Ahmed Memon, Ph.D.** *Regional Coordinator for Resource Efficiency, UNEP, Asia Pacific Regional Office*
10:25 –10:40	Sustainable Public Procurement for Market Transformation	**Mr. Tanmay Tathagat** *Director, EDS, USAID MAITREE*
	10:40 – 11:00 Tea	
	Technical Session	
11:00 -11:15	Life Cycle Assessment – Introduction	**Dr. Bhawna Singh** *Joint Director / Scientist D, MoEFCC*
11:15- 11:30	LCA certification process	**Dr. K Murugan** *MD and CEO of DQS UL, India*
11:30 –11:45	Eco-labeling – Global context and feasibility for India	**Dr. Archana Walia** *Director, India Program, CLASP*
11:45 -12:00	LCA Experience in building construction industry	**Ms. Nidhi Gupta**, *EDS, USAID MAITREE*
12:00 -13:25	LCA - Industry Experience and Way Forward: Industry representatives, CII, FICCI, NEERI, TERI	Discussion Moderated by **Mr. S Suresh Kumar,** *Joint Secretary and Additional CEO, GeM*
13:25 -13:30	Vote of Thanks	**Ms. Apurva Chaturvedi** *Clean Energy Specialist, Energy & Environment Office, USAID*
	13:30 Lunch	

2.3 Proceedings

The session started with a welcome address from Mr. Atul Bagai, Country Head, UNEP. He set the context of the workshop and gave a background of India's efforts towards Sustainable Public Procurement and highlighted the importance of life cycle assessment in decision making.

Mr Atul Bagai, Country Head, UNEP giving the Welcome Address

This was followed by an opening address from Mr. Michael Satin, Director, Clean Energy and Environment Office USAID. He stated that SPP is key to good governance and should be a priority at all levels of decision making – Nation to municipalities. He emphasized the necessity of creating awareness regarding the impact of public procurement decision on social, economic and environmental factors. He also highlighted that life cycle evaluation of products is a first step towards greening supply chains and reduce dependency on fossil fuels. Mr. Satin also introduced USAID MAITREE program and its partnership with the Government of India.

Opening Address by Mr. Michael Satin, Director, Clean Energy & Environment, USAID India

Mr. Sanjay Prasad, Joint Secretary, MoF gave a special address with emphasis on challenges faced by Ministry with respect to life cycle assessment → lack of LCA expertise, requirement of internal capacity building, trusted agencies for LCA and need of contextual practical solutions.

He cited examples of contracts awarded in India based on LCA. The existing policies and programs are based on environmental concern and the MoF is keen to include LCA as one of the conditions for material procurement. The existing manual for goods already specifies LCA and the Public Procurement Task Force in March 2018, included an action plan for SPP. The GEM certification process has improved the Govt. E Market place, over the past two years. He pointed out that though there is an efficient and effective process for processing over a hundred thousand tenders every month, contextualization as per India's SDG's, policies privileging MSME, women entrepreneurs, SC ST is yet required. He stated that public procurement constitutes 20-22% of the GDP and urged the group to deliberate on a SPP framework that encourages good GDP for India.

Mr. Sanjay Prasad, Joint Secretary, Ministry of Finance

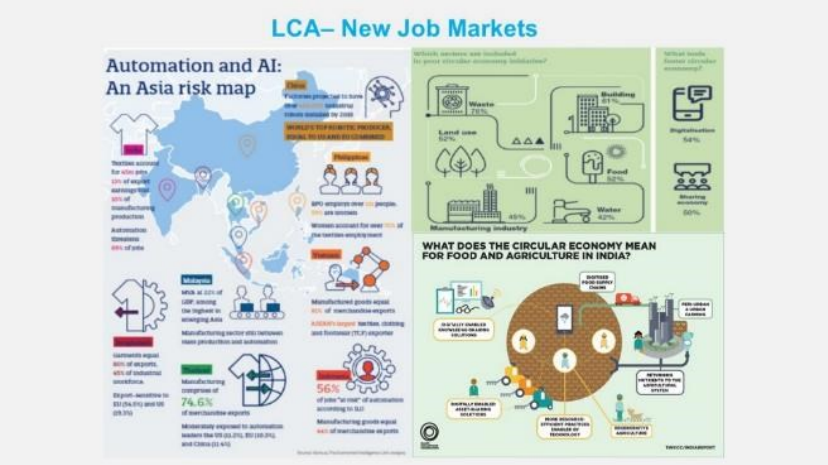
Mr. Anil Jain, Special Secretary, MoEF&CC, chaired the event and emphasized the importance of reuse, recycling, and waste management in life cycle assessment, and life cycle cost-based approach as a potential to identify opportunities for waste to wealth creation. He also highlighted the need for innovative business models based on circular economy (cited EESL's ESCO model), re-thinking India's taxation policies and standardization of procurement policies. There is a need for policy advisory and R&D for the government to develop evidence-based policies. Furthermore, he stated that endorsements by champions and prominent personalities is one of the ways to create awareness.

Mr. Anil Jain, Special Secretary, MoEF&CC

Mr. Mushtaq Memon, Regional Coordinator for Resource Efficiency, UNEP, Asia Pacific Regional Office drew reference to the global commitment to accelerate the shift towards sustainable consumption and production in both developed and developing countries and circular economy being the key objective of SPP, especially in the Asia Pacific Region.

For countries like India, with huge GDP, requiring huge resources, circular economy is strongly advocated, that decouples GDP from resource consumption. LCA based procurement offers possibility of decoupling, where the circular society is designed, incorporating the 3R's, leading to reduction in natural resource consumption and environmental impact. The important concern on LCA is to institutionalize it with policies, framework and certification processes. He reinforced the need to align supply chains with policies, and efficiency at each stage of extraction, sourcing and manufacturing. The extended life of the products to be considered before recycling.

The key to integrate LCA is through enablers like better awareness, advantage of new technology – block chain, IoT, big data, etc, innovative funding models and partnerships. He drew reference to FICCI's report on socio-economic benefits of LCA and creation of jobs based on circular economy. He concluded with stating that an LCA based economy is a product of businesses, government and citizens working together to form a regulatory framework with technical innovations, leading to community awareness, and UNEP would support the upcoming programs for the same.



Mr. Mushtaq Memon, UNEP presenting LCA based procurement creating new jobs

Mr. Tanmay Tathagat, Director, Environmental Design Solutions presented the possibility of Life Cycle Assessment being the driver for transforming markets. He drew examples from MAITREE program, where through private sector engagement, scaling up, creating enabling policy environments and consumer engagement the program strives towards energy efficiency. He cited partnerships with Lucknow Development Authority (LDA) where greening affordable housing was possible through life cycle thinking. Another example of creating demand for large scale sustainable procurement was through EESL's super-efficient Airconditioning program. He also presented an overall framework for Sustainable Public Procurement (SPP) and explained the sustainability criteria for product procurement in addition to the basic criteria (business as usual). Sustainable criteria for products could include – Organizational criteria, Social criteria and product specific criteria.

Mr. Tanmay Tathagat, EDS; presentation on LCA for Market Transformation and SPP Framework.

Dr. Bhawna Singh, Joint Director at MoEFCC, introduced LCA terminologies and nuances to the audience. LCA is a holistic system with direct and indirect trade-offs. She presented LCA

methodology and documentation procedure. She discussed impact analysis and regional impact characterization. She pointed out that life cycle impact approach offers scope to measure indicators like material use, global temperature change, GHG emission from transport etc. The presentation was followed by discussion on the methodology of LCA and its adaptability for the Indian context. There were questions on what dataset can be used, how can a single matrix for measuring LCA be established, consensus on what should be fed into the SPP decision making. Dr. Singh informed the audience of the ongoing work towards building Indian data inventory. She also suggested that LCA being a relative study, a hybrid approach can be considered by using available and relevant datasets.

Dr Bhawna Singh, Joint Director at MoEFCC, introducing life cycle assessment studies

Dr. Murugan MD and CEO of DQS UL, India focused on Life Cycle Assessment Certification Process. He emphasized that the ISO 14040 and 14044 already include life cycle assessment in its framework, however LCA does not have an ecosystem in the current scenario, which can be brought in through the certification system. The certification is valid for three years, after which the product is re-certified. He spoke about the steps and methodology involved in the certification process. The process for certification included two stages, post which there would be a technical review concluding with the issuing of the certificate. The methodology included data collection, declarations like environmental labelling (ISO14024), self-declared environment claims (ISO 14021) and environmental declarations with third-party certification (ISO 14025).

Dr Murugan, MD and CEO, UL DQS, presenting the LCA certification process

Dr. Archana Walia, Director, India Program, CLASP discussed benefits of Ecolabelling and how it helps to measure the products' holistic environmental impact following the cradle to grave approach. Various ecolabels indicators and three major global ecolabels were studied to develop an optimum ecolabelling methodology for the Indian context. She also informed the audience of a study on the existing ECOMARK program and revisions suggested. The products that have been certified under ECOMARK are leather products, fire extinguishers, paper products and flush doors and shutters. She explained the criteria for formulating the initial set of ecolabeling criteria for air-conditioners. The benefits of ecolabeling for AC's was also highlighted. As per Dr Walia, waste generation, global warming potential, resource consumption and pollution generation should be assessed within each life cycle stage of the product. She conveyed that efforts towards SPP need to focus equally on demand generation and cannot be solely supply-driven.

Dr. Archana Walia, Director at CLASP, presenting the ecolabelling initiative in India

Ms. Nidhi Gupta, Environmental Design Solutions, gave a snapshot of the building construction industry's success in the adopting LCA through its various green building rating systems, green material criteria specifications and labelling programs. Green building rating systems have advanced to include Whole Building Life Cycle Assessments and are even asking projects to provide Environmental Product Declarations (EPD). She highlighted that within the building construction sector the following materials have in depth LCA studies – Cement, Steel, Glass, Plasterboards, Office Furniture, Carpets, Office Equipment. LCA based thinking in the construction industry was driven through the private sector and is now penetrating the public sector. BEE's nearly Zero Buildings (nZEB) program for existing buildings and CPWD's Green Rating Manual are examples of government's initiatives towards life cycle-based thinking.

Nidhi Gupta, EDS, USAID MAITREE, presenting LCA penetration in the building construction industry

Mr. S Suresh Kumar, Joint Secretary and Additional CEO, GeM, Ministry of Commerce and Industry, led the industry discussion on way forward and stressed the importance to assess need for a market readiness study in terms of capacity and preparedness for the LCA based sustainable public procurement framework.

Mr. S Suresh Kumar, Joint Secretary and Additional CEO, GeM, Ministry of Commerce and Industry

Representatives from Industry, FICCI, CII, TERI, NEERI, Thinkstep, EESL and many more participated in the discussion.






LCA - Industry Experience and Way Forward: Industry representatives, CII, FICCI, NEERI, TERI

3. Annexures

3.1 List of Participants

	Organization	Name	Designation
1	MoEFCC	Mr. Anil Jain	Special Secretary
2	MoF	Mr. Sanjay Prasad	Joint Secretary
3	GeM	Mr. Suresh Kumar	Joint Secretary/ Addl CEO
4	UNEP	Mr. Atul Bagai	Head, UN Environment Country Office, India
5	UNEP	Mr. Mushtaq Memon	Regional Coordinator for Resource Efficiency, UNEP, Asia Pacific Regional Office
6	UNEP	Ms. Divya Datt	
7	USAID	Mr. Michael Satin	Director, Clean Energy & Environment
8	USAID	Mrs. Apurva Chaturvedi	Clean Energy Specialist
9	EDS	Tanmay Tathagat	Director
10	MoEFCC	Dr. Bhawna Singh	Joint Director/ Scientist
11	UL DQS India	Dr. K Murugan	Managing Director & CEO
12	CLASP	Dr. Archana Walia	Director of India Programs
13	EDS	Ms. Nidhi Gupta	MAITREE
14	MoF	Mr. Sudesh Kumar	
15	MoF	Mr. Arvind Jangra	
16	MoF	Mr. Vikram Rajvanshi	Consultant
17	MoEFCC	Mr. W Bharat Singh	Scientist
18	MoEFCC, Ozone Cell	Mr. Fahad Naim	

19	Ministry of Railways	Mr. Manoj Kumar Gupta	ED
20	Ministry of Railways	Mr. Sanjay Kumar	General Manager
21	Ministry of Railways	Tarini	
22	UNEP	Mr. Soumya Bhattacharya	
23	UNEP	Mr. Jitendra Sharma	
24	USAID	Ms. Priya Sreedharan	Senior Clean Energy Technical Advisor
25	Development Alternatives	Dr Vijaya Lakshmi	Vice President
26	EDS	Anamika Prasad	Director
27	EDS	Gurneet Singh	Director
28	CII	Ms. Seema Arora	Executive Director
29	CII	Ms. Nandini Kumar	Consultant
30	FICCI	Ms. Deepa Chaudhary	Assistant Director
31	EESL	Dr. Anant Shukla	Additional General Manager
32	TERI	Ms. Shailly Kedia	Fellow Integrated Policy Analysis
33	TERI	Mr. Nitin Bajpai	Project Associate Resource Efficiency & Governance
34	TERI	Mr. Souvik Bhattacharyya	Fellow Resource Efficiency & Governance
35	EDS	Ms. Aarti Nain	Associate Director
36	EDS	Mr. Nabeel Ahmed	Associate Director
37	EDS	Mr. Piyush Varma	Associate Director
38	EDS	Mr. Mohit Varma	MAITREE
39	EDS	Ms. Gopal N	MAITREE
40	GIZ	Ms. Reva Singh	
41	GGGI	Mr. Shantanu Gotmare	
42	ThinkStep	Mr. Ritesh Agarwal	Director- Strategic Accounts
43	EDS	Ms. Mariyam Zakiah	MAITREE
44	EDS	Ms. Paridhi Goyal	MAITREE
45	EDS	Ms. Aditi Verma	MAITREE
46	EDS	Mr. Abhishek Soni	MAITREE
47	UL DQS India	Mr. Ganesh Kumar V	AVP & National Head - Sales & Marketing
48	UL DQS India	Mr. Nilesh D	
49	UL DQS India	Mr. Puneet Randeo	
50	UL DQS India	Mr. Anurag Singh	
51	United Technologies	Mr. Samit Ray	Regional Director south Asia
52	Voltas Ltd.	Mr. Mohan Singh	

3.2 Presentations

a) LCA for Sustainable Public Procurement

Mr. Mushtaq Ahmed Memon, Ph.D., Regional Coordinator for Resource Efficiency, UNEP, Asia Pacific Regional Office

Sustainable Public Procurement (SPP) & SDGs

The 10YFP / One Planet is a multi-stakeholder network that is building the global movement for sustainable consumption and production through 6 Programmes:

- Sustainable Food Systems PROGRAMME
- Consumer Information PROGRAMME
- Sustainable Lifestyles & Education PROGRAMME
- Sustainable Tourism PROGRAMME
- Sustainable Buildings & Construction PROGRAMME
- Sustainable Public Procurement PROGRAMME

Steps to Establish SPP/GPP - Examples

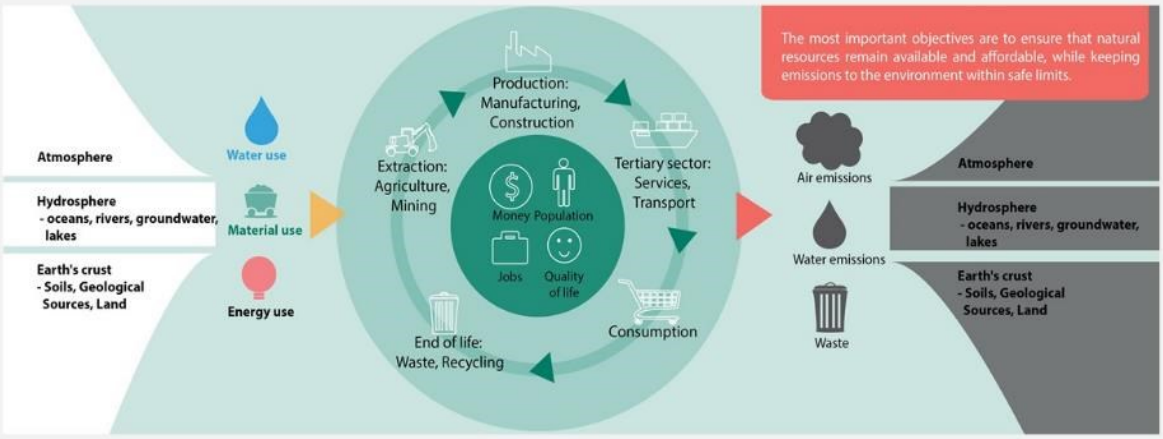
	Support Policy Development and Enhancement	Support Establishment of Policy Implementation Basis	Support Policy Implementation	Proliferate Outcomes and Develop Follow-up Project
VIET NAM	**Propose to Revise or Modify the Legal Framework** • Propose legal review and revision for implementation of GPP	**Develop GPP Guidelies** • Develop guidelines incorporating green procurement into existing public procurement procedures	**Propose GPP Roadmap** • Suggest short-term roadmap for transferring know-how and supporting implementation of GPP	
	Assist Establishment of GPP Criteria • Support establishment of criteria for GPP products	**Capacity-Building & Awareness-raising** • Hold workshops for policy-makers, procurers and companies		**Outcomes and Follow-up Project** • Proliferation of outcomes and propose measuresto cooperate with other similar projects • Development of follow-up project after completion of pilot project
THAILAND	**Recommend GPP Incentive Mechanisms** • Recommend GPP incentives through benchmarking	**Transfer of Know-how** • Host an event to support networking between Korea and Thailand experts		
	Assist Establishment of GPP Criteria • Support establishment of criteria for GPP products	**Awareness-raising & Public Outreach** • Hold events to promote GPP of construction & building materials		

LCA for SPP – Circular Economy

Asia Pacific home to 16 of 28 megacities

Asia Pacific home to < 4.2 billion people

The region's share of global gross domestic product (at purchasing power parity) rose from 30.1% in 2000 to 42.6% in 2017,



LCA for SPP – Target Setting

Natural Resources

In 2015, Asia and the Pacfic represents 63% of global material use.

GHG emissions

330% GHG emissions from the region grew by 330%, including increase in short-lived climate pollutants

Plastic

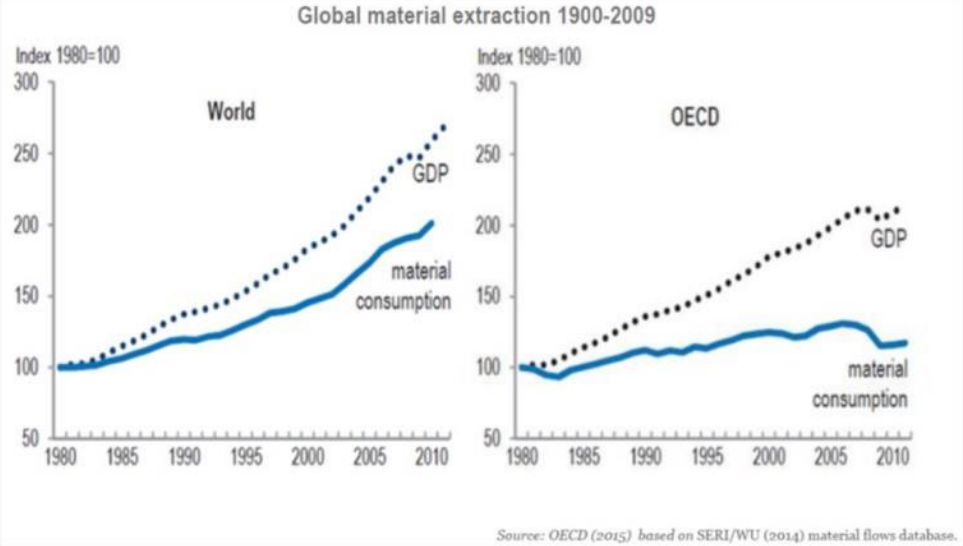
6,300 Mt of plastic waste has been generated as of 2015. Of this waste, 9% has been recycled, 12% incinerated, and 79% has accumulated in landfills or the natural environment.

