

Green Buildings and Certifications



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Potential for Green Infrastructure in Indian Railways

Green infrastructure - solving urban and climatic challenges by building with nature for which some of the main components include:

- Stormwater Management
 - Climate Adaptation
 - Less Heat Stress
 - Biodiversity Conservation
 - Better Air Quality
 - Sustainable Energy Production
 - Clean Water
 - Healthy Soils
 - Increased Quality of Life
- etc.



Green Rating Agencies



The U.S. Green Building Council



Green Co Rating System



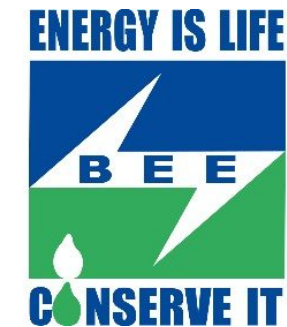
Green Rating for Integrated Habitat Assessment



The Indian Green Building Council

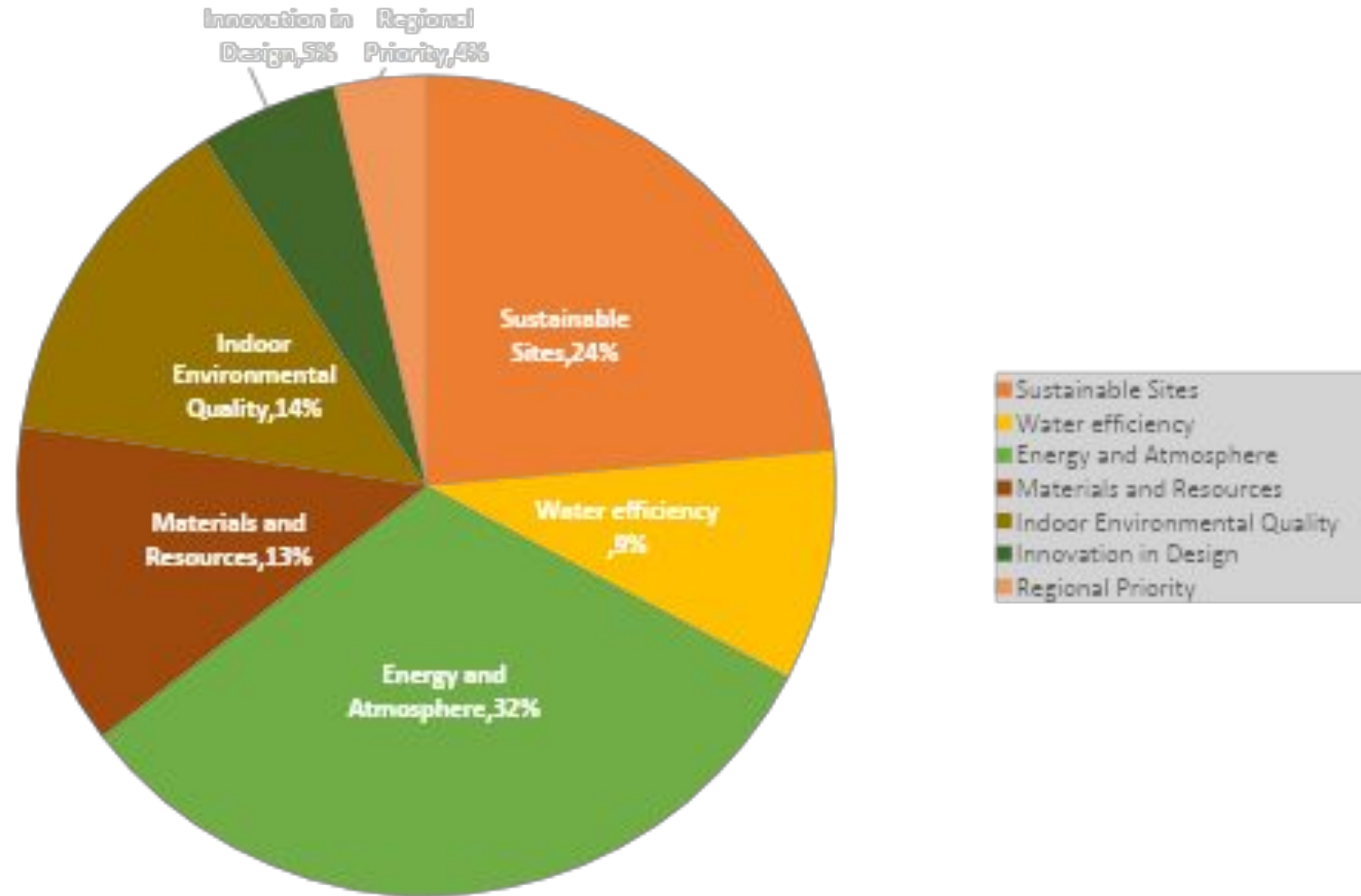


Green Habitat Accomplished Rating

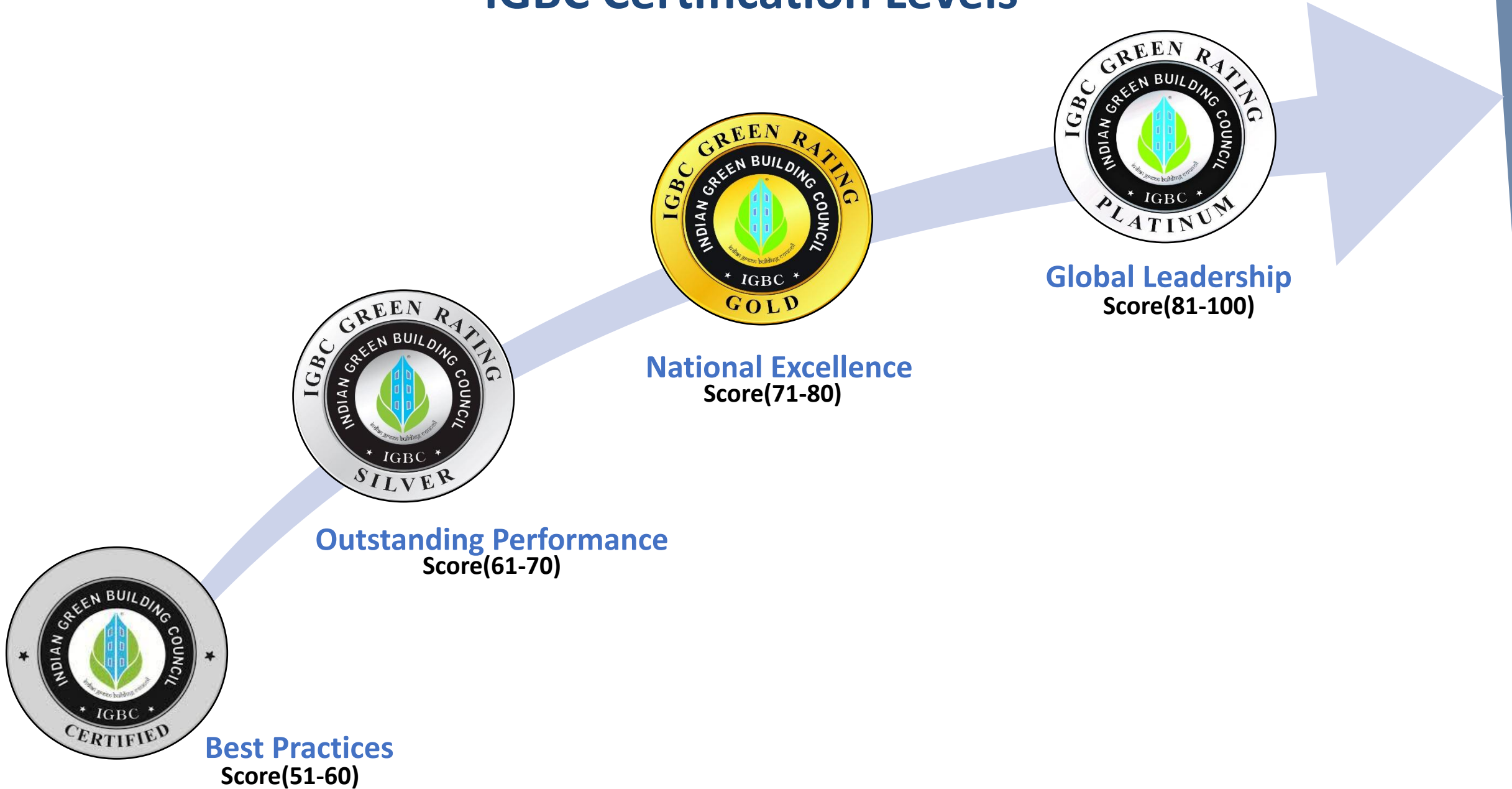


BEE certification

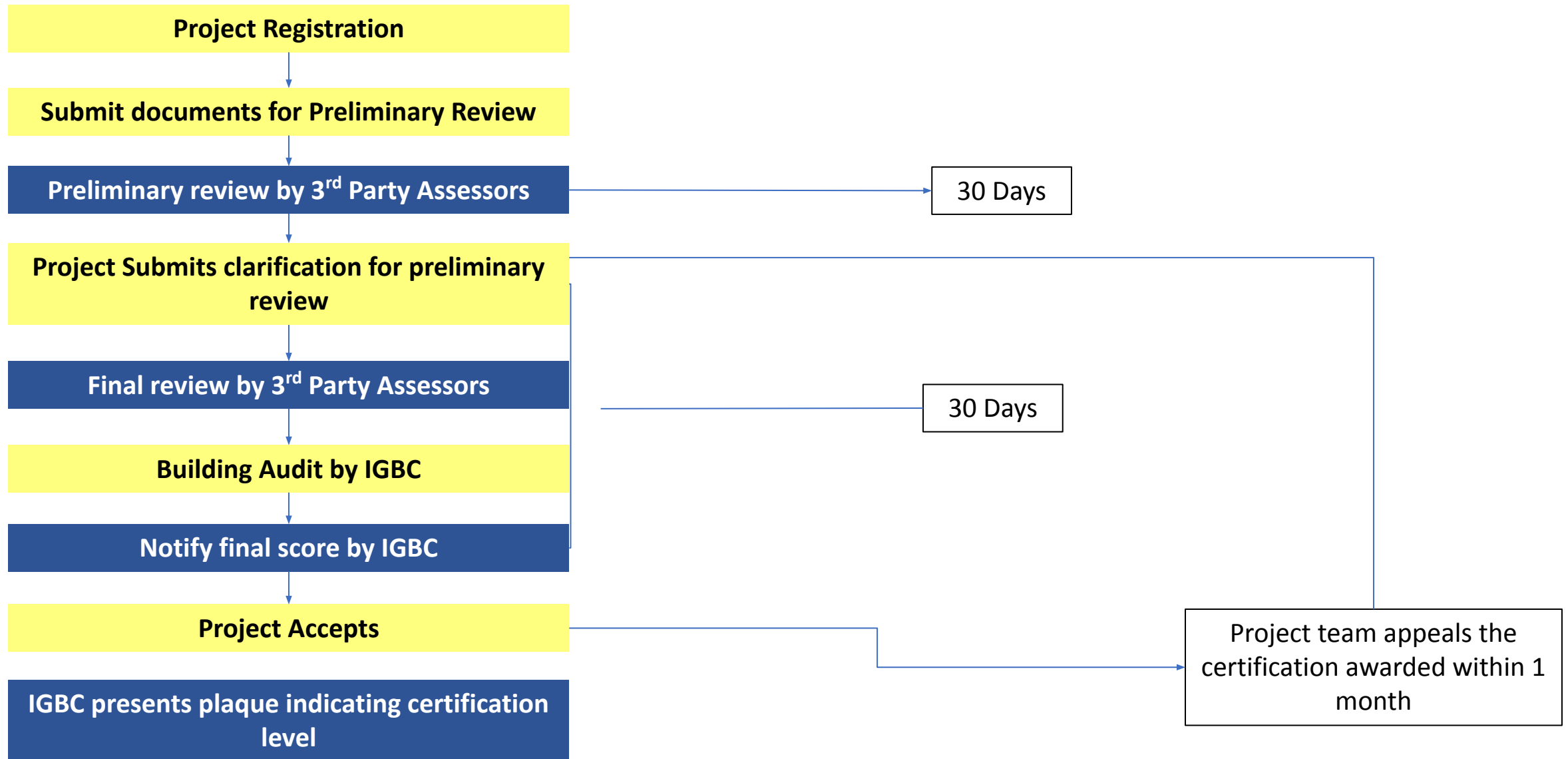
IGBC Rating Systems – Criteria and Weights



