

Green Building's Potential to Reduce Carbon Footprint

R.SURYANARYANAN

Introduction to CDM

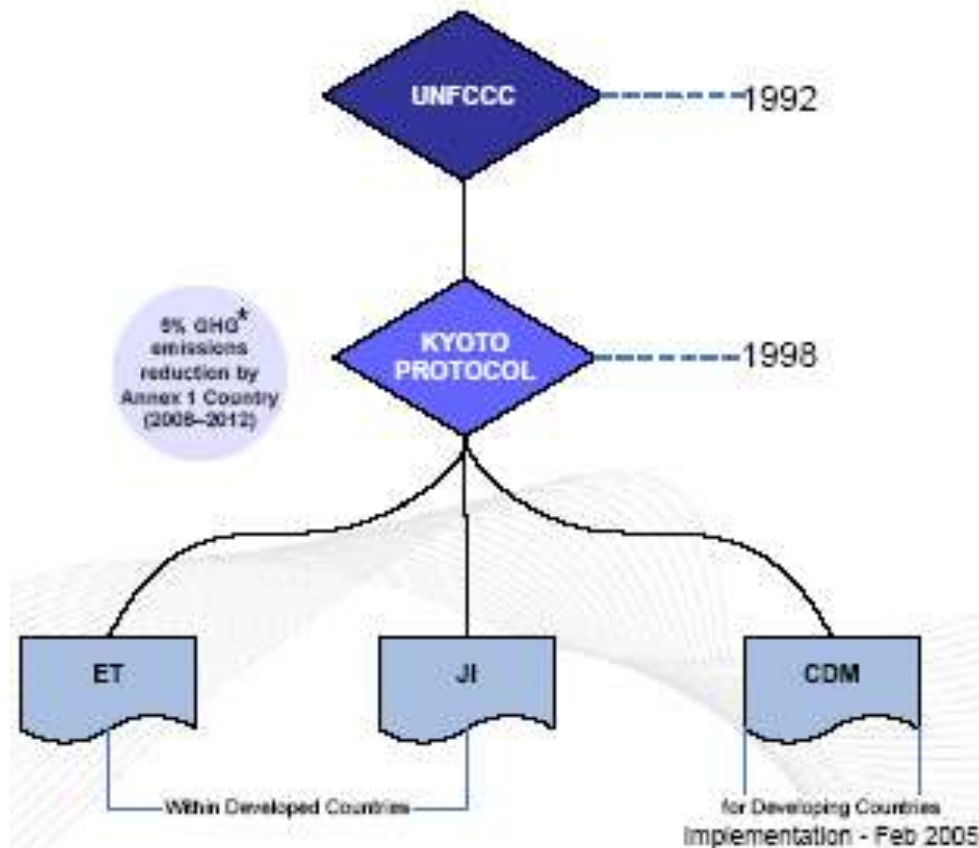
Under the Kyoto Protocol Annex 1 Parties (developed countries and economies in transition) have absolute caps on emissions of greenhouse gases (GHG)

The CDM allows eligible projects to generate emission reductions that can be used to offset excess emissions by Annex 1 Parties

1 CER = 1 tonne of CO₂

These CERs can be traded and sold, and used by industrialized countries to meet a part of their emission reduction targets under the Kyoto Protocol

Background



List of Annex 1 countries (37 countries)

	Australia		Latvia
	Austria		Liechtenstein
	Belarus		Lithuania
	Belgium		Luxembourg
	Bulgaria		Monaco
	Canada		Netherlands
	Croatia		New Zealand
	Czech Republic		Norway
	Denmark		Poland
	Estonia		Portugal
	European Community		Romania
	Finland		Russian Federation
	France		Slovakia
	Germany		Slovenia
	Greece		Spain
	Hungary		Sweden
	Iceland		Switzerland
	Ireland		Turkey
	Italy		Ukraine
	Japan		UK

* 6 Greenhouse Gases : CO₂, CH₄, N₂O, SF₆, PFCs, HFCs

What are the eligibility criteria for CDM projects?

They include, amongst other things:

- Project activities must reduce GHG emissions below the baseline
- The baseline for CDM project would give GHG emissions that would have occurred in the absence of the proposed project activity
- Projects must define the baseline using an approved methodology

Projects must be **VALIDATED** against these criteria by a **Designated Operational Entity (DOE)**, after which they may be registered as a CDM project

Following registration....