Air pollution

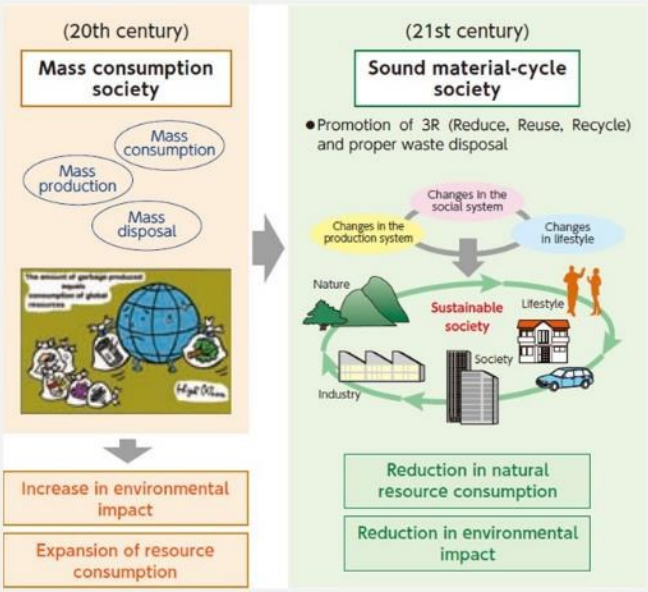
70% Air pollution is responsible for more than 6.5 million deaths annually, the bulk of which – 70 %– occurs in Asia Pacific.

Source: APCAP, 2018

Circular Economy – Decoupling



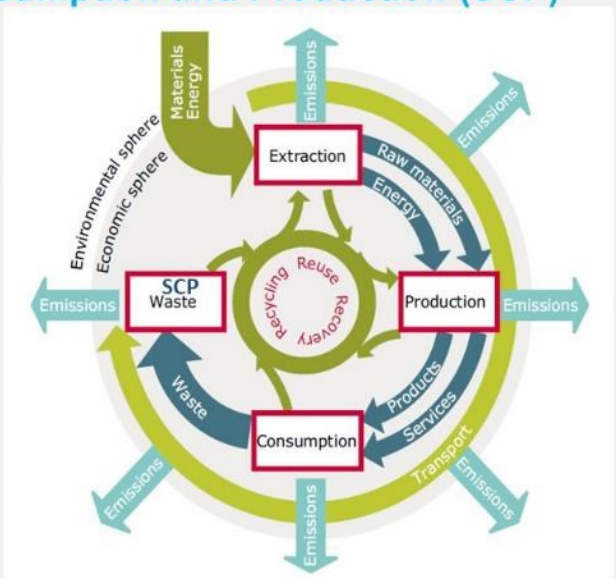
LCA for SPP– Linear to Circular Society



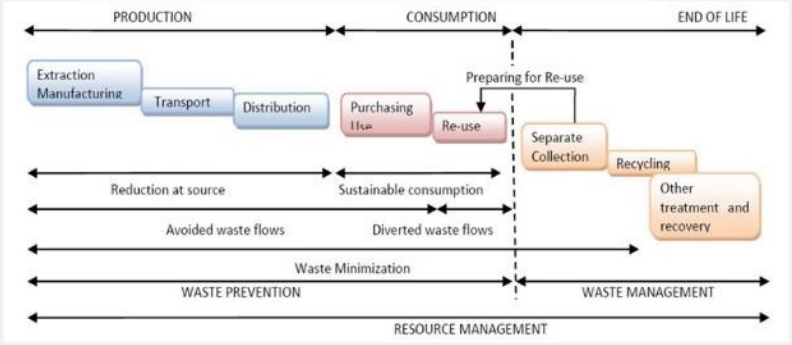
History and Current State of Waste Management in Japan, MOEJ (2014)

LCA to SPP–
Sustainable Consumption and Production (SCP)

Enabling Environment
- Policy
- Technology
- Standards
- MEPS
- Regulations
- Incentives
- Private sector engagement
- Access to finance

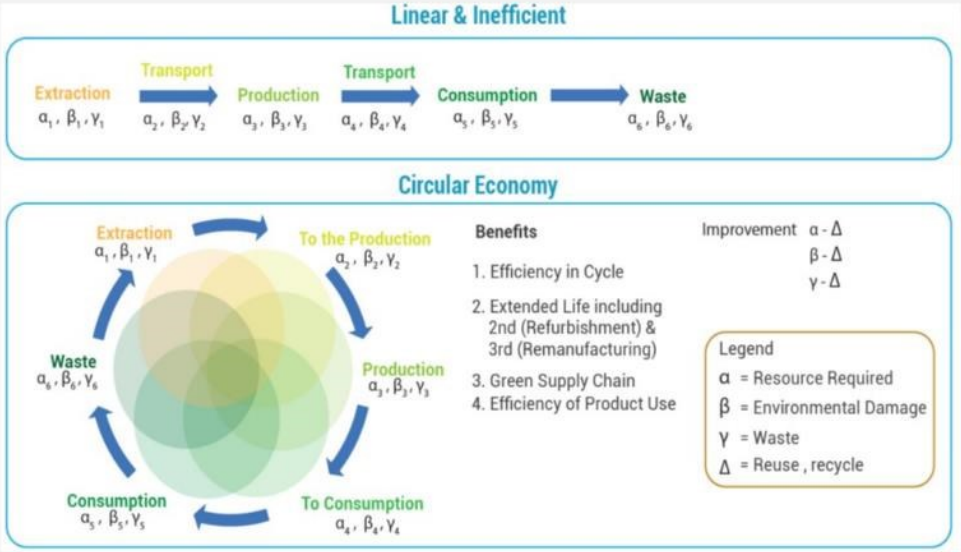


LCA for SPP– Value Chain



ISWA Key Issue Paper on Waste Prevention, Waste Minimization and Resource Management, ISWA (2012)

LCA to SPP– Setting the Goals



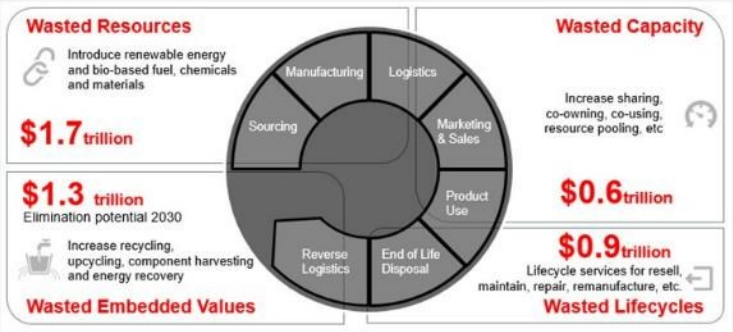
LCA – Business Models

Business model	Description	Illustration
Circular Supply Chain	Provide renewable energy, bio-based- or-fully recyclable input materials to replace single life-cycle inputs	BASF is replacing finite fossil resources with sustainably produced renewable resources through its innovative production Verbund Biomass Balance approach
Recovery & Recycling	Recover useful resources / energy from disposed products or by-products	Nike reuses and recycles footwear manufacturing scrap and post-consumer shoe wastage, converting it into raw material for other sports equipment manufacturing players
Product Life Extension	Extend working lifecycle of products and components by repairing, upgrading and reselling	Patagonia launched an online store where customers trade-in their used clothing in return for store credit, thereby extending the life of products
Sharing Platform	Enable increased utilization rate of products by making possible shared use, access or ownership	Airbnb operates as an online marketplace for people to lease or rent short-term lodging, facilitate tourist experiences or make restaurant reservations
Product as a Service	Offer product access and retain ownership to internalize benefits of circular resource productivity	Philips offers lighting as a service, wherein users are required to pay for the consumed intensity (rather than for the product)

LCA - Enablers

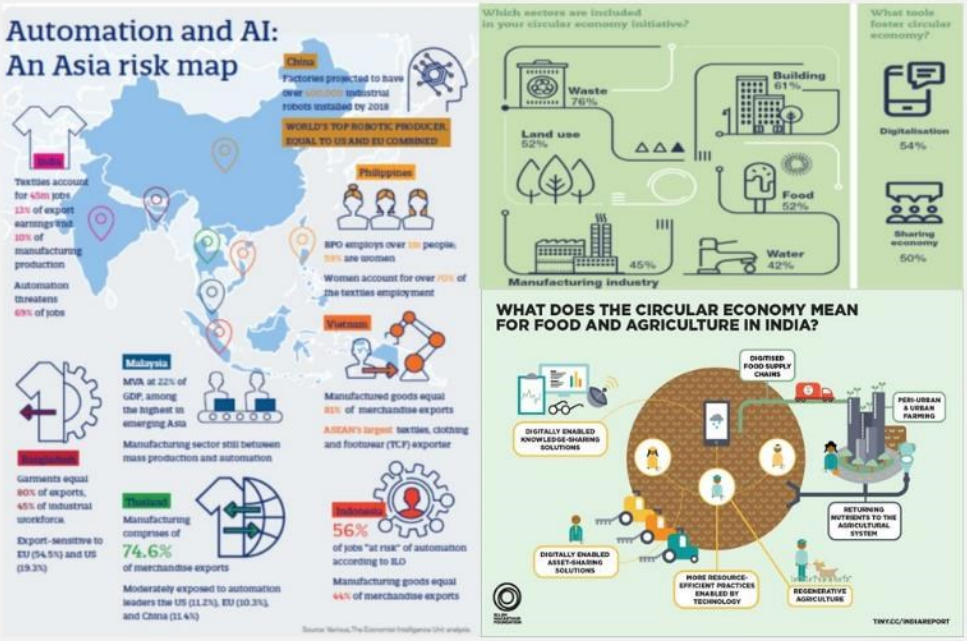
Better awareness	Disruptive technologies	Enabling policy landscape	Innovative funding models	Collaboration and partnerships
▪ Better consumer awareness required to drive adoption of new interaction models (between suppliers and consumers) ▪ Educating entrepreneurs, designers, engineers, procurement officers, and product managers about the art of possible ▪ Intervention in school and university curriculums to influence mindset	▪ Emerging technologies can accelerate a shift towards CE models– for example, enabling cleaner resources (bio-materials), enabling extended lifecycles (through predictive maintenance) and enabling shared platforms (through IoT) ▪ Three types of technologies would be critical– digital technologies (such as IoT), physical technologies (such as 3D printing) and biological technologies (such as bio-based materials)	▪ Favourable policy landscape can help accelerate adoption through elimination of barriers and driving behavioural change ▪ Several policy measures already introduced in India – for instance, Zero Defect, Zero Effect, scheme, plastics waste management rules, e-waste rules, BIS standards for CE principles	▪ Funds required to drive R&D and capital investments ▪ Illustrative examples of best practices – ESG investing (such as green bonds), CE innovation fund introduced by Finnish Government	▪ Need for both cross-sector partnerships and partnerships across different players (for example, MSMEs, government, urban local bodies, NGOs and consumers) ▪ For instance, MSTC and Mahindra partnering for India's first auto shredding business

LCA– Economic Benefits through New Businesses



- **Wasted resources** are materials and energy that cannot be continually regenerated, but instead are consumed and forever gone when used.
- Products with **wasted lifecycles** have artificially short working lives or are disposed of even if there is still demand for them from other users.
- Product with **wasted capacity** sit idle unnecessarily; for instance, cars typically sit unused for 90% of their lives.
- **Wasted embedded values** are components, materials, and energy that are not recovered from disposed products and put back into use.

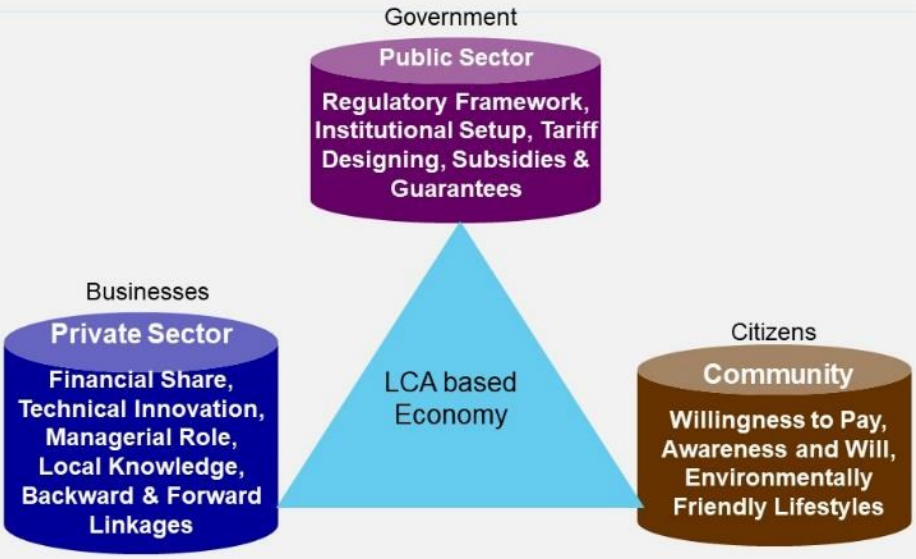
LCA– New Job Markets



LCA for SPP– Focus by Global Community

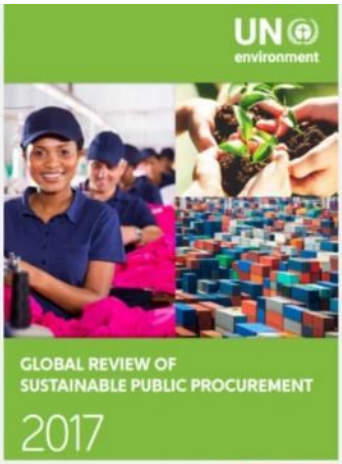
- To bring member states on common "definitions" and "understanding" for all the aspects of waste management chain covering all the waste streams
- To assist member states in identification of gaps and solutions for sound waste management focusing on SMM
- To build regional and national capacity on legislative framework and financing mechanisms for supporting trade and investments across countries or within countries in waste management services and technologies
- Assist in developing B2B (business to business), B2C (business to consumer) and B2G (Business to Government) partnerships leading to build effective and efficient waste management service sector

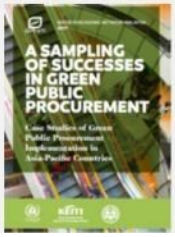
LCA in Action– Working Together!



UNEP Support

1. Identification of gaps and opportunities
2. Identification of priority areas and sectors
3. Establishing the basis for SPP/GPP
4. Developing the guidelines
5. Stakeholder consultations
6. Preparing comprehensive package
7. Delivering the capacity building programmes
8. Supporting the ministries/department to establish SPP/GPP