IGBC Certification Levels



IGBC Certification Process



Available IGBC Certifications

IGBC Green New Buildings	IGBC Green Existing Buildings	IGBC Green Homes
IGBC Green Residential Societies	IGBC Green Interiors	IGBC Green Healthcare
IGBC Green Schools	IGBC Green Factory Buildings	IGBC Green Data Center
IGBC Green Campus	IGBC Green Villages	IGBC Green Townships
IGBC Green Cities	IGBC Green Existing Cities	IGBC Green SEZs
IGBC Green Landscapes	IGBC Green Mass Rapid Transit System	IGBC Green Existing Mass Rapid Transit System
Government Incentives to IGBC Projects	IGBC Green Affordable Housing	IGBC Health and Well-being Rating
IGBC Green Resort Rating	Renewal of IGBC Green Rating	IGBC Green Service Building

Detailed Criteria for IGBC Certification

Mandatory

Not Mandatory

Sustainable Sites

Developing on appropriate sites

Community Connectivity / Basic Amenities

Design for differently-abled

Alternative means for transportation

Protect or Restore Natural topography

Heat island effect

Night Sky Pollution reduction

Soil Erosion Prevention and Control

Compliance to Local Regulations



Water Conservation

Low Flow Fixtures

Rainwater Harvesting

Treatment of Grey water

Use of captured or treated water

Efficient Irrigation systems

Use of native and adaptive species

Reduce turf area



Energy Conservation

Refrigerants - No CFC

Building Envelope measures

Selection of energy efficient equipment

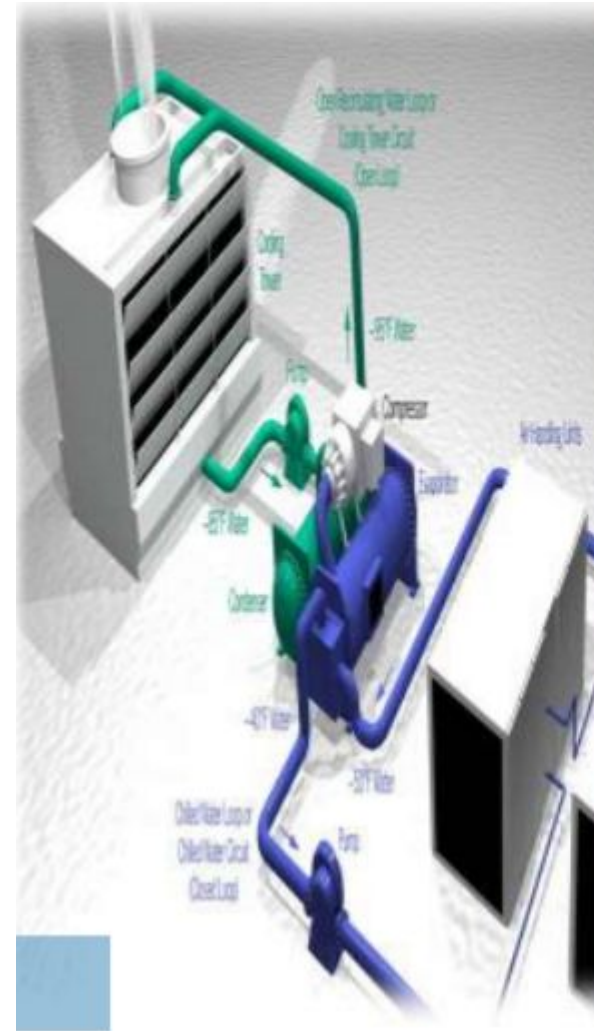
Building Energy Performance

Renewable energy

Green Power

Energy efficient Lighting

Eco-friendly captive power generation



Materials

Waste Segregation: non-process

Construction waste management

Recycled Materials

Reused Materials

Local Materials

Certified wood

Renewable Materials



Indoor Air Quality

Tobacco smoke control

Daylight and Views

Avoid asbestos

Fresh air ventilation

Low VOC content

Building flush out

Eco-friendly house-keeping

