

Green Offices



Ministry of Environment, Forest
and Climate Change



Indian Railways
Lifeline to the nation...



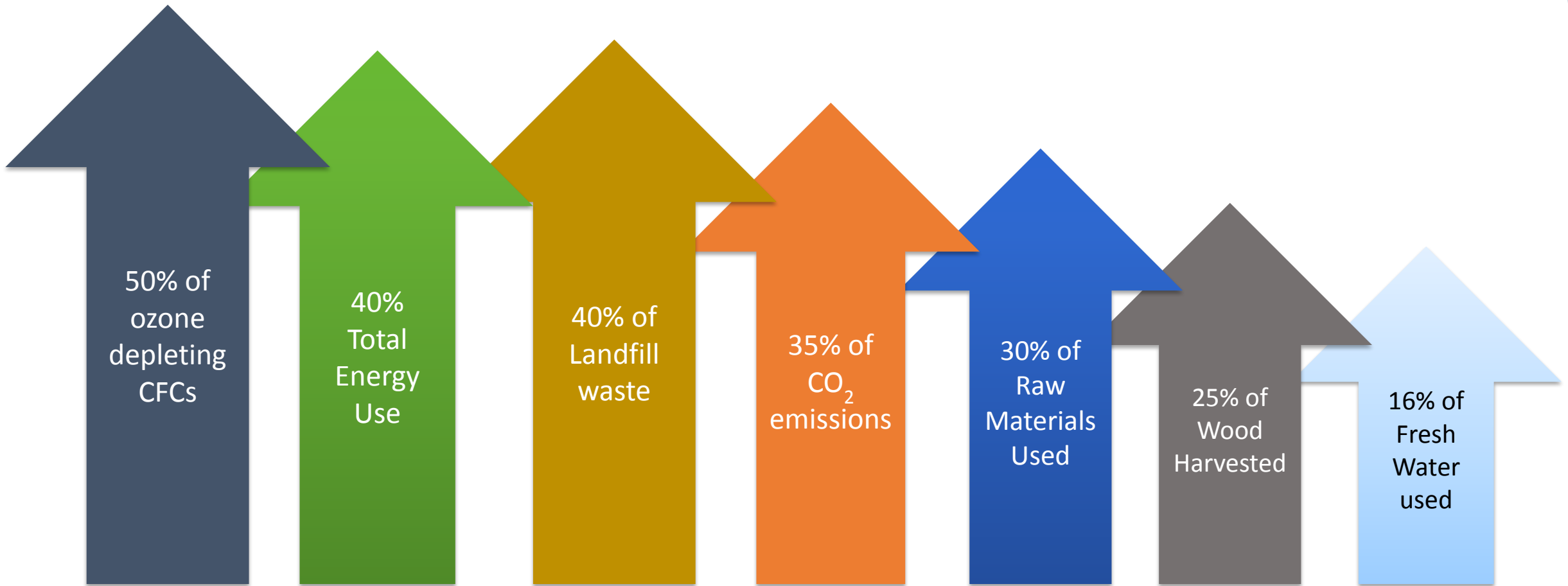
**NATIONAL ACADEMY
OF INDIAN RAILWAYS**
Ministry of Railways - Government of India

Dr. Prasad Modak

Content

- ▶ Need for a Green Office
- ▶ Objectives of Green Offices
- ▶ Benefits of a Green Office
- ▶ Application
- ▶ Rating of Green Offices
- ▶ Case Studies

Impact of Conventional Buildings


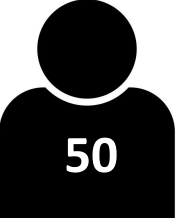




Conventional buildings lead to **ozone depletion, energy overuse, CO₂ emissions and overexploitation of natural resources.**

Need for a Green Office


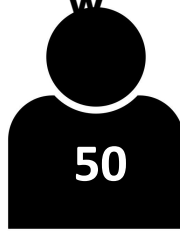


1.