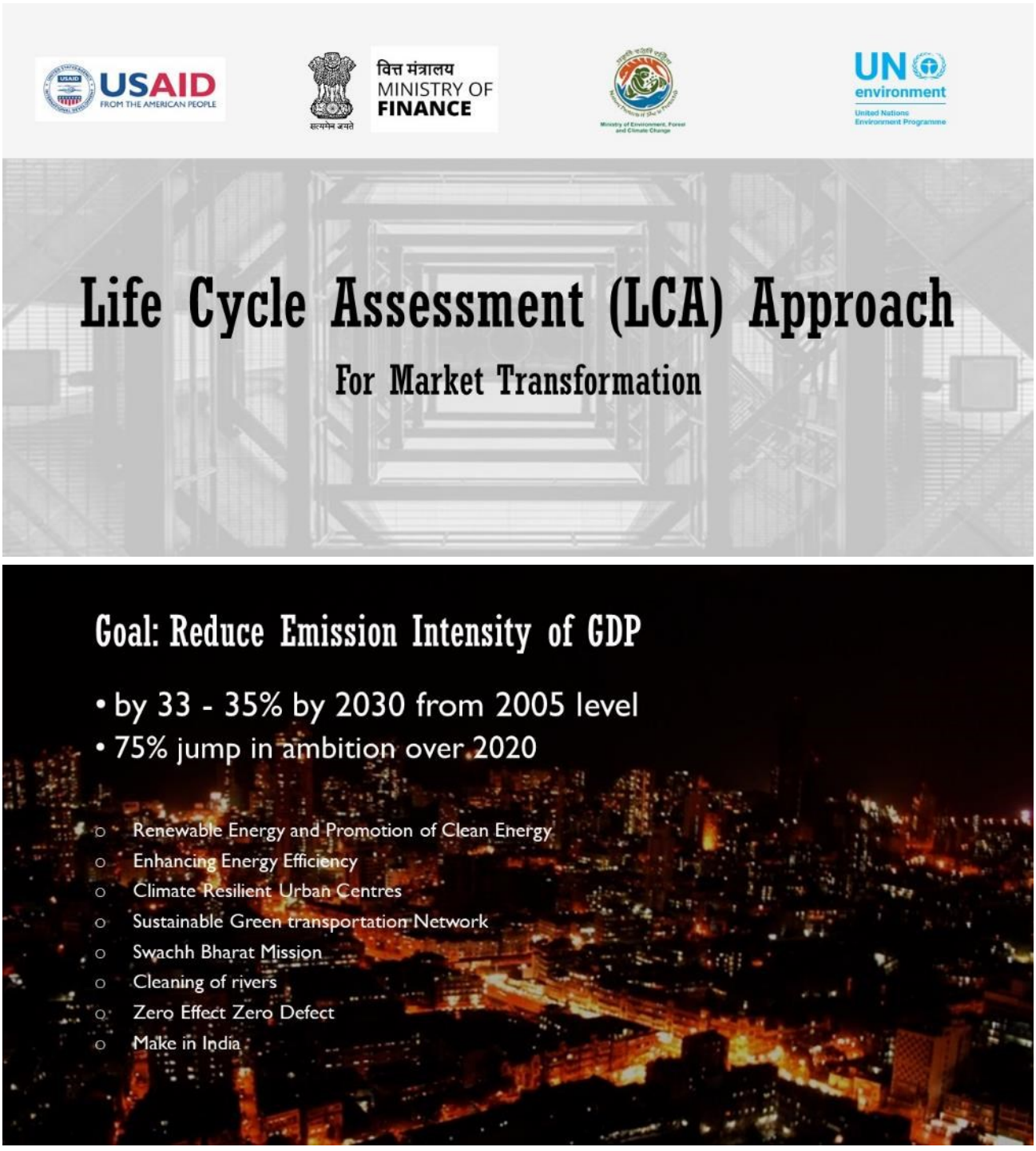


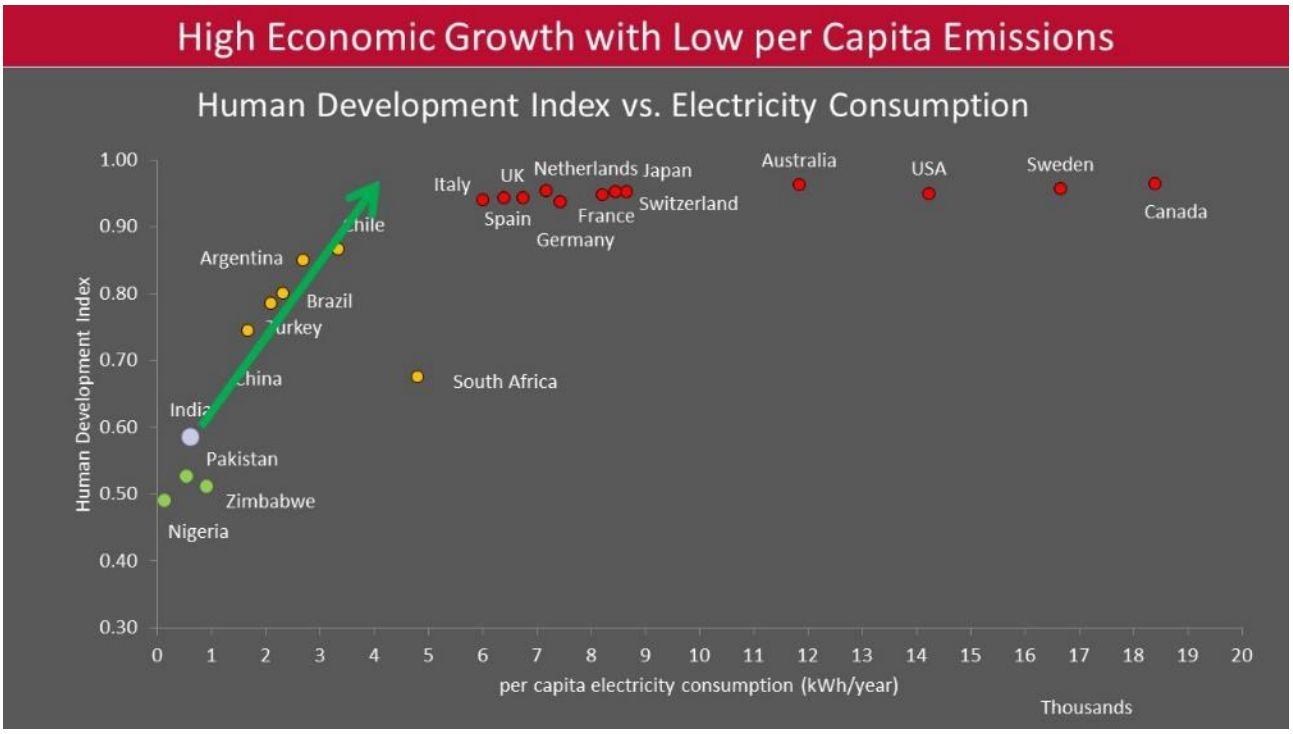



Upcoming Sessions
SEGT
International Conference on Sustainable Energy and Green Technology 2019
https://www.isegt.org
11-14 December 2019
Millennium Hilton Bangkok
Bangkok, Thailand
Shaping the Future of Green Energy & Technologies
Speakers
The Special Sessions supported by United Nations Environment Programme are also co-located with key focus on the following topics:
1. Life Cycle Costing and Life Cycle Assessment for Sustainable Public Procurement and Circular Economy
2. Roles of Digital Technology for Circular Economy
3. Combating Plastic Pollution and Marine Litter through Sustainable Public Procurement and Circular Economy
UN environment
Co-organizers
JGSEE
Technically Supported by:
UTM
Supporting Journals:
energies
JSEE
Early registration : Oct. 10, 2019
Normal registration : Nov. 10, 2019
Full paper submission : Nov. 25, 2019 (optional)
Conference Fees

b) LCA for Market Transformation

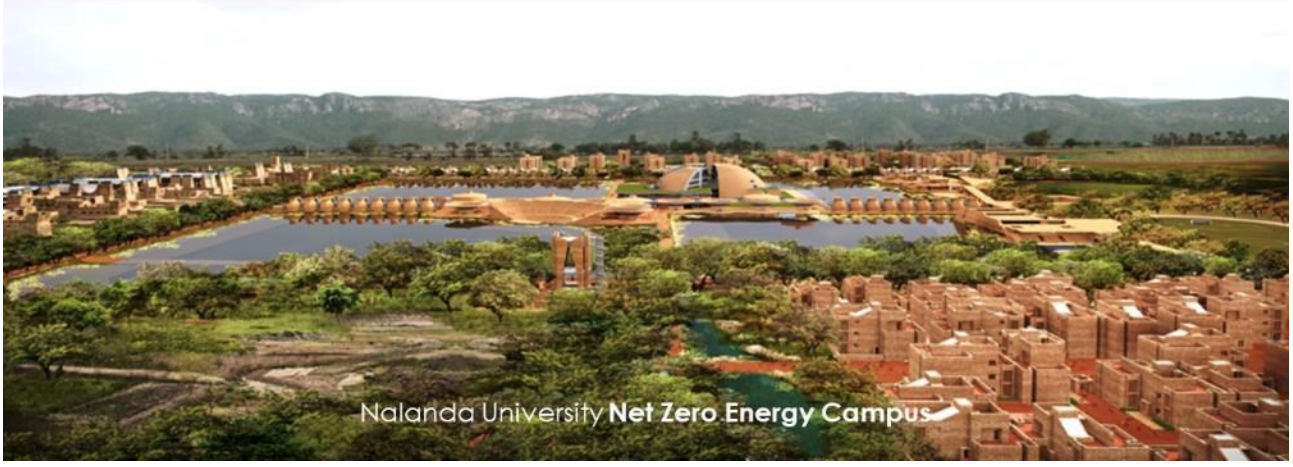
Mr. Tanmay Tathagat, Director, Environmental Design Solutions

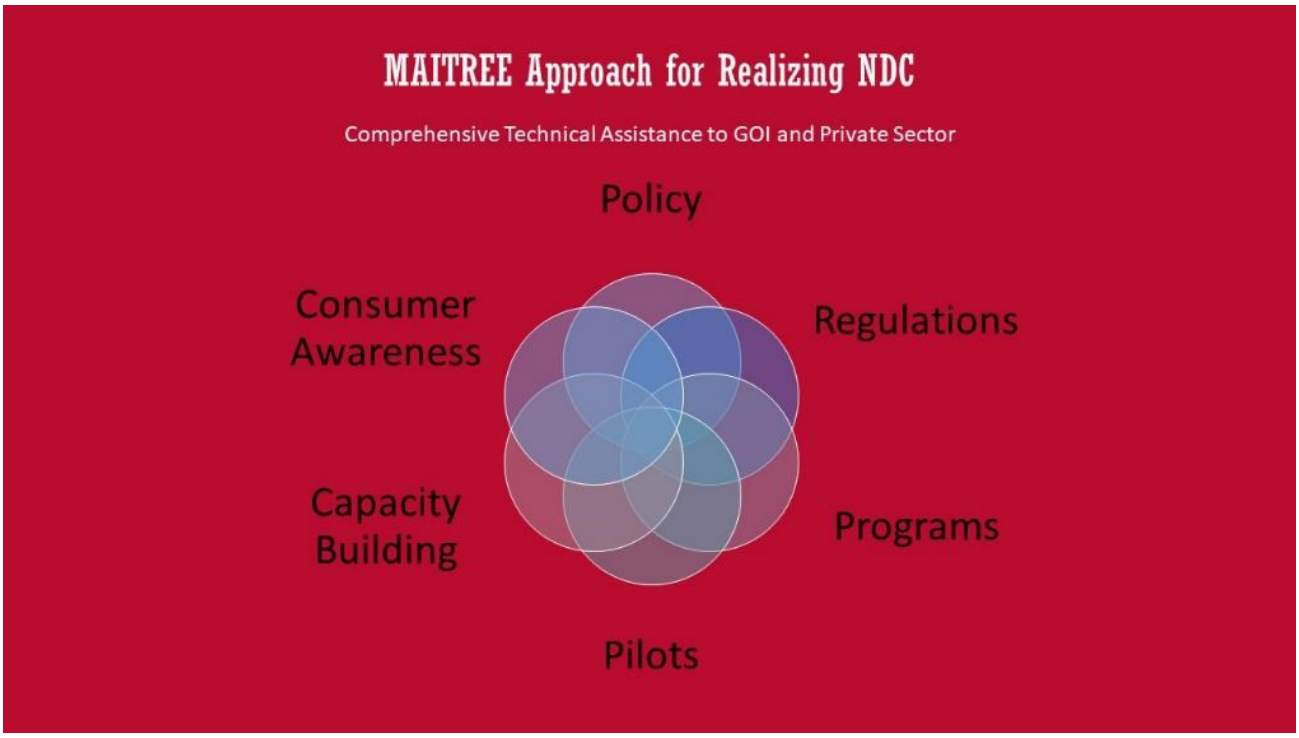




"Sustainable Lifestyle" - Needs based Consumption

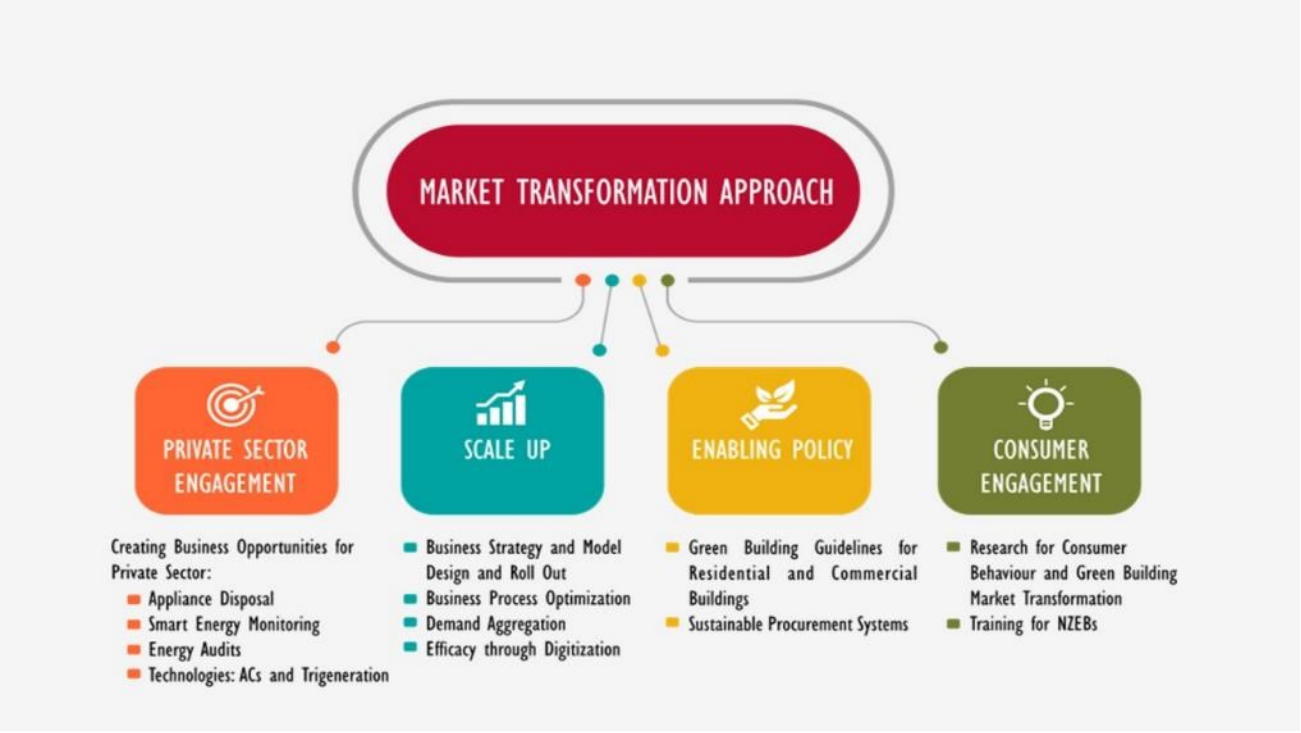
- Propagate a healthy and sustainable way of living based on traditions and values of conservation and moderation

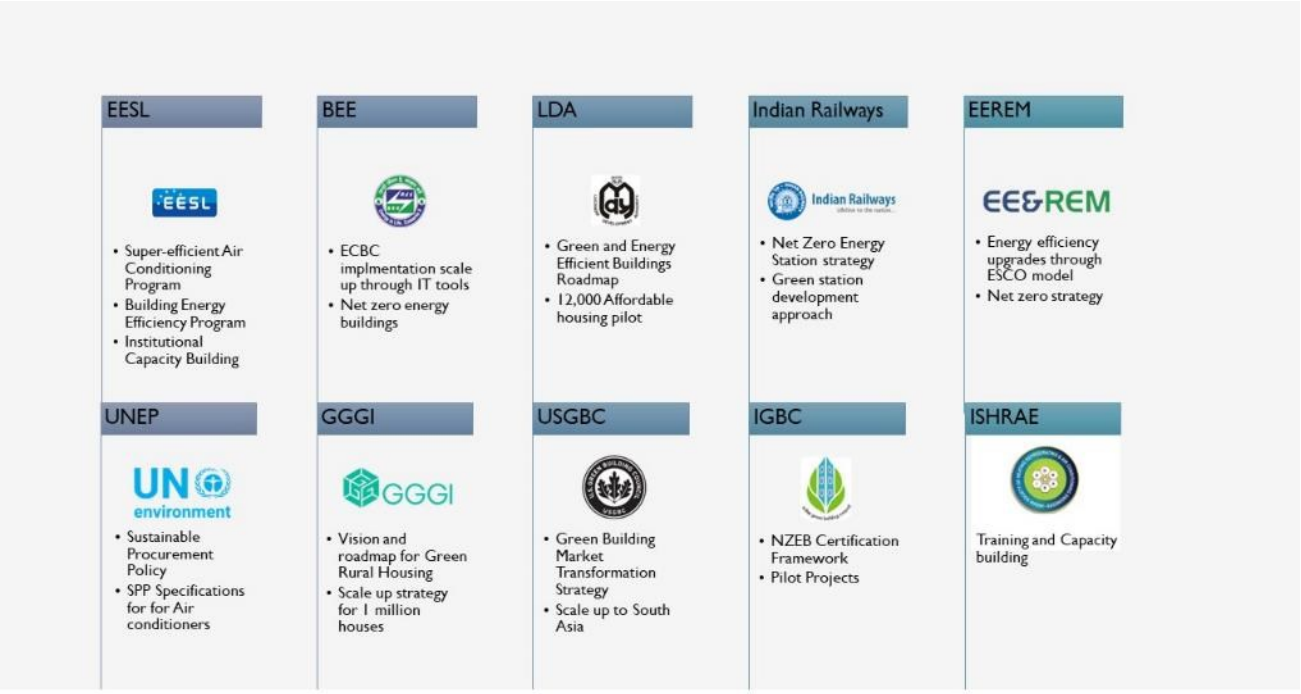




MAITREE supports uptake of cutting-edge technologies, innovative business models, and end-user engagement, to accelerate adoption of energy efficiency strategies and technologies at scale.

1. ENERGY EFFICIENCY IN BUILDINGS	2. SUSTAINABLE COOLING	3. TRAINING & CONSUMER ENGAGEMENT
Support Energy **Conservation Building Code** implementation	Program design and implementation **for low-energy cooling technologies**	**Skill development** for building sector professionals
Expanding markets for green and energy efficient buildings	Support **large scale deployment** of super-efficient air-conditioning technologies	**Capacity building** for energy efficient design, construction and operation
Moving towards **super efficient and Net Zero** Energy target for new buildings		**Consumer outreach** for energy efficiency behaviour modification
Large scale energy efficiency upgrades of existing buildings		


MARKET TRANSFORMATION APPROACH
PRIVATE SECTOR ENGAGEMENT
SCALE UP
ENABLING POLICY
CONSUMER ENGAGEMENT
Creating Business Opportunities for Private Sector:
Appliance Disposal
Smart Energy Monitoring
Energy Audits
Technologies: ACs and Trigeneration
Business Strategy and Model Design and Roll Out
Business Process Optimization
Demand Aggregation
Efficacy through Digitization
Green Building Guidelines for Residential and Commercial Buildings
Sustainable Procurement Systems
Research for Consumer Behaviour and Green Building Market Transformation
Training for NZEBs

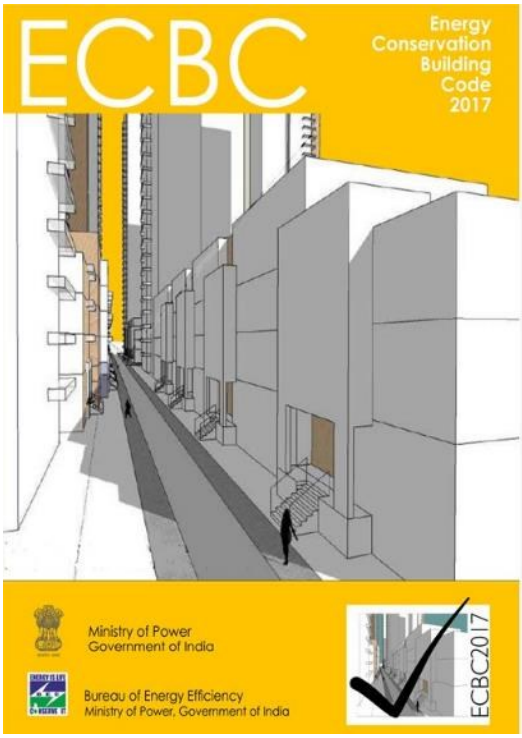

EESL
Super-efficient Air Conditioning Program
Building Energy Efficiency Program
Institutional Capacity Building
BEE
ECBC implmentation scale up through IT tools
Net zero energy buildings
LDA
Green and Energy Efficient Buildings Roadmap
12,000 Affordable housing pilot
Indian Railways
Net Zero Energy Station strategy
Green station development approach
EEREM
Energy efficiency upgrades through ESCO model
Net zero strategy
UNEP
Sustainable Procurement Policy
SPP Specifications for for Air conditioners
GGGI
Vision and roadmap for Green Rural Housing
Scale up strategy for 1 million houses
USGBC
Green Building Market Transformation Strategy
Scale up to South Asia
IGBC
NZEB Certification Framework
Pilot Projects
ISHRAE
Training and Capacity building