Break-out spaces for employees



IGBC Green Factory Buildings

- ▶ IGBC Green Factory Building Rating System is a voluntary and consensus-based program.
- ▶ This rating system is designed to facilitate the development of energy efficient, water efficient, healthy, more productive, environmentally friendly factories.
- ▶ Benefits of Green Factory Buildings:

Energy savings : 30 - 40%

Water savings : 20 - 30%

Enhanced indoor air quality

Health & wellbeing of the occupants

Safety of the workmen

Good day lighting

Green Initiatives at ICF Chennai – Renewable Energy



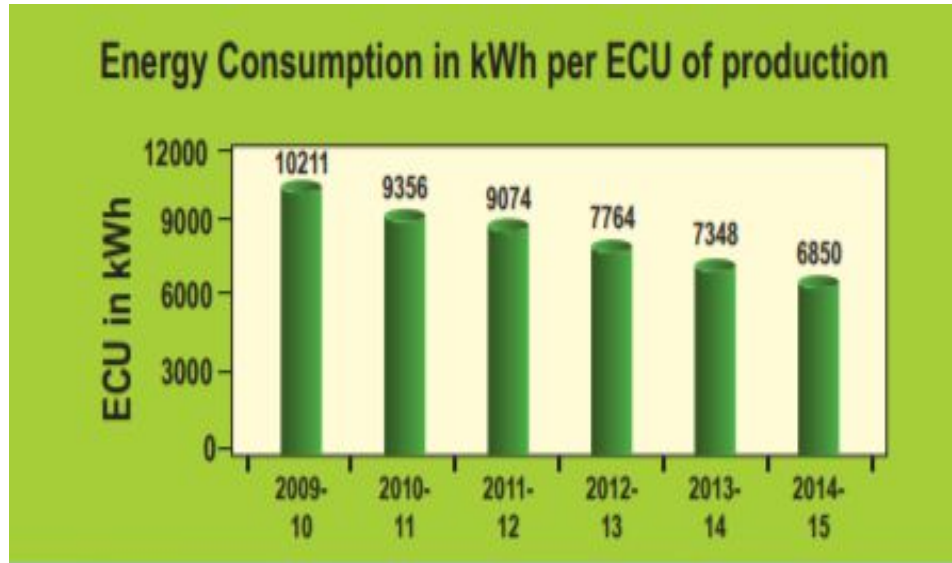
ICF entirely sources its electrical energy requirement from 7 windmills of 1.5 MVA capacity each in the Tirunelveli.

Solar water heaters having total installed capacity of 3000 LPD have been provided in Officers and Subordinate Rest Houses, Apprentices Hostel, ICF Hospital.

ICF has reduced CO₂ emissions to the extent of 60242 ton from 2009 to 2015.



Green Initiatives at ICF Chennai



- ▶ **Energy Conservation Measures:** Energy required for manufacture of coach has declined from about 10,211 units in 2009-10 to 6,850 units in 2014-15.
- ▶ Smart technology enabled energy conservation measures have been implemented across factories.



Energy Conservation measures at ICF Chennai

Device	Function
Occupancy Sensors	• Sense human movement and switch off automatically the Air-Conditioners and room lights when there is no human movement
Automatic Power Factor Correction Panels	• Power factor values are monitored and controlled more precisely. • All 32 substations of ICF have been provided with APFCP and a high power factor of 0.99 has been achieved
Use of timer switches to control lighting circuits /air circulators	• Switch off non-essential lights during night time. • Air-circulators are controlled by timer circuits to automatically switch off during non-working hours.