Toilet Cistern Size	6L	3L
Average daily water use by a worker.	40 Litre	24 Litre
Water Saved	X	16 Litre

 4,160 L x  50 = 208,000 L
 = 416,000 L
 = 832,000 L

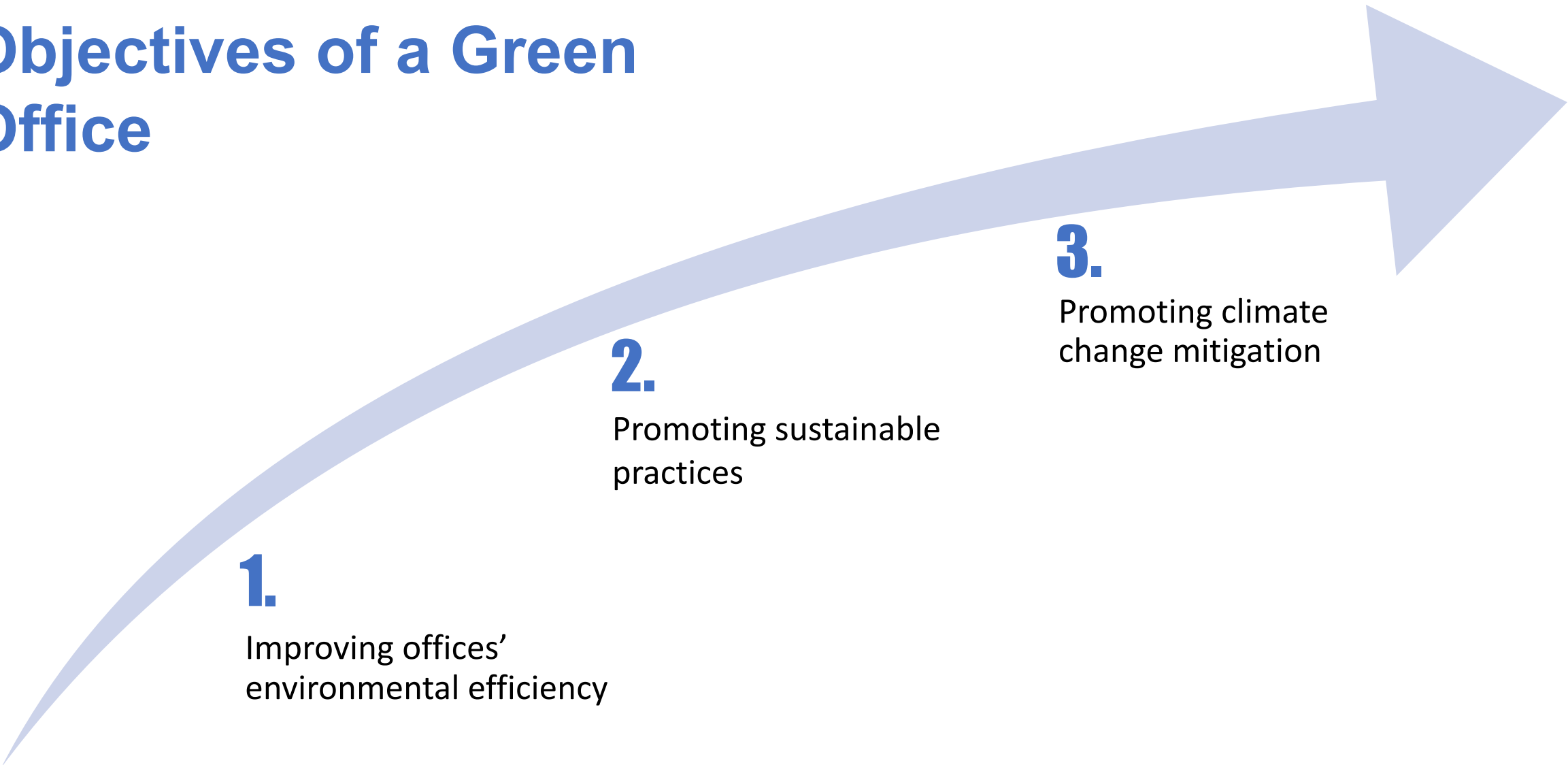
2.

Types of Bulb	Incandescent	LED
Bulb Life (hrs)	1000	25000
Energy Saved	X	70-75 %
Wattage	40 W	8w

 32 W x  50 = 1600 W
 = 32 00 W
 = 64 00 W

Small acts, when multiplied by hundreds of people, can massively **impact** the world.