Strategic Technical Assistance

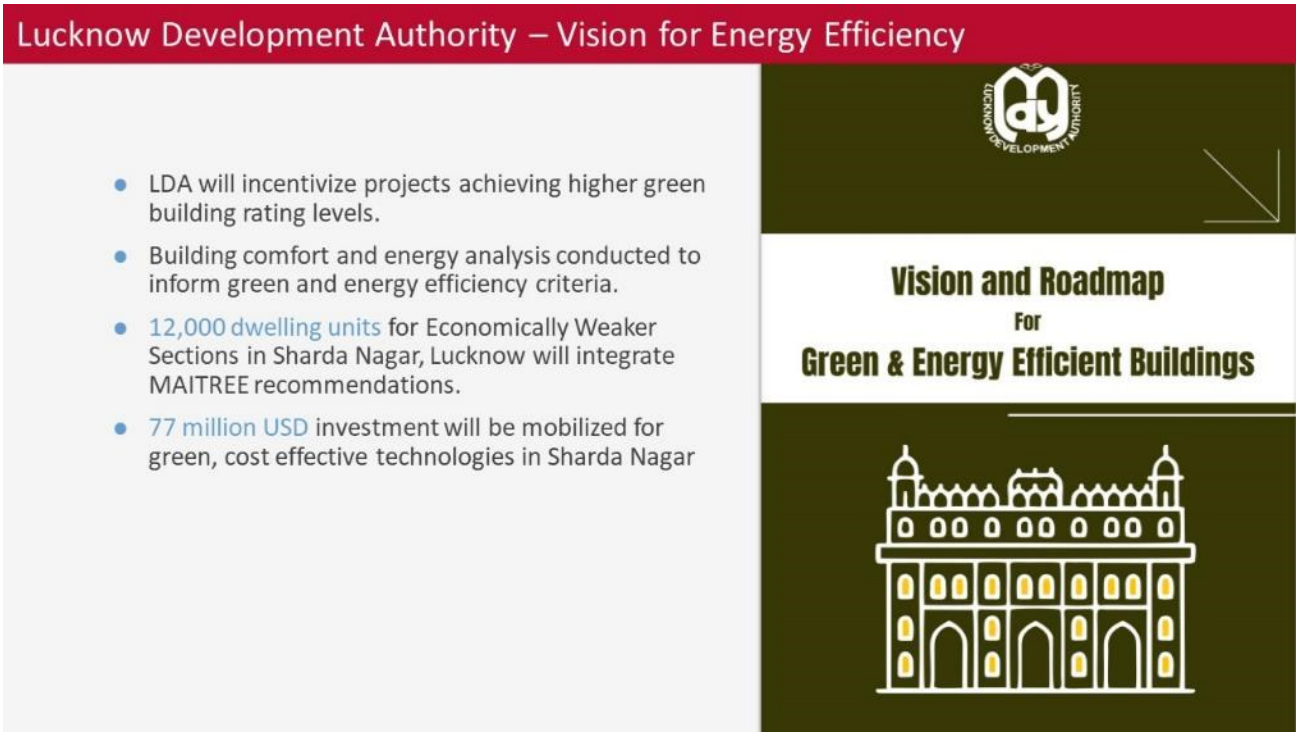
Vision & Comprehensive Policy Framework

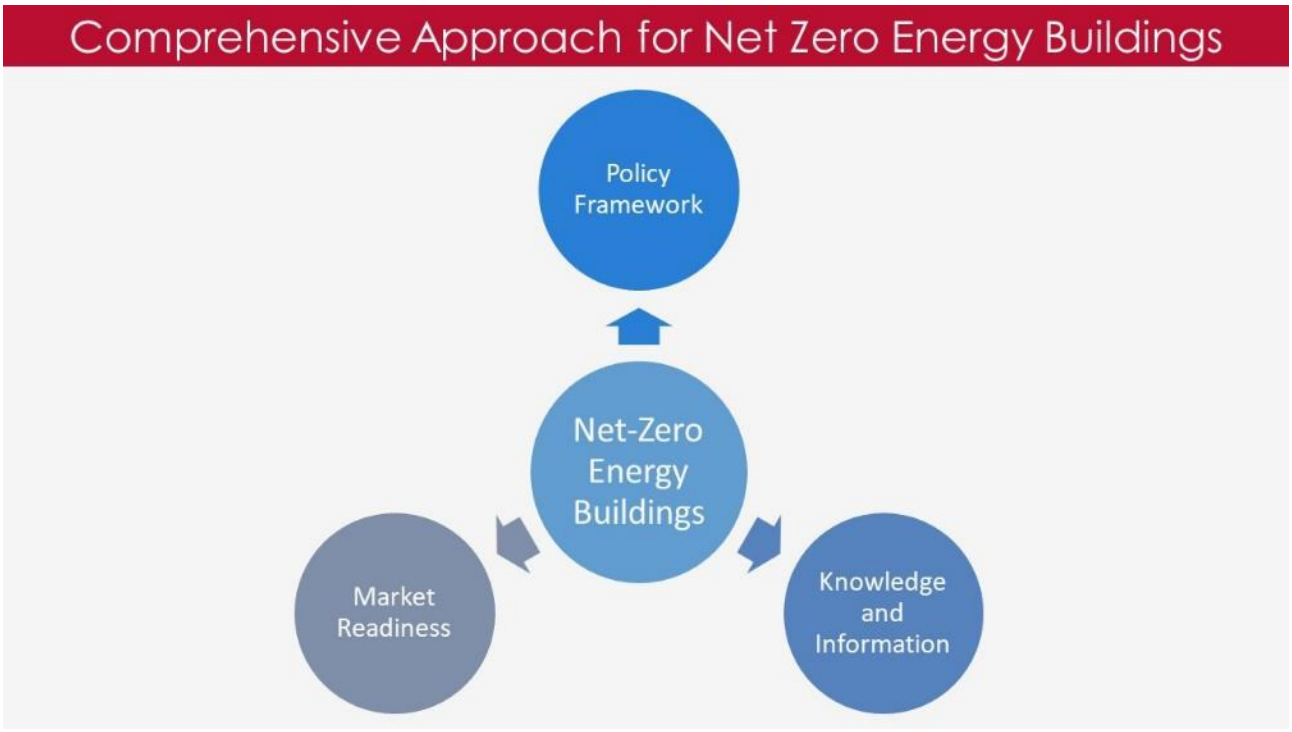
Flexible & Adaptable Process for Effective Operationalization

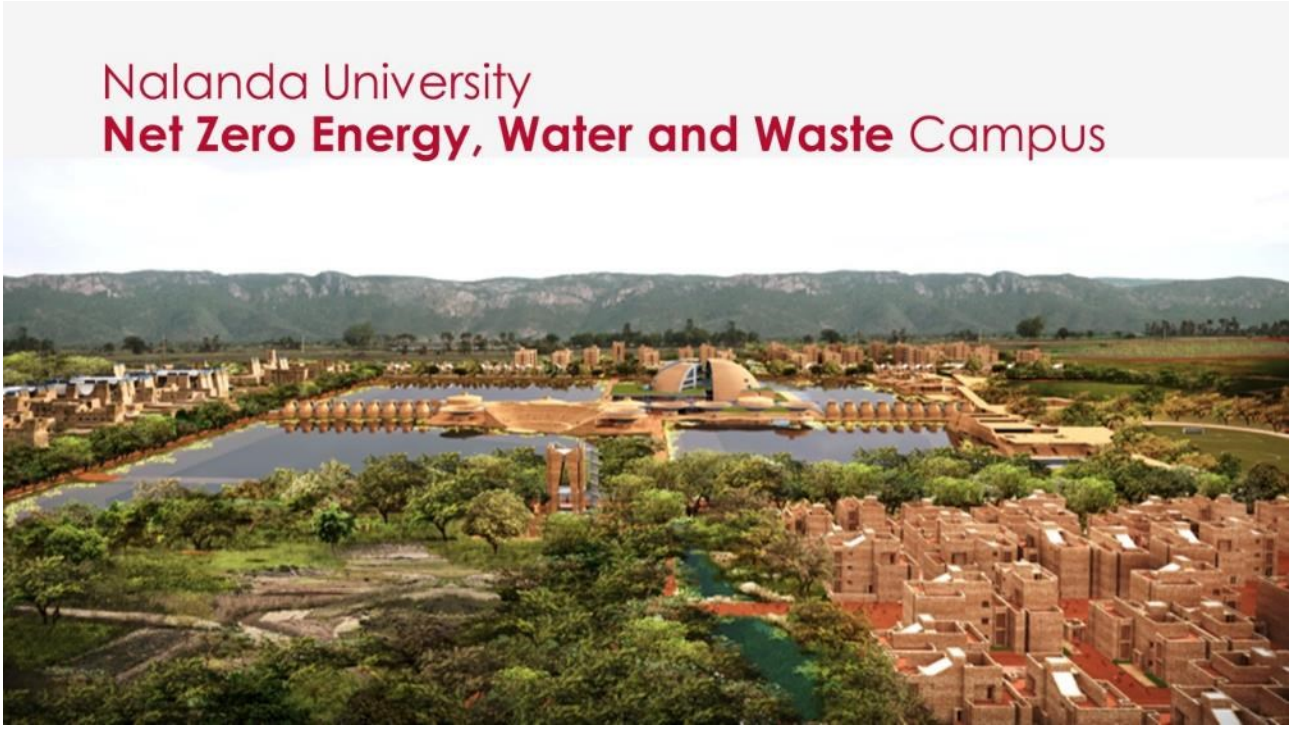
Market based Implementation

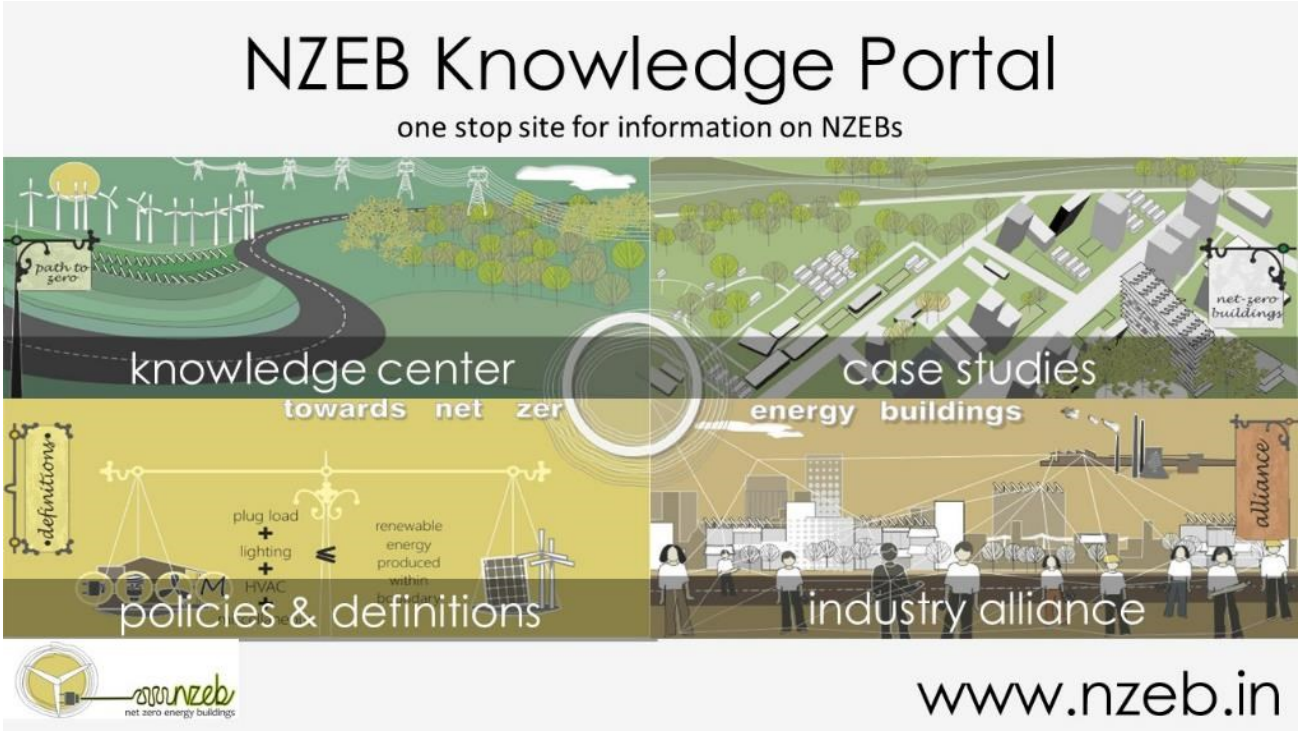



ECBC 2017 – A Unique Tiered Structure
Toward Near Zero Energy Buildings
ECBC+
35%
SuperECBC
50%
ECBC
Mandatory Minimum standards for Commercial Buildings
25%
better than Typical


Lucknow Development Authority – Vision for Energy Efficiency
LDA will incentivize projects achieving higher green building rating levels.
Building comfort and energy analysis conducted to inform green and energy efficiency criteria.
12,000 dwelling units for Economically Weaker Sections in Sharda Nagar, Lucknow will integrate MAITREE recommendations.
77 million USD investment will be mobilized for green, cost effective technologies in Sharda Nagar
Vision and Roadmap
For
Green & Energy Efficient Buildings


Comprehensive Approach for Net Zero Energy Buildings
Policy Framework
Net-Zero Energy Buildings
Market Readiness
Knowledge and Information


Nalanda University
Net Zero Energy, Water and Waste Campus


NZEB Knowledge Portal
one stop site for information on NZEBs
knowledge center
case studies
energy buildings
policies & definitions
industry alliance
www.nzeb.in

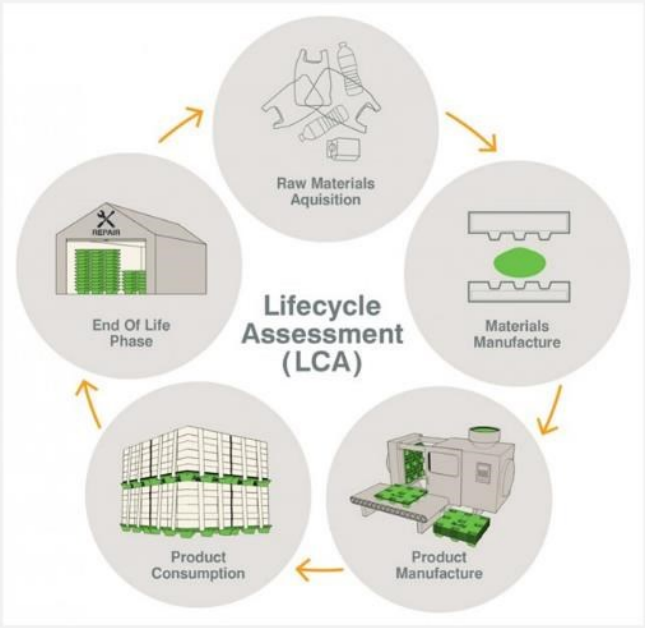

Partnership with Indian Railways
Net Zero Energy Buildings (NZEB) Vision
NZEB technical specifications
NZEB technologies and materials procurement
Action plan and M&V framework
Capacity building

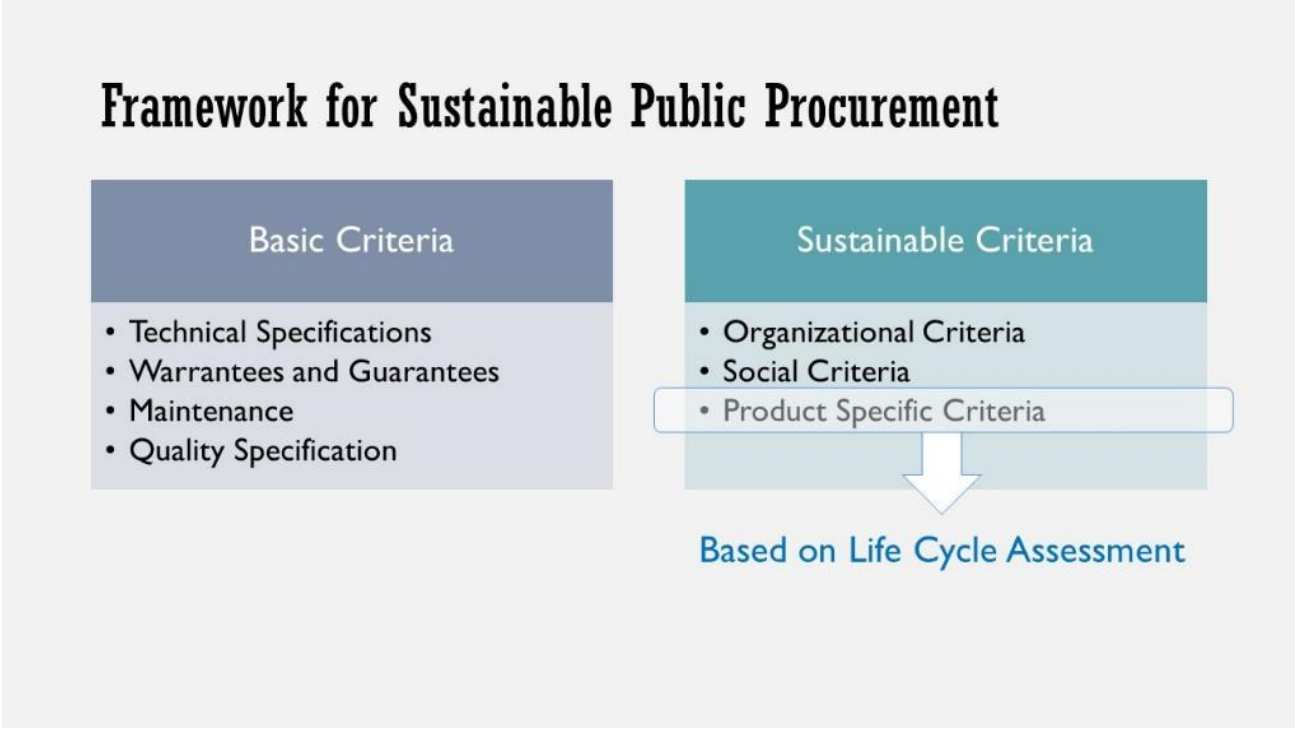

EESL Super Efficient Air Conditioners Program

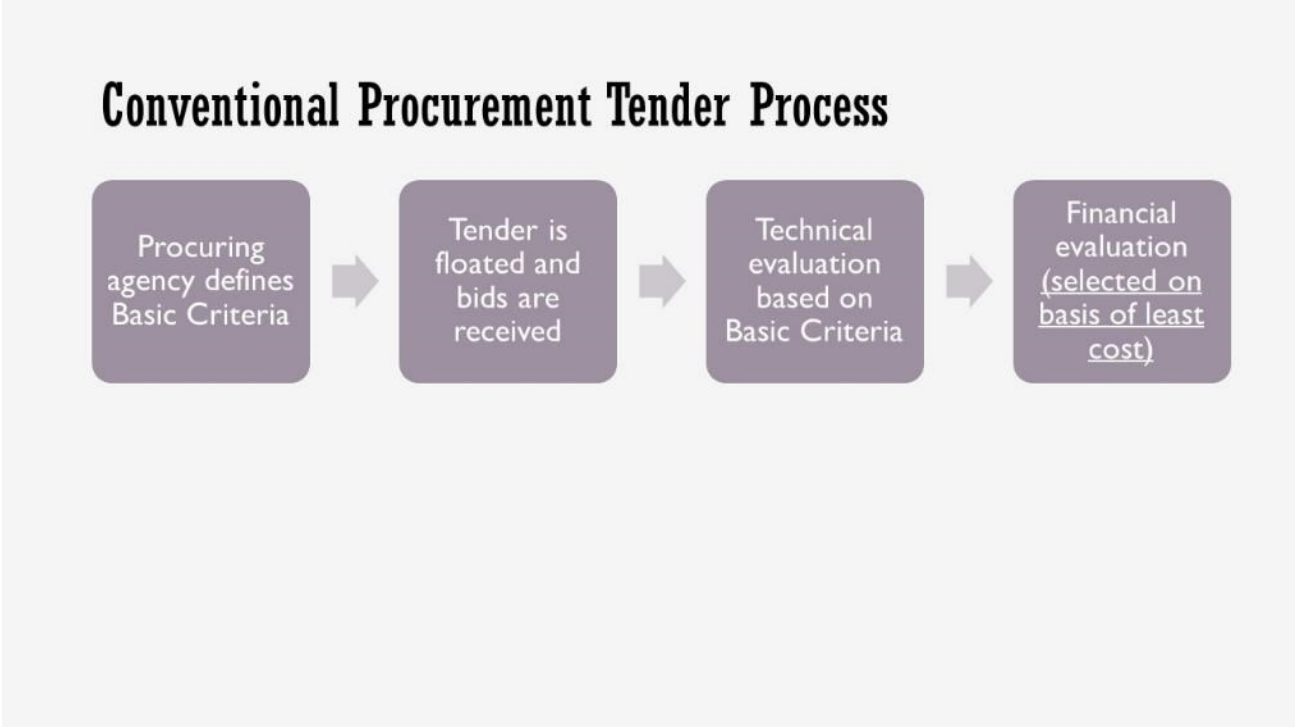

NZEB Rating System Launch with Indian Green Building Council
IGBC Net Zero Energy Buildings Rating System

Product lifecycle

LCA considers collective impacts and environmental footprints throughout all life stages when deciding about the final environmental performance of a product.