Project developers can implement the project and the approved monitoring plan in order to determine:

- Baseline emissions
- Project emissions
- And by subtraction, the emission reductions

The Monitoring report must then be VERIFIED by a different DOE*, after which the DOE may request the issuance of the CERs

Only after issuance can the CERs be transferred to buyers and surrendered against a cap or compliance obligation

* except in the case of small scale projects where the same DOE can perform both activities

What kind of projects are possible?

Projects that reduce emissions of energy related CO₂

CO₂ emissions from raw material use

Non-CO₂GHG emissions from industrial activities, land fill, agriculture etc

Non-CO₂GHGs are methane, nitrous oxide, PFCs, HFCs and sulphur hexafluoride

Typical examples include:

- Construction of renewable energy facilities in a market dominated by thermal power
- Fuel switch from coal to gas
- Land fill gas capture and flare / utilisation
- HFC or N₂O abatement

How do I go about making a project...?

Review your own commercial activities – the more GHG you emit or the more energy or raw materials you consume, the greater the potential to improve

Identify any activities that would reduce your GHG emissions that you are not legally obliged to do, and that are not current common practice within your industry

Evaluate the magnitude of the potential emission reductions

Identify the reasons why you have not already done this – these are the barriers that stop the project activity from being the baseline

Consider whether the potential revenues from the sale of CERs might be enough to help you overcome these barriers

Other CDM requirements

Methodology :

- In order to get CDM benefits, a project must comply with and register under an approved methodology
- New methodologies can be developed if existing one are not appropriate to apply

Additionality is important for any project to qualify for CDM benefits

A common practice analysis for the project sector would play a major role in demonstration of Baseline and Additionality

Green Building

- Sustainable or high performance building
- Buildings and their sites use and harvest energy, water, and materials efficiently
- Human health and Environment is protected and restored during entire building life-cycle
i.e.
siting, design, construction, operation, maintenance, renovation and deconstruction.



Green Building Concept

- Wastes minimized at every stage during construction and operation of the building
- Measures to prevent erosion of soil
- Rainwater harvesting
- Preparation of landscapes to reduce heat
- Reduction in usage of potable water
- Recycling of wastewater

What makes a building "green"?

A green building is a structure that is environmentally responsible and resource-efficient throughout its life-cycle..



For example.....

Green buildings may incorporate sustainable materials in their construction (e.g., reused, recycled-content, or made from renewable resources);

Create healthy indoor environments with minimal pollutants (e.g., reduced product emissions);

And feature landscaping that reduces water usage (e.g., by using native plants that survive without extra watering).



Why Build Green?

Environmental benefits:

Enhance and protect ecosystems and biodiversity

Improve air and water quality

Reduce solid waste

Conserve natural resources

Economic benefits:

Reduce operating costs

Enhance asset value and profits

Improve employee productivity and satisfaction

Optimize life-cycle economic performance

Health and community benefits:

Improve air, thermal and acoustic environments

Enhance occupant comfort and health

Minimize strain on local infrastructure

Contribute to overall quality of life

Environmental benefits

- Enhance and protect biodiversity and ecosystems
- Improve air and water quality
- Reduce waste streams
- Conserve and restore natural resources



Economic benefits

- Reduce operating costs
- Create, expand, and shape markets for green product and services
- Improve occupant productivity
- Optimize life-cycle economic performance

Social benefits

- Enhance occupant comfort and health
- Heighten aesthetic qualities
- Minimize strain on local infrastructure
- Improve overall quality of life

Cont.....

- Reducing the energy use and greenhouse gas emissions produced by buildings is therefore fundamental to the effort to slow the pace of global climate change.
- Buildings may be associated with the release of greenhouse gases in other ways, for example, construction and demolition debris that degrades in landfills may generate methane, and the extraction and manufacturing of building materials may also generate greenhouse gas emissions.