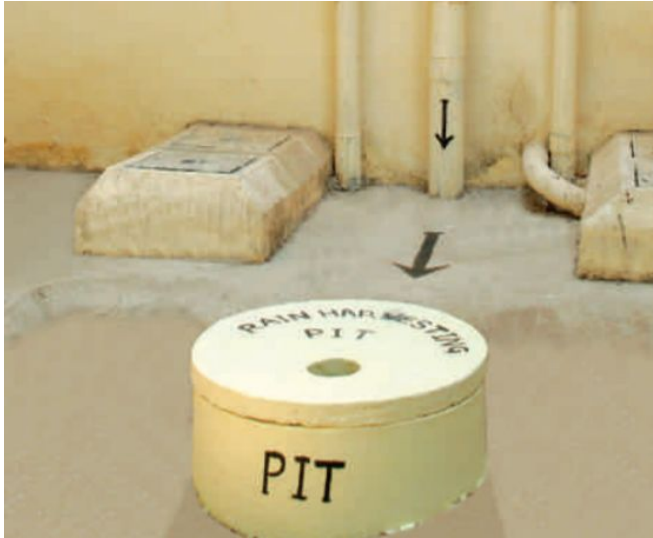
Energy Conservation measures at ICF Chennai

Device	Function
Energy Savers	• Switch OFF Arc welding machines when they are not in use for more than 3 minutes.
Energy Efficiency in Compressed air system and Pumps	• Adjusting the ON/OFF time of air compressors and arresting the leakages in the pipeline. • Energy efficient submersible pumps have been provided replacing old centrifugal pumps.
Star Rated Equipment	• BEE approved star rated electrical products such as ceiling fans, air-conditioners, geysers, refrigerators, water coolers etc.

Energy Conservation measures at ICF Chennai

Device	Function
Turbine air ventilators in place of roof exhaust fans	• Operate on natural draft without electrical power installed to exhaust hot gases emanating from welding operation, furnace etc.
Energy Efficient Lighting	• Replacing old lamps with latest energy efficient lamps. • All pathway lights in the factory area have been provided with induction lamps and all major streets in the colony area have been provided with LED lamps, duly replacing metal halide lamps.
Use of Natural lighting in workshops and office buildings	• Polycarbonate sheets have been provided extensively on the roof to provide excellent diffused sunlight during day

Green Initiatives at ICF Chennai – Rain Water Harvesting



In Railway Colonies, every block has been provided with pipelines to carry water collected on the roof top to percolation pits.

Two percolation pits are provided for every block for recharging the ground water.

Water from the Reservoir is treated and supplied to both Shell and Furnishing factories meeting the entire requirement of the factories, except for drinking water purpose.

Reduction of 15.57% of water usage has been achieved as per Water Audit, 2015.

Green Coaches for Indian Railways – Solar Roof Tops



450 DEMU trailer coaches are being installed with flexible solar panels based on Li-ion battery.

500 passenger trains with existing batteries installed with flexible solar panels.

The flexible solar panels can be easily installed on train coaches and are 80 per cent lighter than conventional solar modules.

Green Coaches for Indian Railways – Solar Roof Tops



Bio-discharge toilets have underslung tanks to collect human waste and degrade it by a special type of bacteria.

Converts human waste into gas and discharged harmlessly into atmosphere.

SMALL CHANGE, BIG GAIN

How the modified bio-toilet of a railway coach works

WHAT'S NEW

At present, digested waste after chlorination is discharged onto railway tracks in liquid form

Odour and colour removing agents are added before it is used as flushing liquid

In new system, the discharge (before chlorination) will be used to flush toilets

ADVANTAGES

Reduce amount of the water used for flushing

A study by mechanical department shows that **600 litres** of water per day per coach can be saved



Can save up to **1cr kilo-litres** of water per year for 55,000 coaches across the country

IMPLEMENTED

In one coach of the 12,685 **Chennai Central-Mangaluru Express**

COST

₹10,000 per toilet + ₹2,000 per toilet for colouring and odour removal agents



Graphic: S Franklin

RAILWAY SOURCES SAID THEY HAVE NOT RECEIVED ANY NEGATIVE FEEDBACK FROM PASSENGERS ON THE MODIFIED BIO-TOILET THAT IS UNDER TRIAL ON THE MANGALURU EXPRESS



Green Coaches for Indian Railways – CNG DEMU



CNG DEMU manufactured at ICF has the mechanism to run on dual fuel using the CNG as an alternate fuel to diesel.