Framework for Sustainable Public Procurement
Basic Criteria
• Technical Specifications
• Warrantees and Guarantees
• Maintenance
• Quality Specification
Sustainable Criteria
• Organizational Criteria
• Social Criteria
• Product Specific Criteria
Based on Life Cycle Assessment

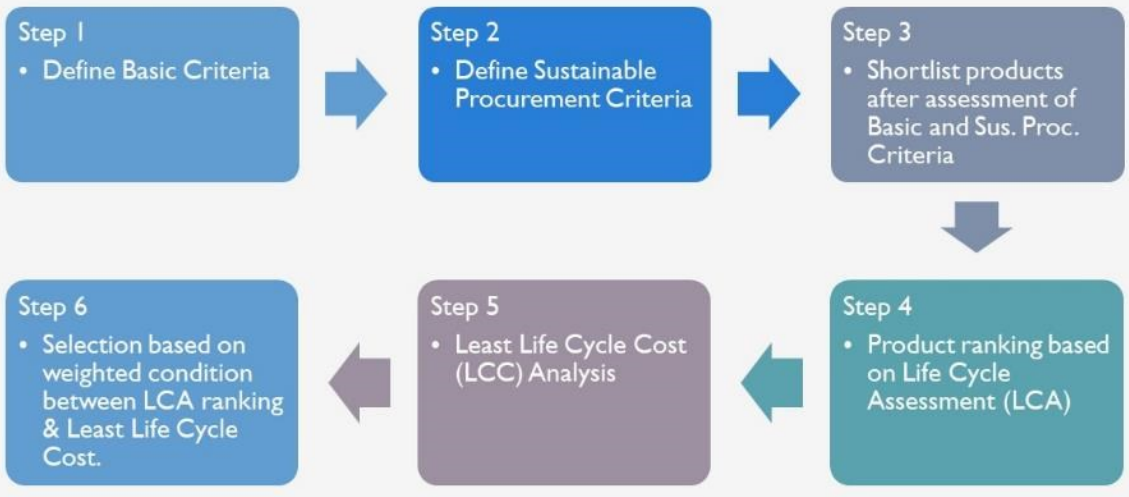

Conventional Procurement Tender Process
Procuring agency defines Basic Criteria
Tender is floated and bids are received
Technical evaluation based on Basic Criteria
Financial evaluation (selected on basis of least cost)

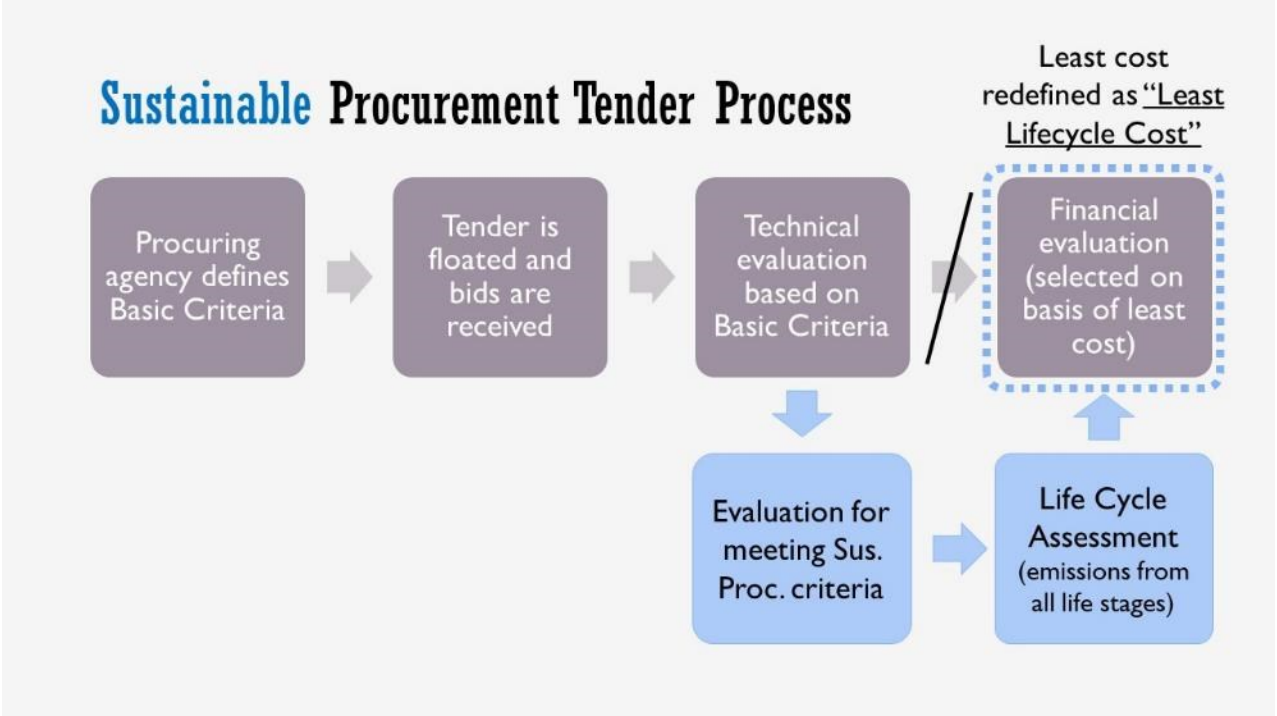
Sustainable Procurement Tender Process

Sustainable Procurement introduces few additional aspects into the procurement process:

1. Introduction of **Sus. Proc. Criteria**
2. Introduction of **Life Cycle Assessment (LCA)**
3. Redefine costs in terms of **Life Cycle Cost (LCC)** instead of upfront cost

Sustainable procurement process





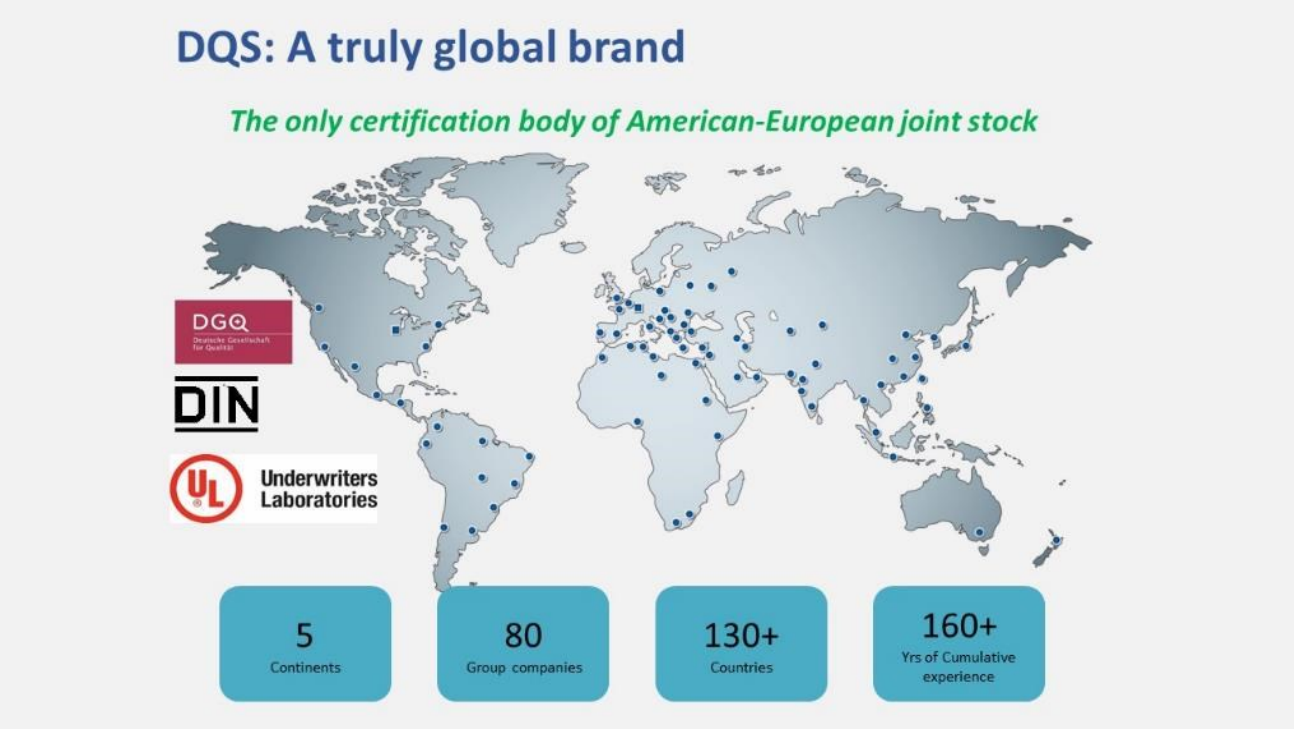
- EESL Super Efficient AC program includes low GWP – Safe Disposal Model
- Affordable Housing for Lucknow Development Authority based on Least Life Cycle Cost
- Greening PMAY-G (Rural Housing)
- Net Zero Energy Building Design

SPP: Market Transformation Benefits to the Individual and the Nation

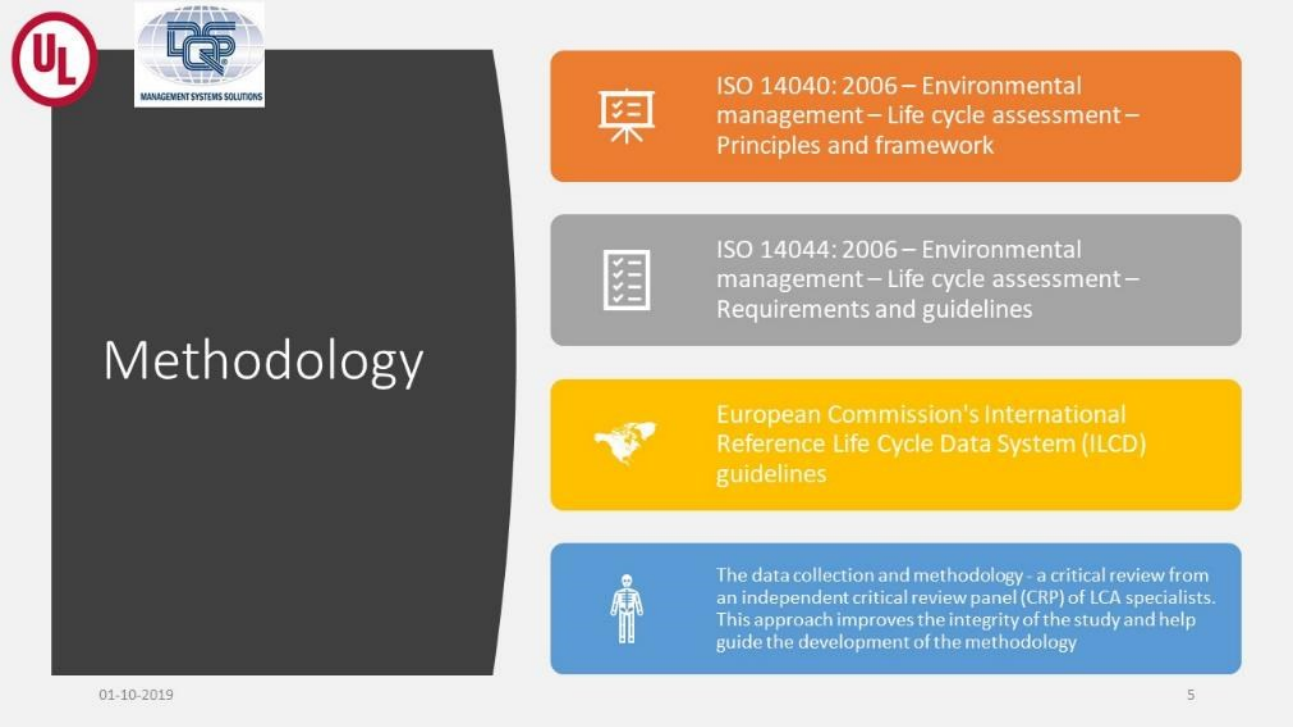
- Energy Savings
- Peak Demand Savings
- Climate Change Mitigation
- Improved Climate Resilience
- Consumer Cost Savings
- Improved Air quality and Health
- Innovation in the Industry
- Employment – Green Jobs
- Linkage to NDCs

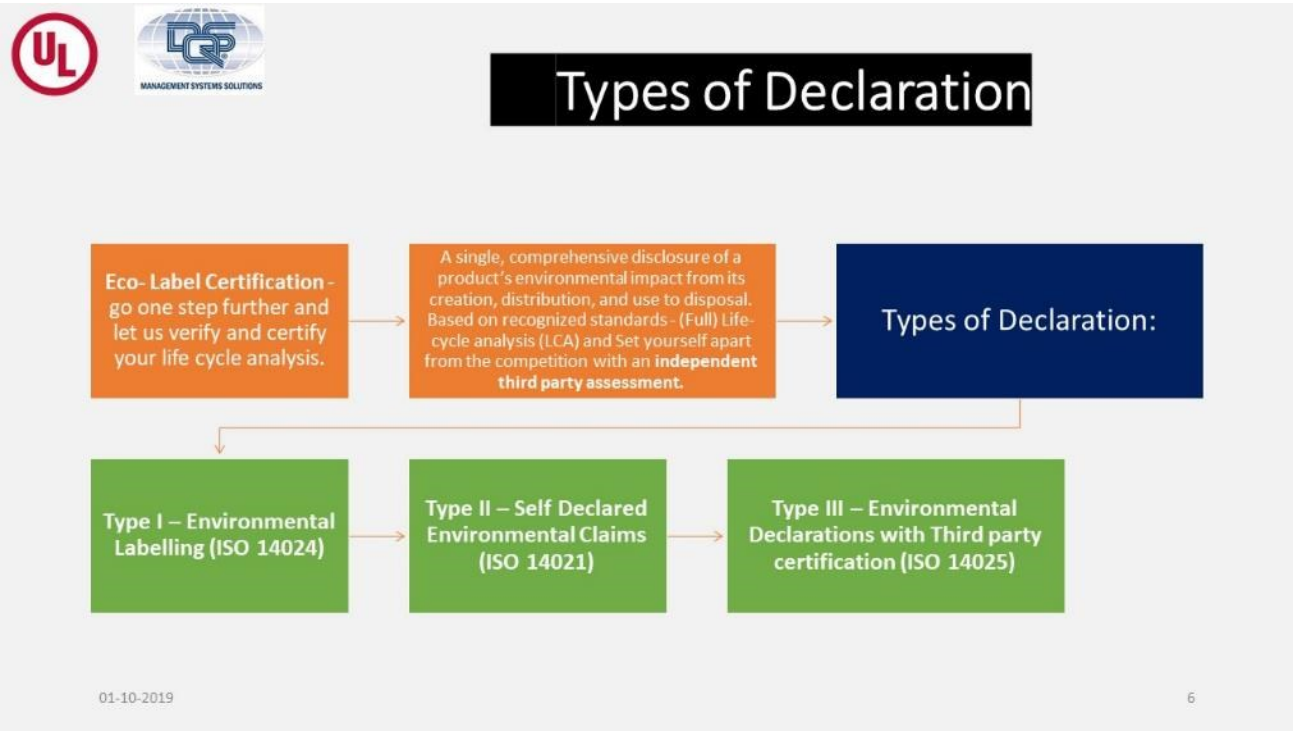
c) LCA certification process

Dr. K Murugan, MD and CEO of DQS UL, India

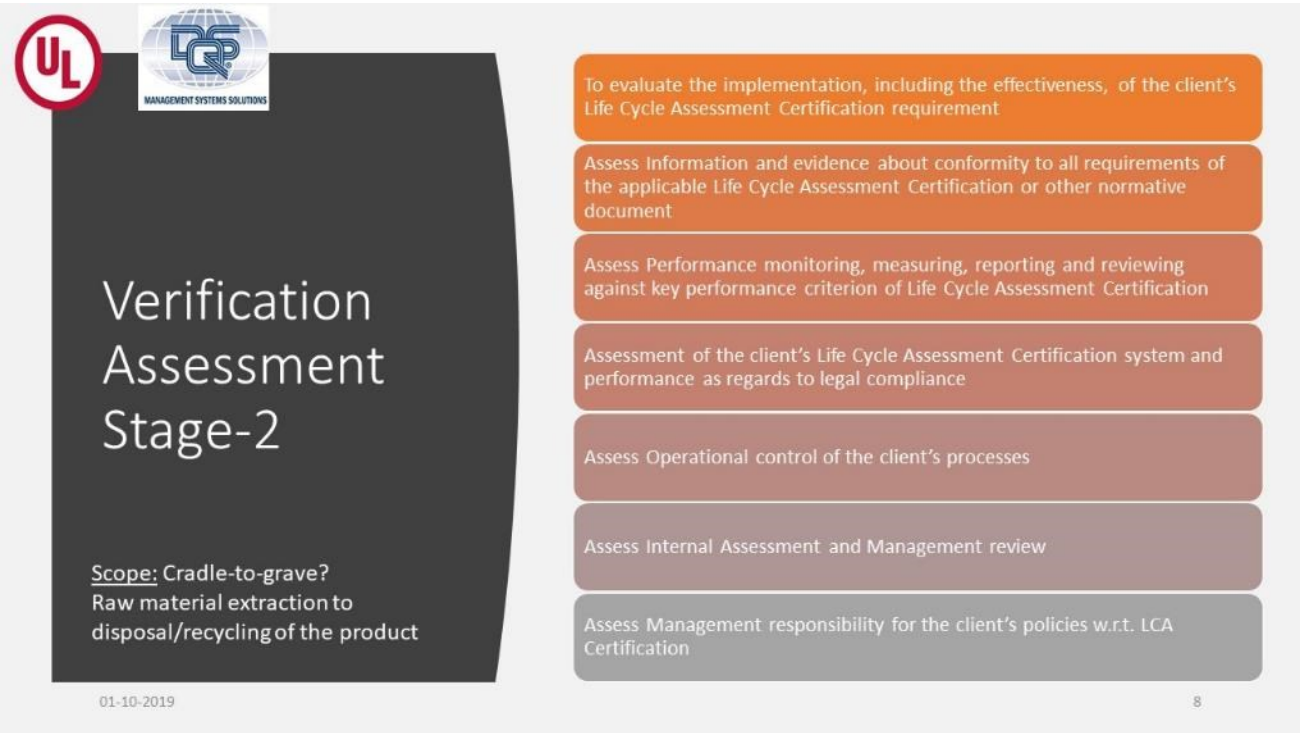

DQS: A truly global brand
The only certification body of American-European joint stock
DGQ
DIN
Underwriters Laboratories
5
Continents
80
Group companies
130+
Countries
160+
Yrs of Cumulative experience