Green Building Rating Systems

More than 30 ratings systems followed worldwide

Some of the green building rating systems

United Kingdom – BREEAM

United States – LEED

Australia – Green Star

Japan – CASBEE

Canada -LEED Canada

India -LEED

More than 67 countries have adopted LEED Rating System

Canada, India, UAE, Brazil etc.,

LEED has globally emerged as the most prominent internationally recognized rating system

LEED Rating System –Focus areas

LEED, a whole-building approach to sustainability by recognizing performance in five key areas



Sustainable sites



Water Efficiency



Energy & Atmosphere



Indoor Environment Quality



Material and Resource

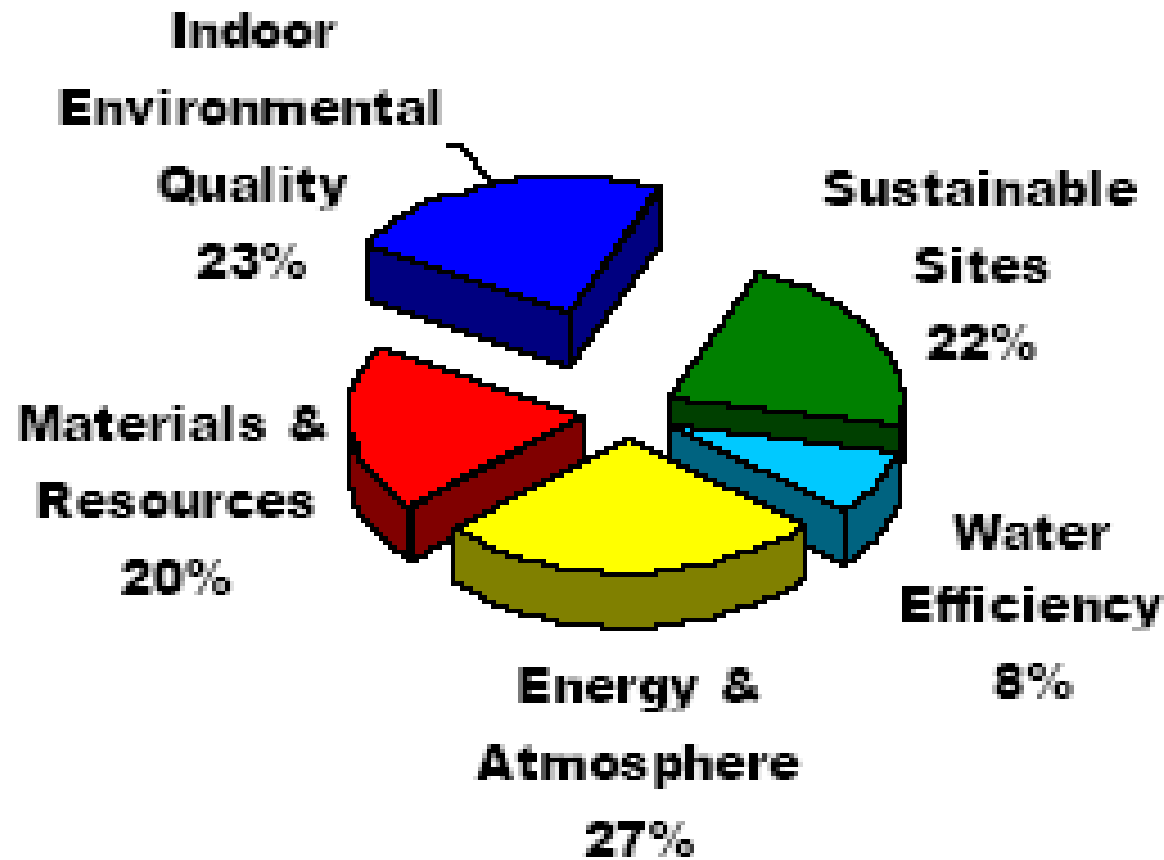
Overview of LEED

- Green building rating system, currently for commercial, institutional, and high-rise commercial, institutional, and high-rise residential new construction and major residential new construction and major renovation. renovation.
- Existing, proven technologies
- Evaluates and recognizes performance in accepted green design categories
- LEED 3.0 product development includes existing buildings, multiple buildings, core existing buildings, multiple buildings, core & shell, interiors, and residential

Overview of LEED (Cont..)