25 Diesel Power Cars of DEMUs have been converted into CNG based dual fuel engine.

Green Coaches for Indian Railways – HOG System



In EOG configuration, power cars provided at both ends to cater to lighting and HVAC load in trains.

All EOG trains are being converted to HOG, a total net saving of Rs 313.8 crores per annum has been achieved by way of reduction in diesel consumption.

Green Coaches for Indian Railways – Green Interiors

Energy efficient lighting in coaches



- LED lights are being provided in coaches for night light fittings, toilet light fittings, passenger alarm, berth indication and accident emergency light fittings.
- Incandescent lamps have been totally replaced with energy efficient fluorescent lights and CFL lights.
- Glass Roofs have been provided for entry of natural daylight and energy savings

Green Coaches for Indian Railways – Green Interiors

Eco-friendly refrigerant in AC coaches



- All new AC coaches are now being manufactured with R-407C refrigerant, which have no chlorine atoms to affect the ozone layer.

Green Coaches for Indian Railways – Green Interiors

Use of eco-friendly materials in coaches



- Use of natural fiber thermoset composite (NFTC) material to replace compreg wood for flooring in the coach.
- Use of polycarbonate seats in place of wooden seats.
- Use of water-based paints, which are more eco-friendly, as a trial measure, in place of solvent paints.
- Use of aluminum composite interiors, which are recyclable, replacing laminated plastic sheets.

Green Coaches for Indian Railways – Green Interiors

Energy Efficient fans



- Conventional DC fans with commutator and carbon brushes which require regular maintenance are being replaced with brushless DC fans.
- Conventional DC fans consume about 38W power while brushless DC fans (BLDC) which consume only 25W power.
- Besides being energy efficient, the brushless fans also require less maintenance.

IGBC Green Railway Stations

- ▶ CII-IGBC with the support of Environment Directorate of Indian Railway has developed the Green Railway Stations rating system. It is a voluntary and consensus-based program.
- ▶ Facilitate adoption of green concepts, thereby reduce the adverse environmental impacts due to station operation & maintenance and enhance the overall commuter experience at station.
- ▶ Designed to help the station management to understand their present position with respect to the '*green performance*' of the station and the measures that need to be taken to enhance the performance on a continual basis.

Three-Pronged Benefits of Green Railway Stations



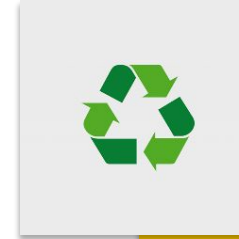
Indian Railways

- Reduction in electrical energy consumption towards non-traction up to 40%.
- Water consumption reduction for station applications up to 30%.
- Effective Waste management during operation.
- Improved station facility management.
- Increased environmental awareness among Indian Railways staff.



Commuters

- Improved accessibility to stations, thereby enabling easier first mile & last mile connectivity
- Effective ventilation & indoor environment quality
- Enhanced health, well-being & safety of commuters.
- User-friendly design for differently abled & elderly people.

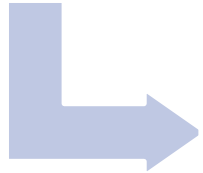


Environment

- Reduction in energy consumption and hence the reduction in the associated environmental impacts.
- Increased use of renewable energy sources, thereby minimizing the fossil fuel energy use
- Improved waste management, thereby avoiding waste being sent to land-fills
- Reducing the dependency on the use of virgin materials.