Life cycle Assessment Certification Process
01-10-2019
ISO 14040: Verify Life cycle assessment report (Environmental management - Life Cycle Assessment - Principles and framework)
ISO 14044: Verify Life cycle assessment report (Environmental management- Life Cycle Assessment- Requirements and Guidelines)
Assessment Framework
1. Goal and Scope definition
2. Life Cycle Inventory Analysis (LCI)
3. Life Cycle Impact Assessment (LCIA)
4. Life Cycle Interpretations
Certification:
Stage-1
Stage-2
Independent Technical Review
Issue of Certificate


Methodology
ISO 14040: 2006 – Environmental management – Life cycle assessment – Principles and framework
ISO 14044: 2006 – Environmental management – Life cycle assessment – Requirements and guidelines
European Commission's International Reference Life Cycle Data System (ILCD) guidelines
The data collection and methodology - a critical review from an independent critical review panel (CRP) of LCA specialists. This approach improves the integrity of the study and help guide the development of the methodology
01-10-2019
5


Types of Declaration
Eco- Label Certification - go one step further and let us verify and certify your life cycle analysis.
A single, comprehensive disclosure of a product's environmental impact from its creation, distribution, and use to disposal. Based on recognized standards - (Full) Life-cycle analysis (LCA) and Set yourself apart from the competition with an independent third party assessment.
Types of Declaration:
Type I – Environmental Labelling (ISO 14024)
Type II – Self Declared Environmental Claims (ISO 14021)
Type III – Environmental Declarations with Third party certification (ISO 14025)
01-10-2019
6


Verification Assessment Stage-1
Review of LCA report & documents
Evaluation of the location and the location-specific conditions
Review Client's status and understanding of the requirement, particularly with regard to identification of key performance objectives during design, manufacturing, operation and disposal phase
To collect necessary information with regard to the scope of the LCA Certification, processes and location(s) of the client, and related statutory and regulatory aspects and compliance (e.g. quality, environmental and legal aspects of the client's activities, associated risks etc.)
Evaluation of internal assessment and management reviews and the level of implementation as per requirements of the relevant product and system standards
To verify the readiness for Stage-2 and provide a focus on further improvements
01-10-2019
7


Verification Assessment Stage-2
Scope: Cradle-to-grave?
Raw material extraction to disposal/recycling of the product
To evaluate the implementation, including the effectiveness, of the client's Life Cycle Assessment Certification requirement
Assess Information and evidence about conformity to all requirements of the applicable Life Cycle Assessment Certification or other normative document
Assess Performance monitoring, measuring, reporting and reviewing against key performance criterion of Life Cycle Assessment Certification
Assessment of the client's Life Cycle Assessment Certification system and performance as regards to legal compliance
Assess Operational control of the client's processes
Assess Internal Assessment and Management review
Assess Management responsibility for the client's policies w.r.t. LCA Certification
01-10-2019
8

Assessment Team Competency

DQS shall ensure that the assessment team members, including external experts, involved in the engagement are, as a team, demonstrate competence in the following areas:

- Life Cycle Assessment
- Sustainability subject matters
- Stakeholder engagement
- Environmental Management Standard;
- Energy Management Standards;
- Carbon footprint standard

Assessment team includes Product and Management System experts

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Do we need rating to be included?
We can jointly evolve!

LCA Certification Procedure

✓ Acceptance of the proposal with agreed methodology

✓ Submission of data as requested after signing the contract

✓ Evaluation of documentation by DQS India and release of desk review and onsite assessment report with gap analysis

✓ Submission of final documentation along with corrections/ additional clarifications as applicable

✓ Final Evaluation documentation, Critical Review and recommendation to Final Approver of DQSI

✓ Award of Certification by DQS India

Advantages of LCA Certification:

➢ Identify and reduce a product's potential environmental impact. LCA help in identifying, compiling and evaluating the potential inputs, outputs and the equivalent environmental impacts of the product throughout its life cycle

➢ Build consumer confidence in the quality and safety of your products

➢ Gain a tool for process and product optimization

➢ Set yourself apart from the competition with an independent third-party assessment

➢ LCA examine energy and resource consumption, emissions to air and water, incidental waste, toxicity and risk potential. Increase consumer confidence and reduce carbon footprint etc

10

How DQS and UL are positioned?

DQS

- Has established Sustainability Competency business (DQS CFS) in Germany
- Does assessment for more than 130 ISO Standards
- Does Sustainability assessments across the globe
- Works with 30 Industry Sectors including Aerospace, Automotive, Electrical, Medical, Telecom, Chemical, etc
- DQS Nxt Technology Platform aligned to Industry 4.0 Practices

UL

- Known for Product safety Certifications across the globe
- Writes standards
- Has got testing laboratories
- Works with institutions to evolve standards
- Works on Product verticals and sectors
- Keeps evolving with newer methods

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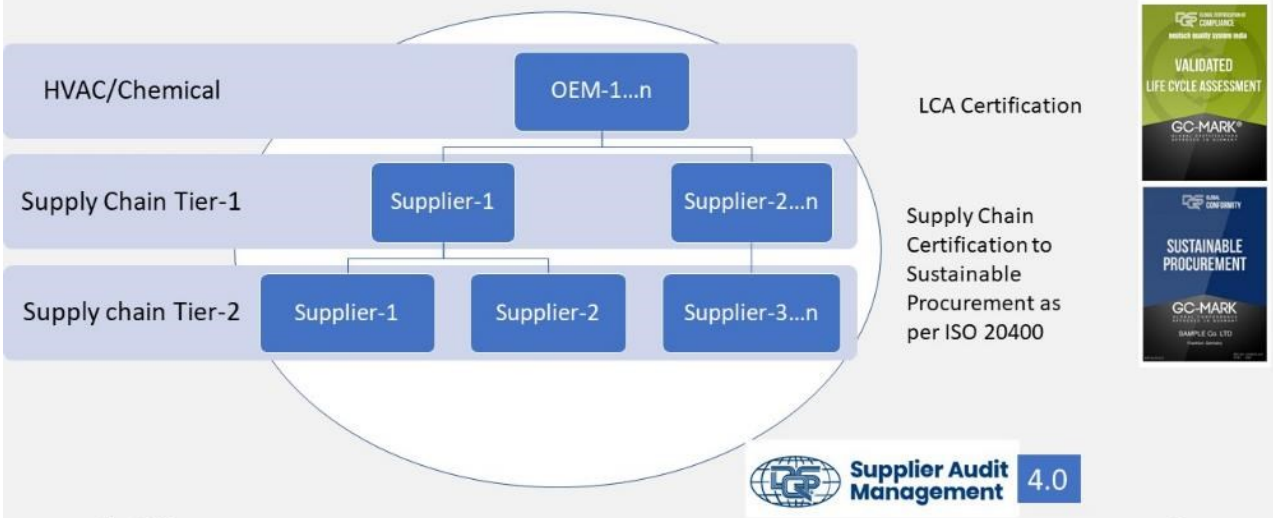
Proposed Ecosystem: LCA with Sustainable Procurement



01-10-2019 12


NXT
Simple, Versatile and Integrated way to handle Supplier Audit Management
Supplier Audit Management
4.
Manage a wide range of supplier-related activities, data and processes in a single, comprehensive framework
Ministry of Environment, Forest and Climate Change
MINISTRY OF FINANCE
USAID
FROM THE AMERICAN PEOPLE
UNEP
UL
01-10-2019
13

d) Eco-labeling – Global context and feasibility for India

Dr. Archana Walia, Director- India Program, CLASP


Raw Material Procurement
Manufacturing
Distribution
Consumer Use
Disposal
An ecolabel measures a product's holistic environmental impact

A Comparison of Existing Ecolabels Worldwide

LABEL	REGION(S)	PRODUCT TYPES COVERED	PRIVATE OR GOVERNMENT-INITIATED
BASF ECO-EFFICIENCY	Brazil, Germany, USA	Appliances, building products, cleaning products, cosmetics, electronics, energy, forest products, healthcare, machinery	Private
B-CORPORATION	USA, Canada	Appliances, building products, carbon offsets, food, financial services, textiles, tourism, water, waste, electronics, energy	Private
THAI GREEN LABEL	Thailand	Lamps, ACs, refrigerators, household appliances such as computers, washing and drying machines, TVs, fans, electric cables	Government
CHINA ENERGY CONSERVATION PROGRAM	China	Appliances, lighting, electronics, office equipment, and industrial tools	Government
CRADLE TO CRADLE CERTIFIED PRODUCTS PROGRAM	USA, France, Germany, Spain	Appliances, building products, cleaning products, cosmetics, electronics, furniture, machinery, textiles, forest products	Private
ECOMARK: INDIA	**India**	**Building products, cleaning products, cosmetics, food, forest products, packaging, textiles, electrical appliances**	Government
ENERGUIDE FOR APPLIANCES	Canada	Appliances	Government

A Comparison of Existing Ecolabels Worldwide

LABEL	REGION(S)	PRODUCT TYPES COVERED	PRIVATE OR GOVERNMENT-INITIATED
ENERGY STAR	USA, New Zealand, Canada	Appliances, building products, electronics, machinery	Government
ENVIRONMENTAL PRODUCT DECLARATION	Belgium, Italy, UK, Switzerland, Taiwan	Appliances, building products, cleaning products, commodities, energy, electronics, machinery, textiles, transportation, water	Private
EU ECOLABEL	Europe, Australia, Canada, Malaysia	Appliances, building products, cleaning products, electronics, forest products, textiles, tourism	Government
CHINA ENVIRONMENTAL LABELLING	China, New Zealand	Appliances, building products, cleaning products, electronics, forest products, packaging, textiles, transportation	Government
GREENGUARD	Europe, Australia, Qatar, USA	Appliances, building products, cleaning products, electronics, furniture, machinery, textiles	Private
GREENSEAL	Canada, Indonesia, South Africa, USA	Appliances, building products, cleaning products, cosmetics, forest products, machinery, tourism, food	Private
SCS INDOOR ADVANTAGE	USA	Appliances, building products, furniture	Private

Three major global ecolabels were studied in detail to arrive at an optimum ecolabelling methodology for India.

EU Ecolabel is a voluntary scheme established by the European Commission, and covers a wide range of products and services

GECA is an independent Australian label that covers a wide variety of products and services and follows the ISO 14024 principle.

Green Seal is a non-profit environmental standard development and certification organization. Its flagship program is the certification of products, services, restaurants, and hotels.

All of these labels adopt a life cycle approach to measuring the environmental performance of a product

Each of these labels covers a wide range of products – household products, cleaning products, furniture, cooling devices, appliances, paper products, and ecotourism

Three major global ecolabels were studied in detail to arrive at an optimum ecolabelling methodology for India.

Base environmental performance assessment on a feasible set of criteria

Explore ways to introduce financial incentives to certified manufacturers

Develop different assessment mechanisms for different product types

Studying India's *Ecomark* Program

The *Ecomark* program is based on the following criteria:

Pollution Mitigation | Energy Conservation | Recyclability | Environmental Impact | Biodegradability

And bases its assessment on the following environmental impact categories:

Sustainable Manufacturing | Projected Impact on the Environment | Percentage of Recycled Materials | Natural Resource Consumption | Waste Generation

Products and Product Types Currently Certified Under The *Ecomark* Program

Ministry of Environment, Forest & Climate Change

मानकः पथप्रदर्शकः
Bureau of Indian Standards

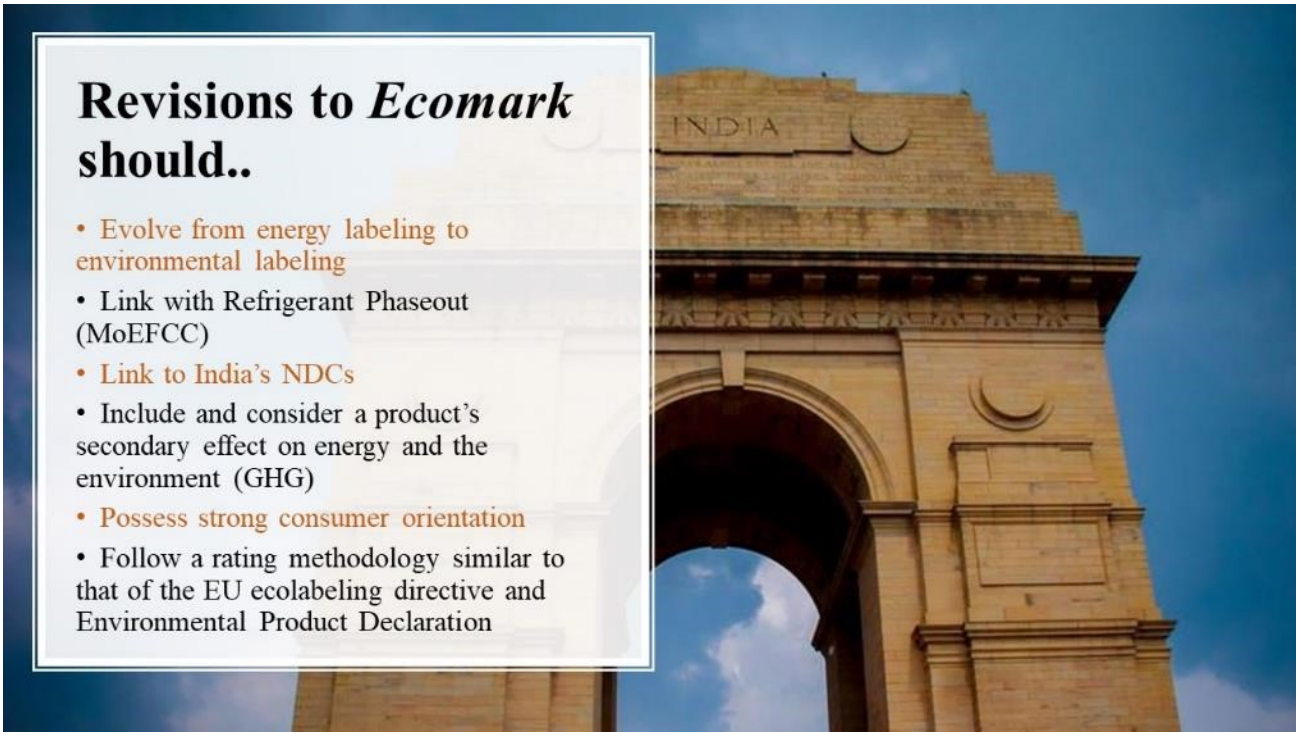
ENERGY IS LIFE
BEE
CONSERVE IT

UNEP

Preliminary Consultations With Different Entities Have Established Strong Governmental Support For AC Ecolabeling

STAKEHOLDER CONSULTATIONS


BUILDING ON THE EXISTING ECOMARK PROGRAM
The proposed criteria for cooling appliances could potentially be included as an integral part of the existing program.
Constitute Technical Committee
Draft Initial Criteria
Encourage Pilot Projects
Identify Improvements to Draft Criteria
Roll Out the Program


Revisions to *Ecomark* should..
• Evolve from energy labeling to environmental labeling
• Link with Refrigerant Phaseout (MoEFCC)
• Link to India's NDCs
• Include and consider a product's secondary effect on energy and the environment (GHG)
• Possess strong consumer orientation
• Follow a rating methodology similar to that of the EU ecolabeling directive and Environmental Product Declaration
INDIA

Several environmental impact categories are to be incorporated into the ecolabeling criteria

WASTE GENERATION | GLOBAL WARMING POTENTIAL | RESOURCE CONSUMPTION | POLLUTION GENERATION

The proposed criteria will attempt at assessing these categories within each life cycle stage of the product types under consideration.

RELEVANT STANDARDS AND INITIATIVES

ISO 14000 Series of Standards	International Reference Life Cycle Data System	India Environment Protection Act – Ozone Depleting Substances Rules	BEE Star Labelling Programme
CPCD Waste Handling Rules	MOEFCC Clearances, in conjunction with Montreal Protocol	MOEFCC HCFC Phase-Out Plan	IS 1391, Room Air Conditioners – Parts A and B

A preliminary set of criteria, based on the following broad areas of focus, can be integrated into *Ecomark*.