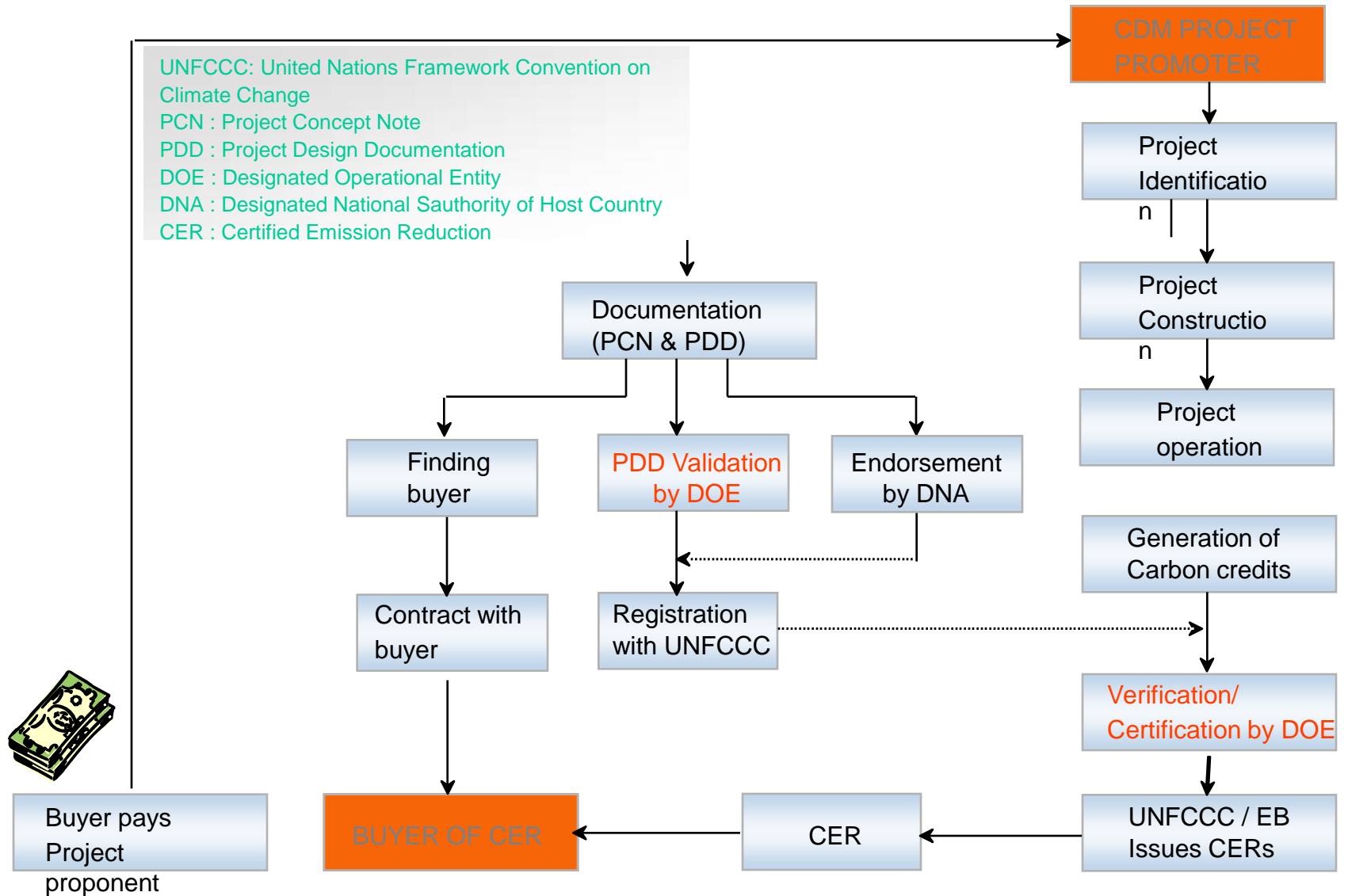
- Whole-building approach encourages building approach encourages a collaborative, integrated design and a collaborative, integrated design and construction process construction process
- Optimizes environmental & economic Optimizes environmental & economic factors factors
- Four levels of certification
 - LEED Certified 26 - 32 points
 - Silver Level Silver Level 33 - 38 points
 - Gold Level Gold Level 39 - 51 points
 - Platinum Level m Level 52+ points (69 possible)

LEED Point Distribution



Five LEED credit categories

Typical CDM Process



CDM Benefit for Green Buildings

CDM Benefits for Green Buildings?