Objectives of a Green Office



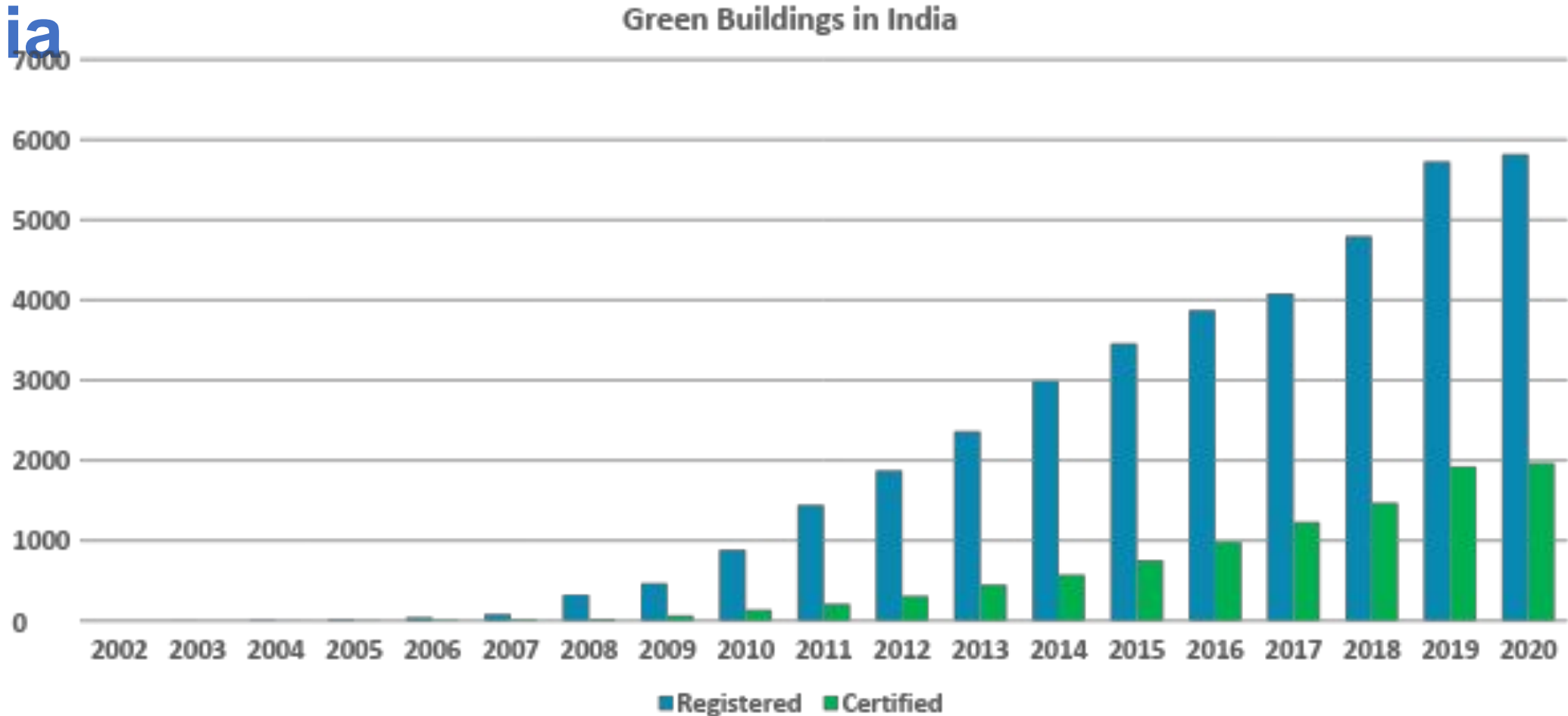
1.
Improving offices'
environmental efficiency

2.
Promoting sustainable
practices

3.
Promoting climate
change mitigation

A green building is one which uses **less water**, optimizes **energy efficiency**, **conserves natural resources**, generates **less waste** and provides **healthier spaces** for occupants, as compared to a conventional building.