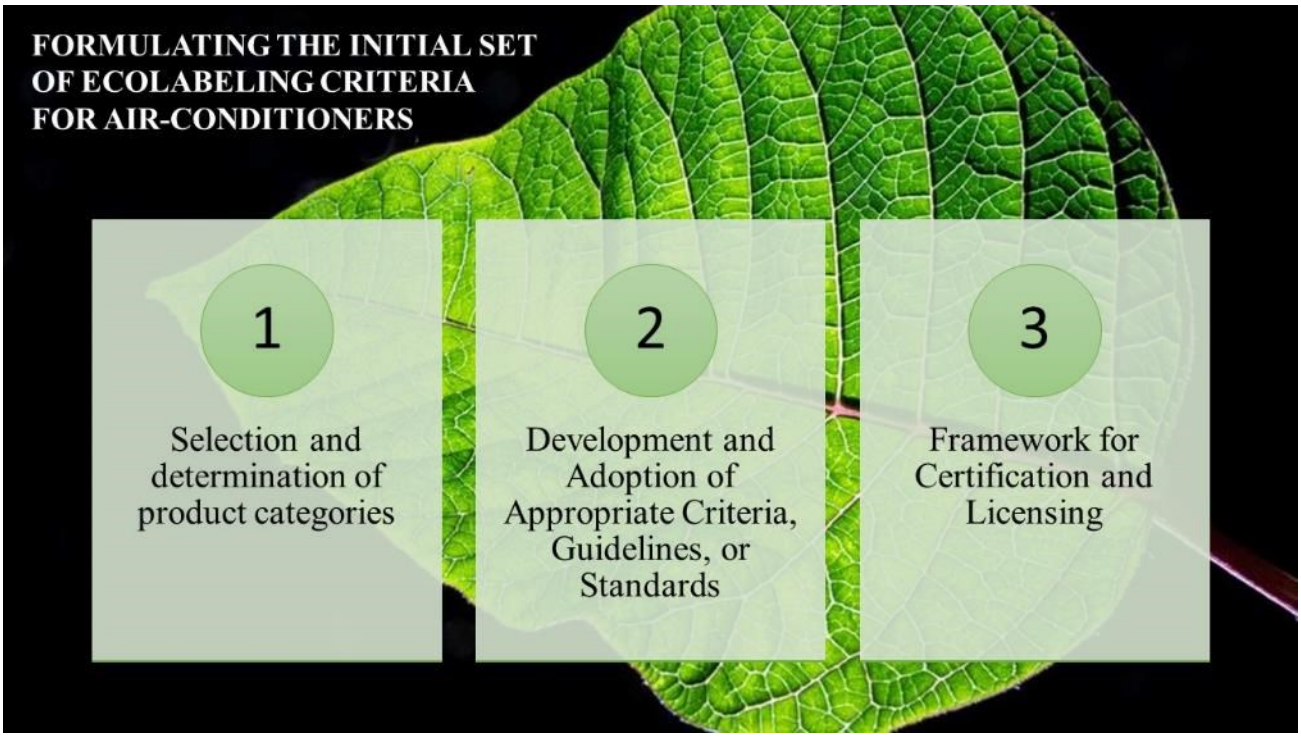

Management	Sustainable Manufacturing	Sustainable Distribution	Sustainable Disposal	Sustainable Transport	Operations and Maintenance
Environmental Management System	Use of Sustainable Materials	Energy Consumption Reduction	Waste Minimization and Prevention	Promotion of Environmentally-Friendly Transport Options	Sustainable Operations and Maintenance
Human Resource Management	Improvement of Process Efficiency	Renewable Energy Integration	Innovative Waste Disposal Technologies		Social Awareness
Resource Use Monitoring	Reduction of Human Toxicity				

SPECIFIC ENVIRONMENTAL, HUMAN HEALTH, AND ETHICAL CRITERIA






Appliance Ozone Depletion Potential	Appliance Global Warming Potential	Appliances Should Incorporate Recyclable Packaging Which Does Not Contain Harmful Substances	Appliance Manufacturing Units Must Demonstrate Zero Human Toxicity Potential	Appliance Manufacturing Units Must Have a GHG Emission Limit	At Least XX% Of Electricity In Manufacturing Facilities Must Come From A Renewable Source


FORMULATING THE INITIAL SET OF ECOLABELING CRITERIA FOR AIR-CONDITIONERS
1
Selection and determination of product categories
2
Development and Adoption of Appropriate Criteria, Guidelines, or Standards
3
Framework for Certification and Licensing


The proposed criteria will focus specifically on air conditioning devices.
Efficiency
GWP
Affordability
Emissions
Resource Use
Safety

PROPOSED PARTICIPANTS AND STAKEHOLDERS

The institution of AC ecolabeling in India is expected to result in a number of benefits

GOVERNMENT

- Creation of recognition mechanisms
- Reduced need for regulations
- Manifestation of improved taxation and subsidies structures

INDUSTRIES

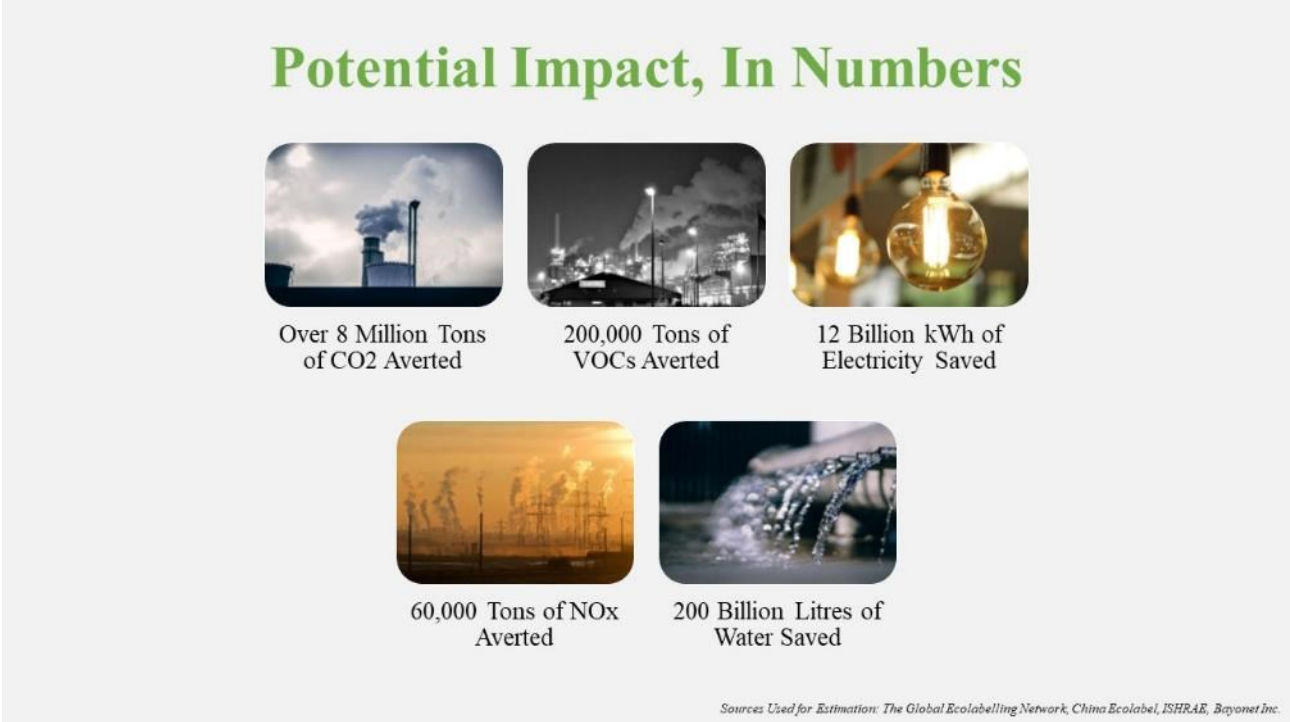
- Improved understanding of a product's environmental benefits and liabilities
- Improvement in product design
- Creation of effective negotiation tools

NONPROFITS

- Increased availability of base information to effect positive social and environmental change
- Potential introduction of training programs on environmental impact assessment

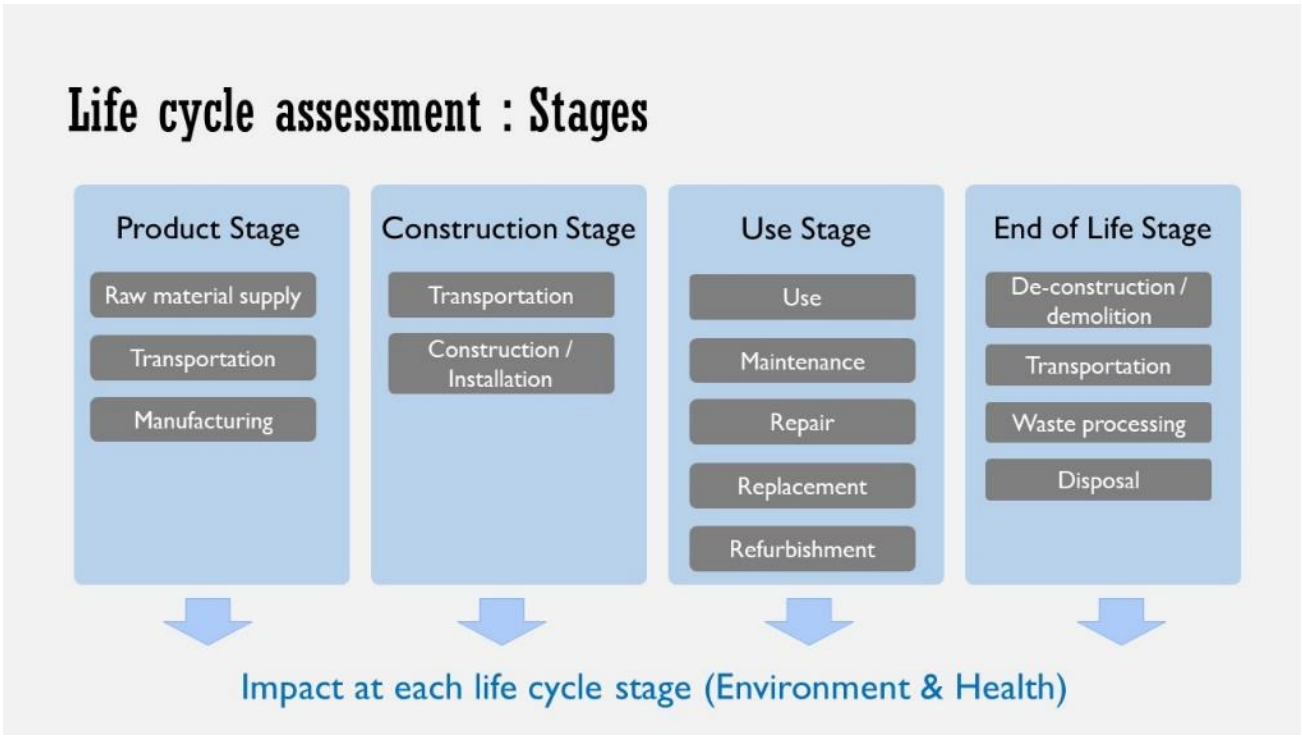
CONSUMERS

- Assistance in making informed decisions
- Increased availability of environmental information for several product types
- Potential creation of a new job sector


Potential Impact, In Numbers
Over 8 Million Tons of CO2 Averted
200,000 Tons of VOCs Averted
12 Billion kWh of Electricity Saved
60,000 Tons of NOx Averted
200 Billion Litres of Water Saved
Sources Used for Estimation: The Global Ecolabelling Network, China Ecolabel, ISHRAE, Beyonet Inc.

e) LCA Experience in building construction industry

Ms. Nidhi Gupta, Environmental Design Solutions

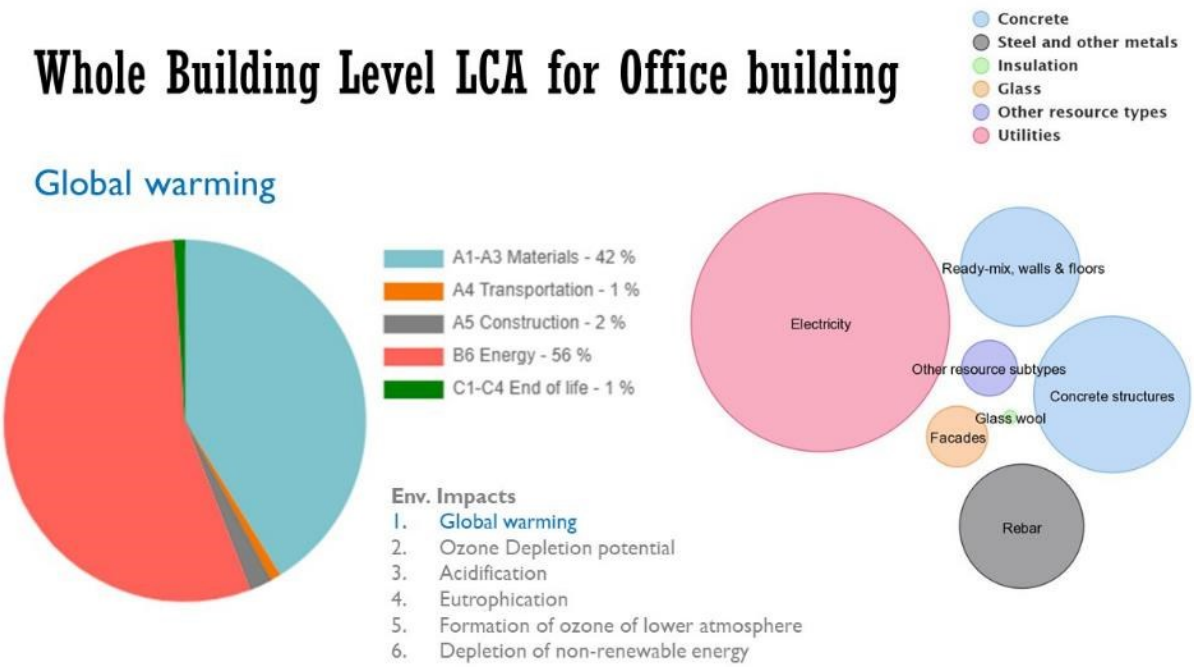


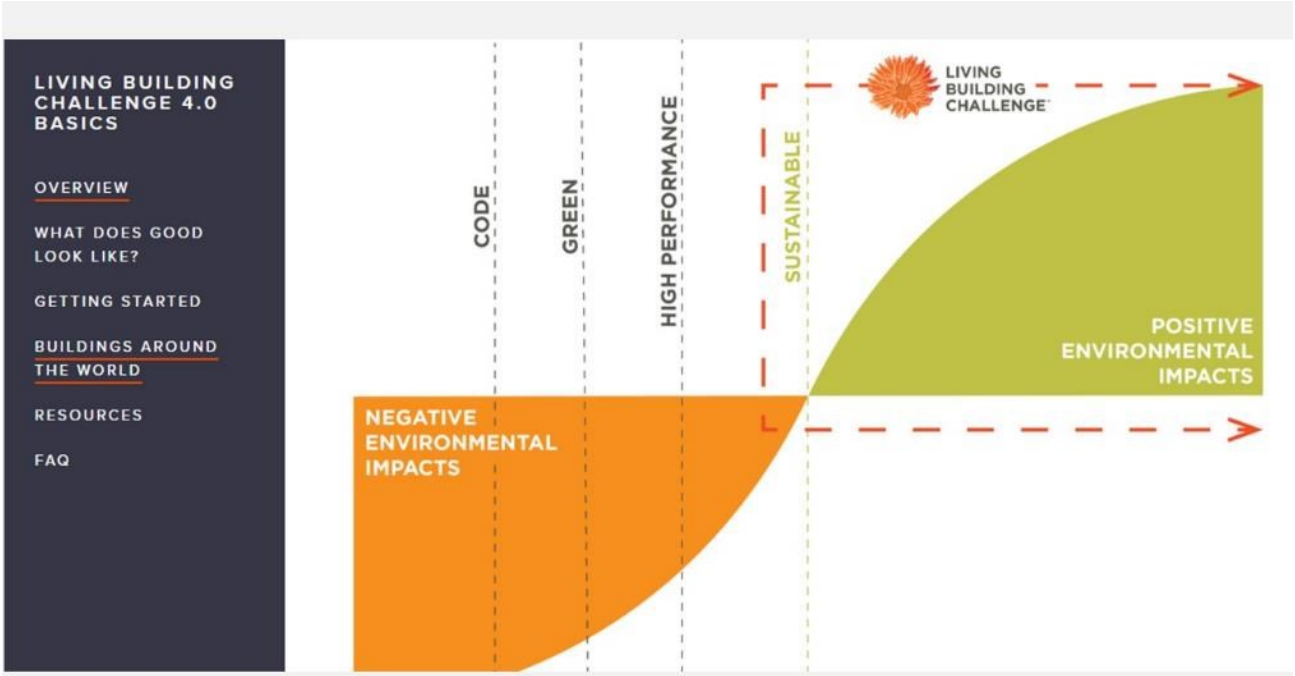
LCA can be performed at three levels

Whole Building Level	Building System Level	Building Product Level

- How are impacts from materials versus impacts from operational energy distributed?
- How much do the different building parts contribute to the total impacts?
- How can the selection of materials be optimized in order to reduce the environmental impacts?