Buildings is an important energy consumer (30-50% of total generation)

Green Buildings

- Consumes at least 40-50 % less energy
- 20-30 % less water vis-à-vis a conventional building (With an incremental cost)

So Green buildings has huge potential to earn CDM benefits by implementing energy efficiency projects that contribute to sustainable development

Carbon Financing

Example for green building

Key Statistics for Baseline Building

- Area of building: 10,000 m²
- Cost of building ~ Rs. 20 Crores (\$4.5 million)
- Energy Intensity: 200 kWh/m²/year
- Annual Energy Consumption (baseline): 2,000 MWh
- Annual Energy Cost (baseline): Rs. 1 Crore (\$225,000)

Carbon Financing

Example for green building

Key Statistics for Green Building

- Area of building: 10,000 m²
- Cost of building ~ Rs. 22 Crores (\$5 million)
- Energy Intensity: 150 kWh/m²/year (25% reduction)
- Annual Energy Consumption: 1,500 MWh
- Annual Energy Cost: Rs. 0.75 Crore
- CO₂ Reduction Over Baseline: $500 \times 0.8 = 400$ tCO₂
- Savings from CO₂ Reduction = 10,000 Euros = 7 Lacs
- Savings from Energy Reduction = 25 Lacs (\$55,000)
- Simple Payback = Approx. 6 years

Major Energy Efficiency Areas for buildings

- Roof / wall Insulation
- High performance glazing
- Terrace garden or high albedo roof
- Energy efficient lighting
- Air handling unit
- High COP Chillers
- Energy efficient Motors
- Pumping system with Variable speed drives
- Cooling Towers

Green Building Projects CDM registered

ITC Sonar, Kolkata is first Indian hotel to successfully be part of carbon credit trading in India

Technopolis office building, Kolkata

Olympia Technology Park, Chennai
(Validation under process)

Case Study-1 –Hotel Sonar Bangla Kolkata

Energy Efficiency and fuel switch measures

Measures Implemented:

- Installation of variable frequency drives
- Retrofit of existing HVAC system to reduce unwarranted moisture laded
air load in the pre-cooled air unit (PAU) by in stalling U shaped heat pipes that improves efficient heat transfer in the PAU pipes and thus reduce chiller load
- Retrofitting various pumps
- Enhancement of the treatment efficiency of the sewage treatment unit
- Replacement of electric water heater with solar water heater

Case Study-1 : Hotel Sonar Bangla Kolkata

Supply Side Energy Efficiency improvements

Measures Implemented:

- Installations of magnetizer for better fuel atomization
- Reuse of low energy waste heat of the flue gases exhausted from the boiler stack to pre-heat the boiler feed water and improve the generation efficiency of the boiler
- Utilization of the waste heat of the return steam condensate to reduce HSD consumption

Result:

- ~3000 t CO₂eq reduced per annum
- Assists in relieving electricity supply constraint in the region
- Reduction in pollution associated with extraction, transportation and utilization of fossil fuels
- Encourages green technology adoption in other Indian hotels

Case Study-2 : Technopolis, Kolkata

Demand side energy efficiency management

Exposure of glass wall area- High performance double glazed panels with reflective low “e” glass panes and having low U value and solar heat gain co-efficient.

Roof insulation – U value of the roof kept low with R-15 extruded polystyrene insulation and roof gardening.

Each AHU is provided with VFD driven supply air blower and each AHU room has a heat recovery wheel (HRW) with supply/recovery air fan.

Chillers- two 650 TR water cooled centrifugal chillers with COP of 6.1 are installed & a 300 TR water screw with COP of 5.5, kept as a standby

Cooling towers – There are two 1700 TR cooling towers in the HVAC system for cooling the water used as cooling medium in the HVAC system of the building.

Average annual GHG reduction : 9000 tCO₂

Case study-3 : Olympia Technology Park, Chennai

Demand side energy efficiency management

Energy efficient design of wall construction (material with better insulation properties)

Energy efficient design of the roof construction- Over deck insulation and roof garden.

Energy efficient glass area – high performance glazing (double glazed with low U- value, optimum light transmission and optimum shading coefficient)

Energy efficient design of the HVAC system

- High performance chillers
- VFD (Variable frequency drives) for AHU and chilled water pumps
- Heat recovery wheels

Annual average GHG reduction= 15000 t CO₂

Few LEED Commissioning Projects

Indira Gandhi International Airport, New Terminal T-3, New Delhi with GMR & DIAL

AIRCEL Office Building, Gurgaon

HCL Building, Manesar

Lemon Tree Hotel, New Delhi

Dabur Building, Gurgaon

BEE - STAR RATINGS OF OFFICE BUILDINGS

Star Rating - based on the Energy Performance Index (kWh/sqm/year)

Buildings will be rated from 1 star to 5 star (1 star- less energy efficient; 5 star- more energy efficient). Similar to star rating of appliances.

Star Rating - based on actual performance of the buildings in terms of specific energy consumption.



Thank You!