Growth of Green Buildings in India

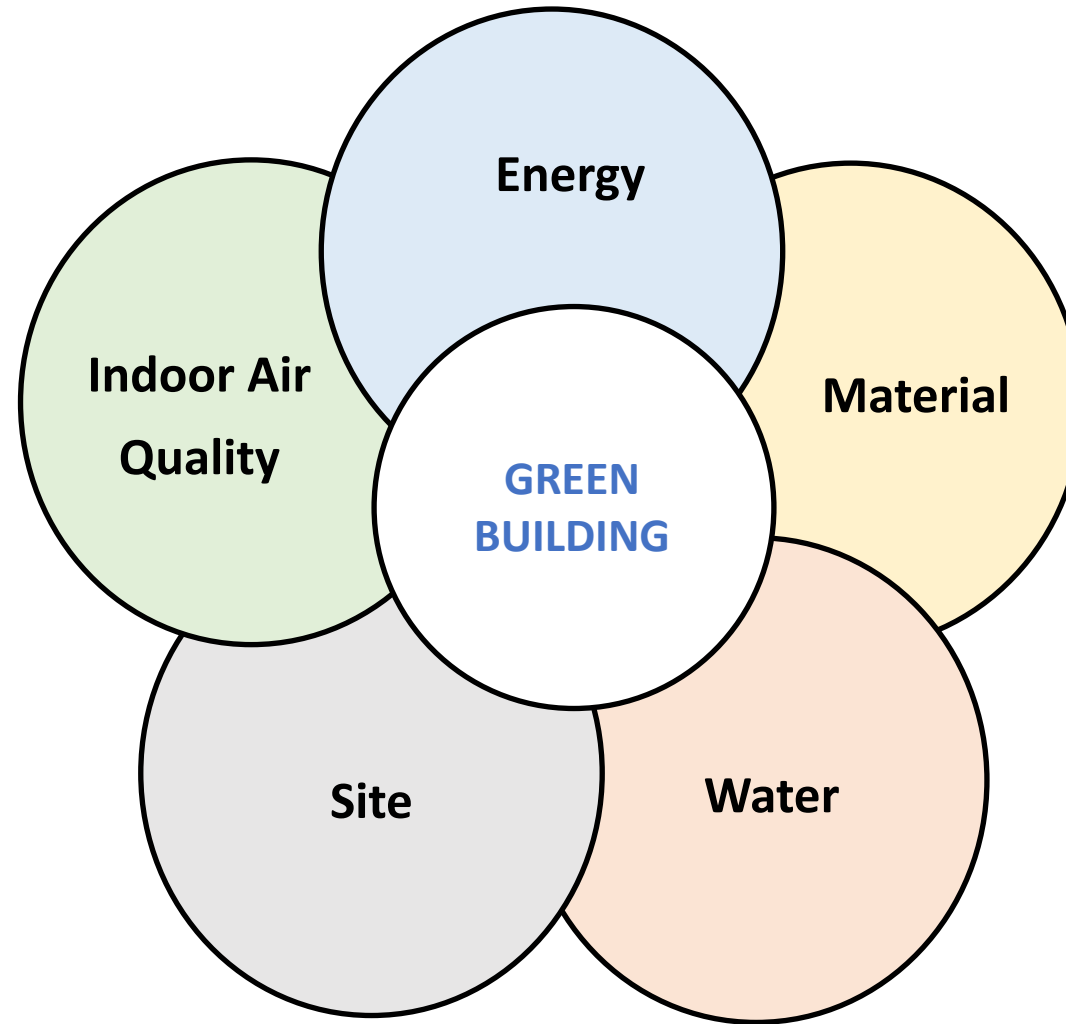


**Source : IGBC: Green Building Movement in India, 2012*

All types of buildings over the country :