Steps involved in Green Railway Station Rating

Training for the Railway Station operation and Maintenance personnel on 'Green Railway Station'

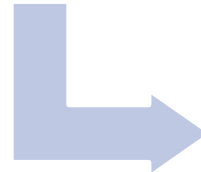


Performance improvement study

- Reducing energy & water consumption
- Increasing renewable energy
- Effective waste management
- Enhancing passenger amenities



Guidance on implementation of green measures



Facilitation of assessment by Third Party independent experts



Award of 'Green Railway Station Rating'

Case Study: Secunderabad Railway Station



Achievements at a Glance

- First Platinum Rated Station in India.
- ISO 14001-2015 Certificate- Environmental Management system.
- National Tourism Award 2016-2017

Source:

<https://www.financialexpress.com/infrastructure/railways/indian-railways-secunderabad-station-is-1st-to-achieve-igbc-green-platinum-rating-details-pictures-here/1709849/>



Measures to achieve Platinum Certification

Energy Conservation

Air-conditioned waiting halls equipped with CO₂ sensors and exhaust designed to maintain CO₂ levels below 700 ppm

Installation of solar panels and LED lights (500 KWP panels, saving INR 65 lakh per annum)

Beautification

Cheriyal scroll paintings over station walls, entrance and pillars.

Portico and concourse of the north entrance of platform number 1 are influenced by Asif Jahi style of architecture, who was a Nizam from Warangal.

Passenger Friendly Amenities

Ladies waiting halls with sanitary napkin dispenser, baby feeding rooms and incinerator.

KINDLE digital books provided at the AC waiting halls.

Free Wi-Fi for mobile, laptop and other digital devices.

Non-slippery ramps with handrails, exclusive waiting halls for senior citizens/divyangjan, Braille buttons on elevators, battery cars and special divyangjan toilets.

Green Railway Stations – In the News

Sec'bad is India's first green station

BUSINESS BUREAU
Hyderabad

Secunderabad Railway Station (South Central Railway) has received CII-IGBC (Indian Green Building Council) Platinum rating. The Station gains the unique distinction of becoming India's first platinum rated green railway station. The award was given under IGBC Green Railway Stations Rating System.

Piyush Goyal, Minister for Railways, C Shekar Reddy, chairman, IGBC Hyderabad Chapter presented IGBC plaque and certificate to Vinod Kumar Yadav, GM, SCR at a programme organised at Secunderabad Railway Station on Friday.

Green Railway Stations rating is a tool to facilitate adoption of green concepts, thereby reduce the adverse environmental impacts due to station's operation and



BEST PRACTICES: Union Minister Piyush Goyal presenting IGBC plaque and certificate to SCR GM Vinod Kumar Yadav.

maintenance. The overarching principle of the rating is to enhance commuter's experience. The rating system facilitates energy efficiency improvements; use of renewable energy sources; water management and rain water harvesting; health, hygiene and sanitation; green cover and providing universal access.

Some of the green fea-

tures implemented at station include-100 per cent LED lit railway station, more than 80 per cent spaces with adequate fresh air ventilation, 500 kWp grid connected solar PVs installed at station rooftop, 100 per cent waste water from station and coaching yard is treated and recycled for coach washing and others.

(SEE PAGE 2)

Skywalk to link Metro station

HYDERABAD: Union Minister for Railways Piyush Goyal on Friday said a skywalk would be constructed from Secunderabad Railway Station to link it with the upcoming Hyderabad Metro Rail Station abutting the premises, apart from assuring land for a multilevel car parking facility near the Ganesh temple.

The skywalk would enable Metro passengers to directly reach the station, he said, after launching a series of passenger amenities at the Secunderabad Railway Station here on Friday.

(SEE PAGES 2,3)

Green Building certification for Central railway station in Chennai

A mime show by scouts and guides was organised as part of the awareness campaign.



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Green Mobility Infrastructure – Other Mass Transport Systems



First Bus Terminal in India to Go Green Vadodara Central Bus Station IGBC GOLD (IGBC Existing Building Rating)



First Metro Rail in India to Go Green Delhi Metro Rail Corporation 240+ Metro Stations across the country are going green with IGBC.



Mumbai International Airport Limited - Terminal 2 IGBC Platinum Rated Green Existing Building.
This project has scored Platinum rating with highest points (94 points).
First Green Airport under IGBC Green Existing Buildings.

Thank you



Ministry of Environment, Forest
and Climate Change



Indian Railways
Lifeline to the nation...



**NATIONAL ACADEMY
OF INDIAN RAILWAYS**
Ministry of Railways - Government of India