Whole Building Level LCA for Office building



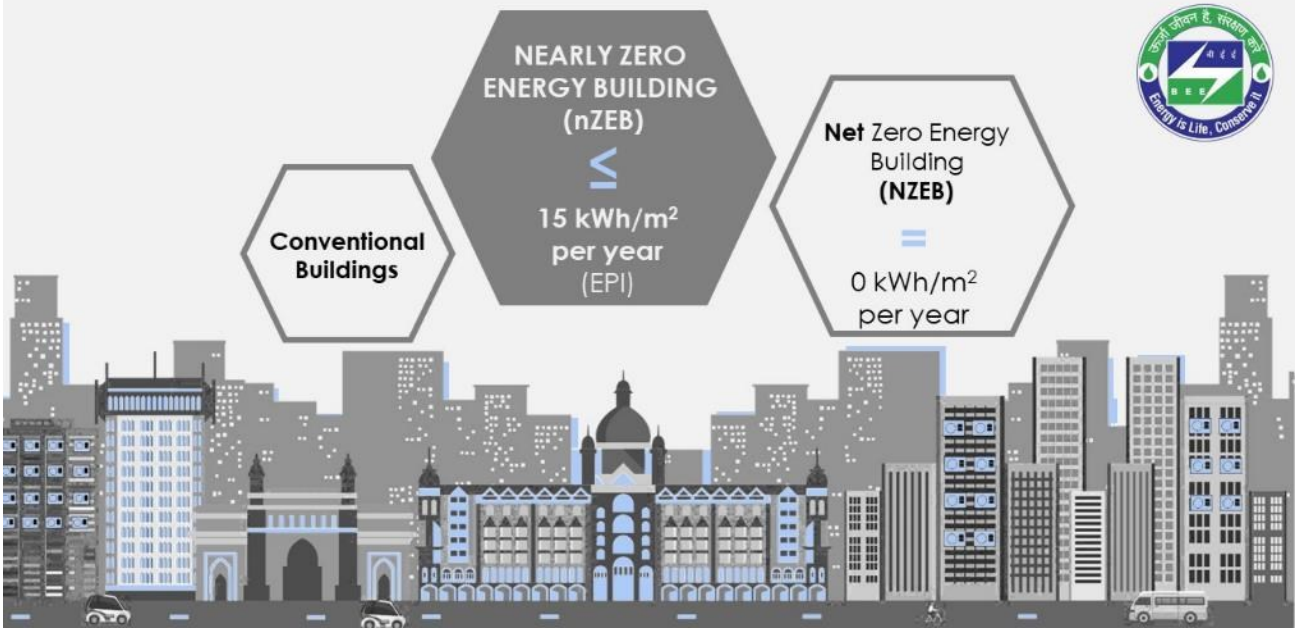


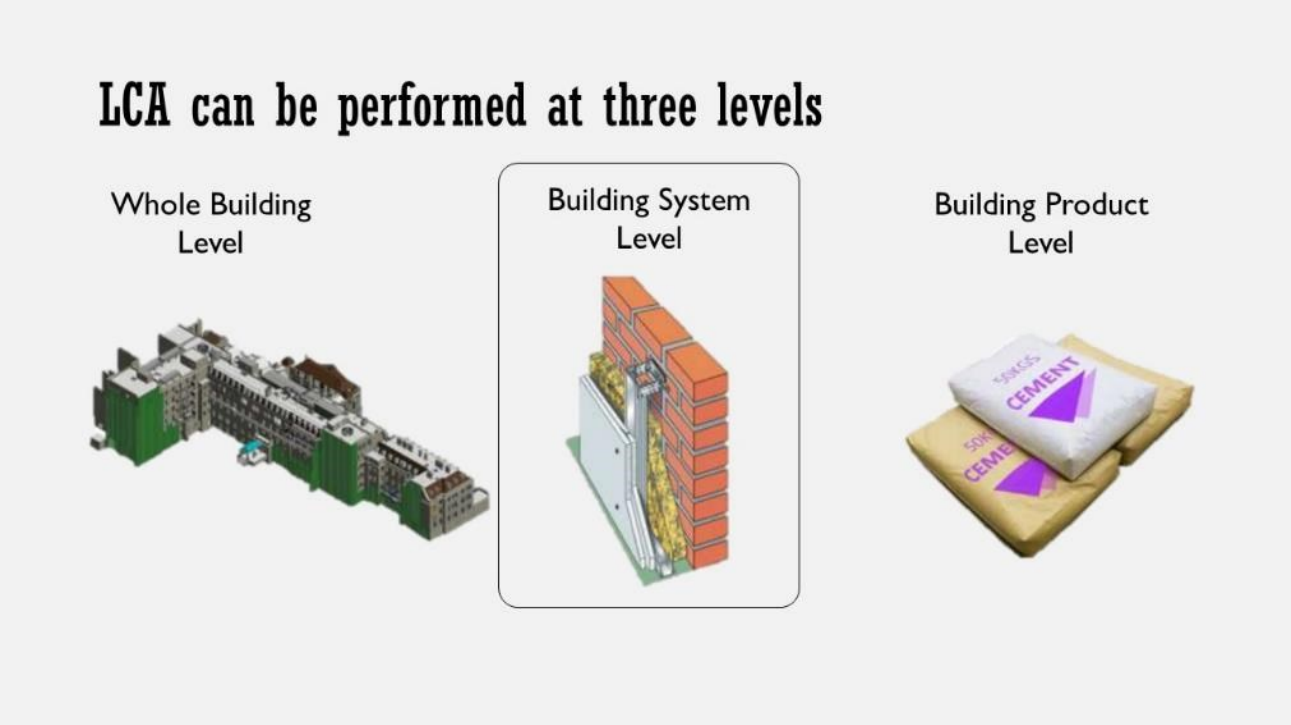
Source: Living Building Challenge

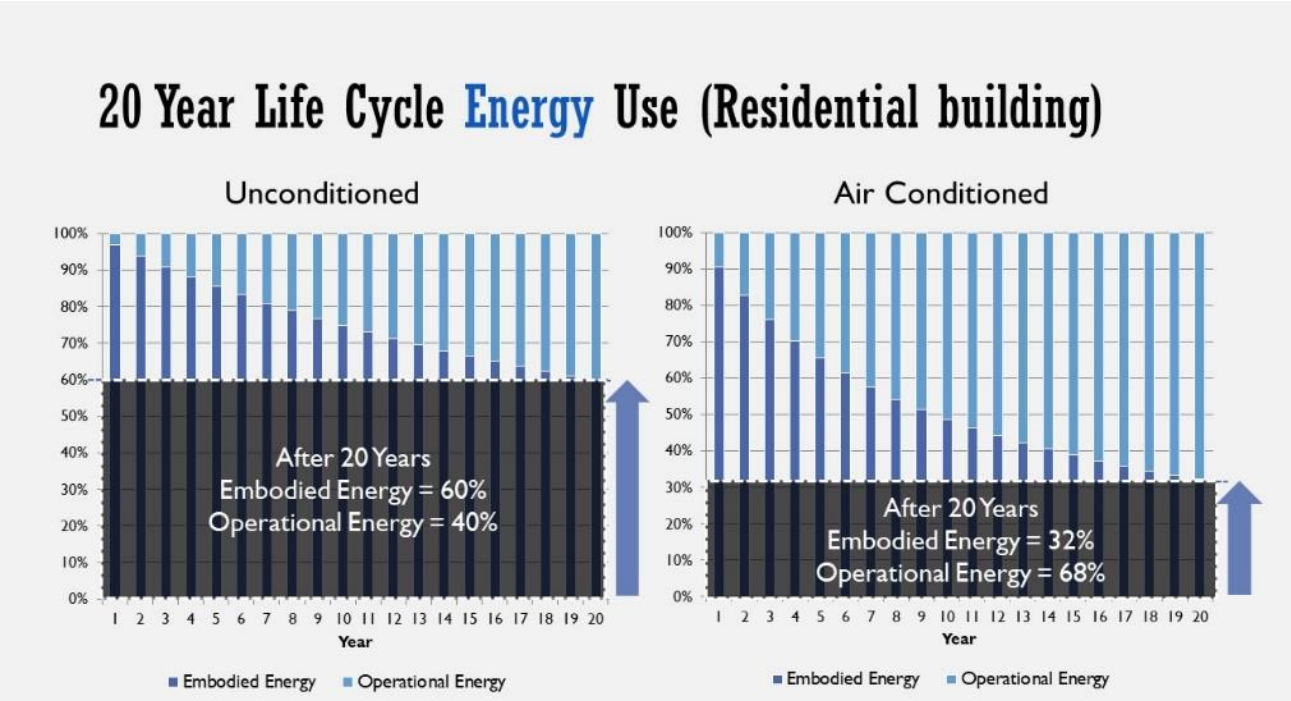
Organizations that have built and are building sustainably

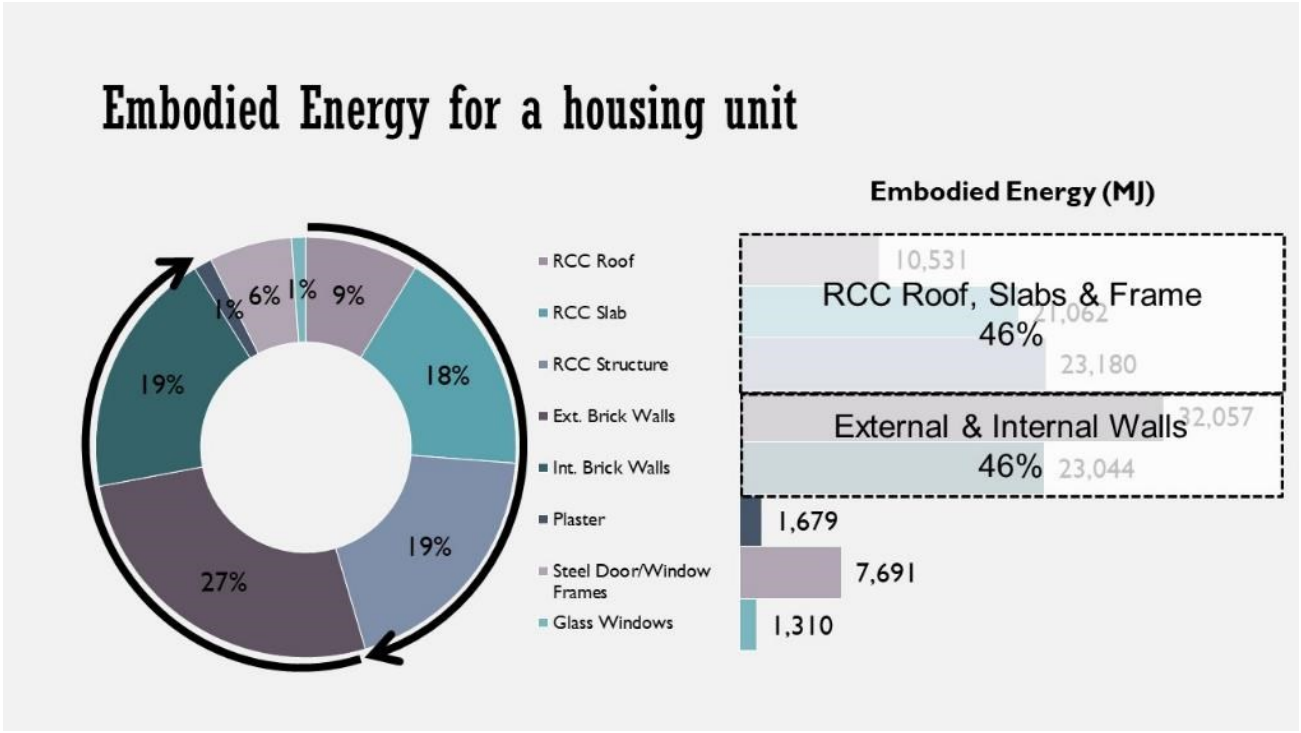
- Chennai Metro
- CII
- Citibank
- Deutsche Bank
- DLF
- Infosys
- ITC
- Kalpataru
- Jaquar
- K Raheja
- Credit Suisse
- IIHS
- GIZ
- Infosys
- Bank of India
- Nirlon Ltd.
- UBS
- Torrent Power
- Mahindra & Mahindra Ltd.
- Google
- IITs
- Star TV
- Tata
- Max Hospitals
- Jaypee
- IFFCO
- BASF
- MNRE
- IIEC
- Sikka Group
- Vodafone
- UNEP
- World Bank

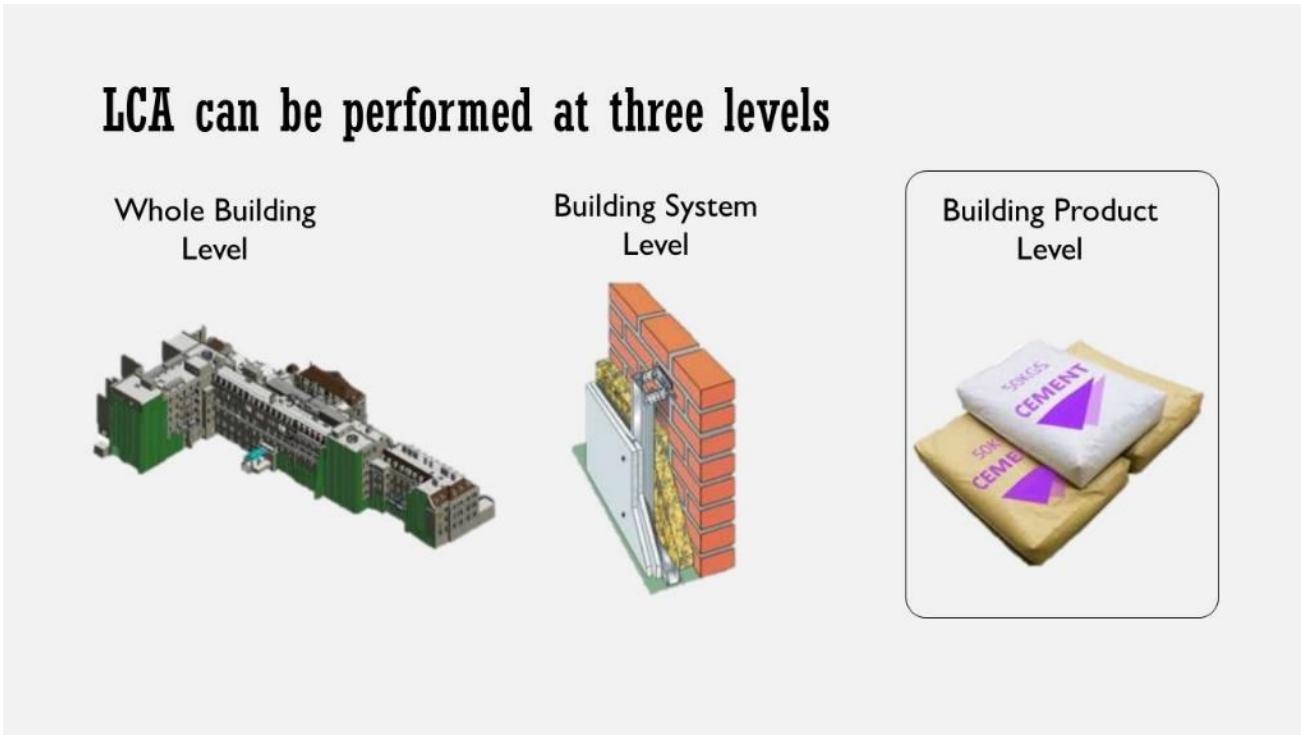
Existing Buildings to nZEB (nearly Zero Energy Buildings)




LCA can be performed at three levels
Whole Building Level
Building System Level
Building Product Level
CEMENT


20 Year Life Cycle Energy Use (Residential building)
Unconditioned
Air Conditioned
After 20 Years
Embodied Energy = 60%
Operational Energy = 40%
After 20 Years
Embodied Energy = 32%
Operational Energy = 68%
Year
Embodied Energy
Operational Energy

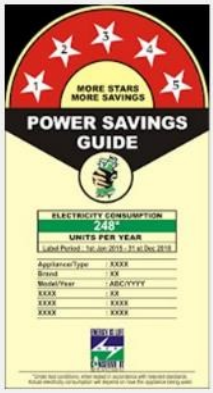

Embodied Energy for a housing unit
Embodied Energy (MJ)
9%
18%
19%
27%
19%
1%
6%
1%
RCC Roof
RCC Slab
RCC Structure
Ext. Brick Walls
Int. Brick Walls
Plaster
Steel Door/Window Frames
Glass Windows
10,531
RCC Roof, Slabs & Frame
46%
21,062
23,180
External & Internal Walls
46%
32,057
23,044
1,679
7,691
1,310


LCA can be performed at three levels
Whole Building Level
Building System Level
Building Product Level
CEMENT

Product / Material Level : Different Terminologies

- Materials with recycled content. (%)
- Materials with industrial waste content (%)
- Locally manufactured materials (distance).
- Rapidly renewable materials.
- Materials with Low Volatile Organic Compounds.
- Materials with no added Urea formaldehyde.
- Low Environmental Impact materials.
- Materials with Ingredient Reporting.

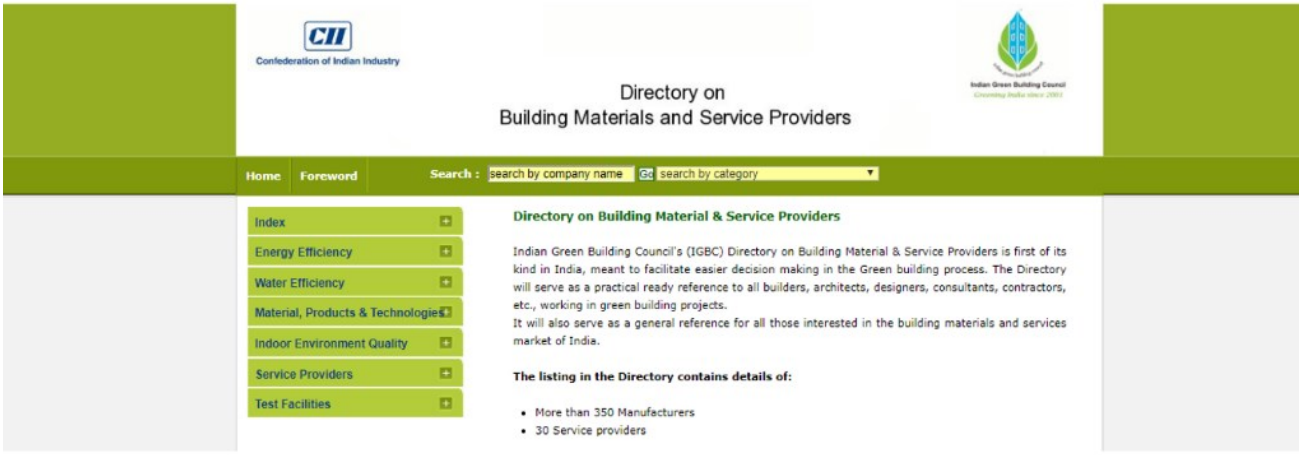
Material & Product Labelling in India



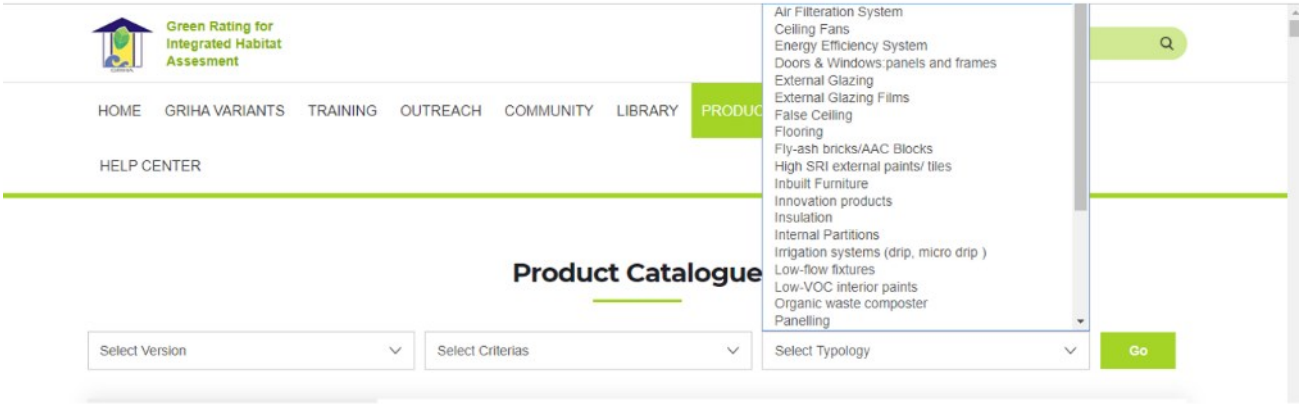
Material criteria in CPWD Green Rating Manual

- Use of flyash based / recycled C&D waste
- Use of cement manufactured from waste products
- Use of local materials
- Use of recycled materials.
- Adherence to Make in India Policy
- Use of Non-toxic and non-hazardous materials.

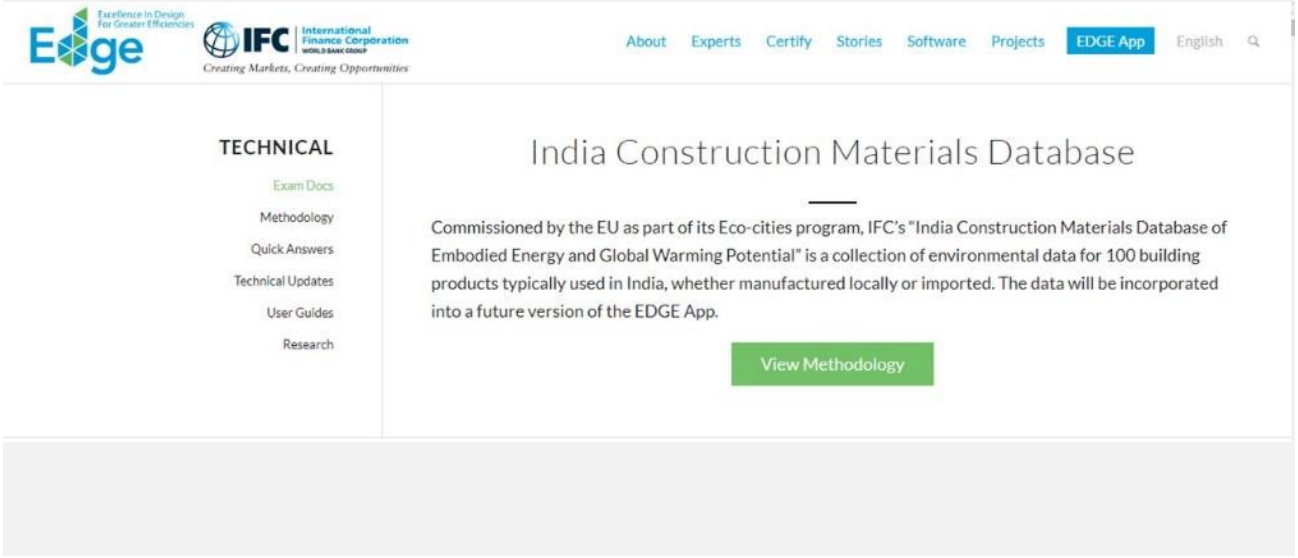
Green materials manufacturers and databases



Green materials manufacturers and databases



Green materials manufacturers and databases



Products & Manufacturers with detailed LCA's in India

- Cement
- Steel
- Glass
- Plasterboards
- Furniture
- Carpets
- Office Equipment

TATA STEEL

HermanMiller

Interface

LCA Databases

thinkstep GaBi

econvent

ESU services

AGRIBALYSE

JRC EUROPEAN COMMISSION

ProBas Umweltbundesamt

PSILCa

social hotspots database

soca

Ökobau.dat

USDA

NEEDS

www.LC-Inventories.ch

15804-IA

BIOENERGIEDAT

Source: openLCA Nexus