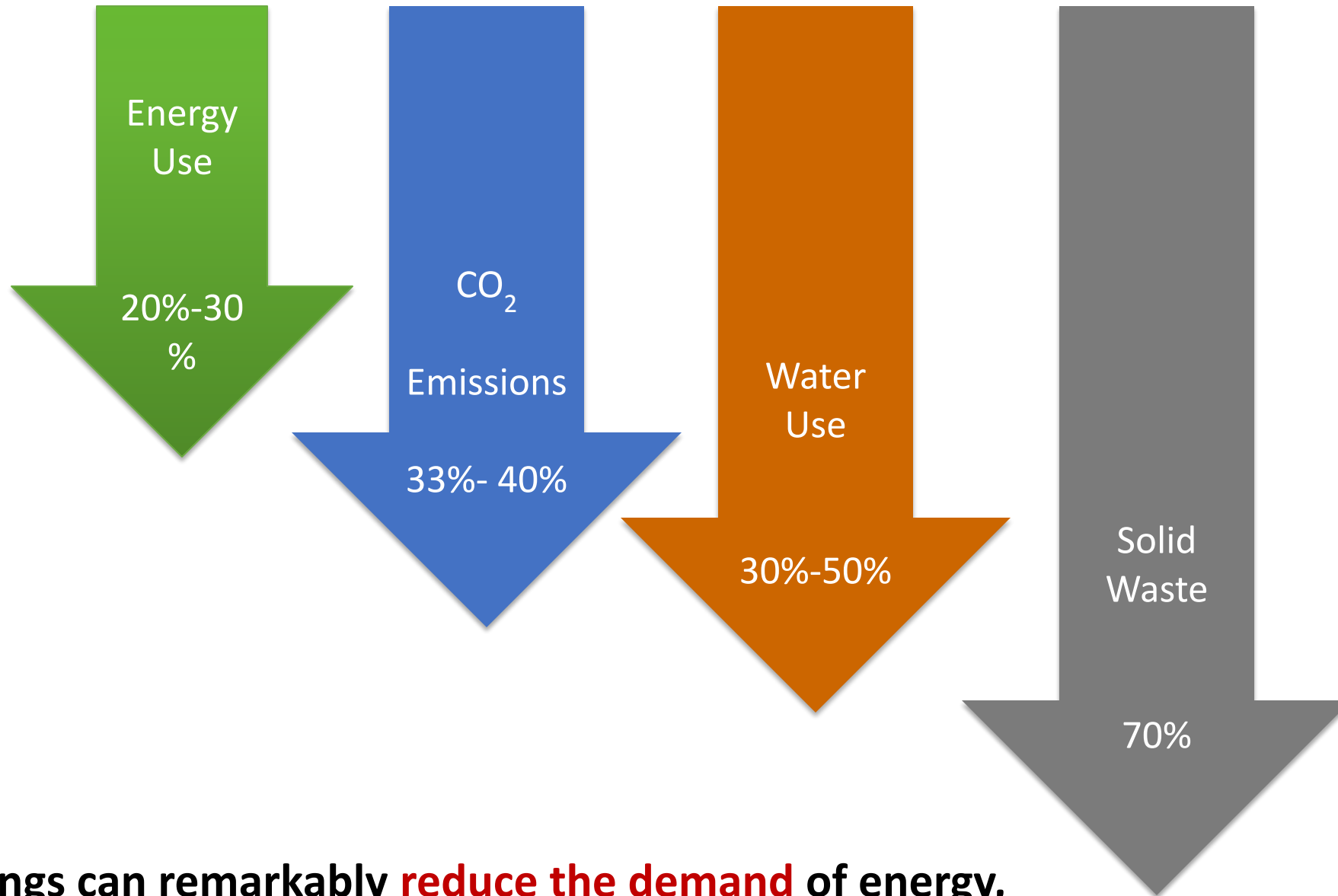
Airports, Banks, Colleges, Convention Centres, Factories, Hospitals, Hotels, Institutions, IT Parks, Offices, Residential, Schools, SEZs, Townships

The Concept of Green Office



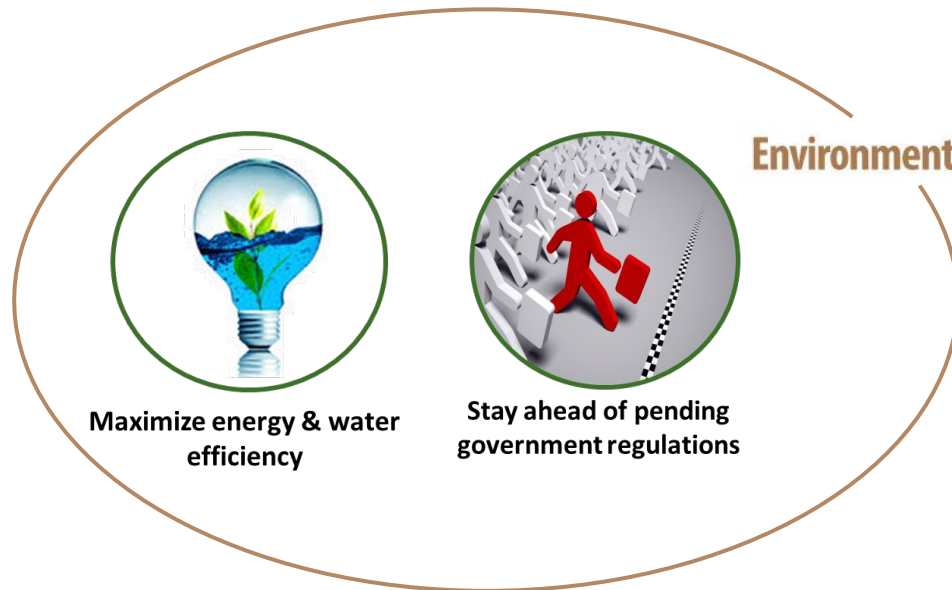
The concept Green Buildings essentially revolves around the five spheres such as **energy, material, water, site and indoor air quality.**

Benefits



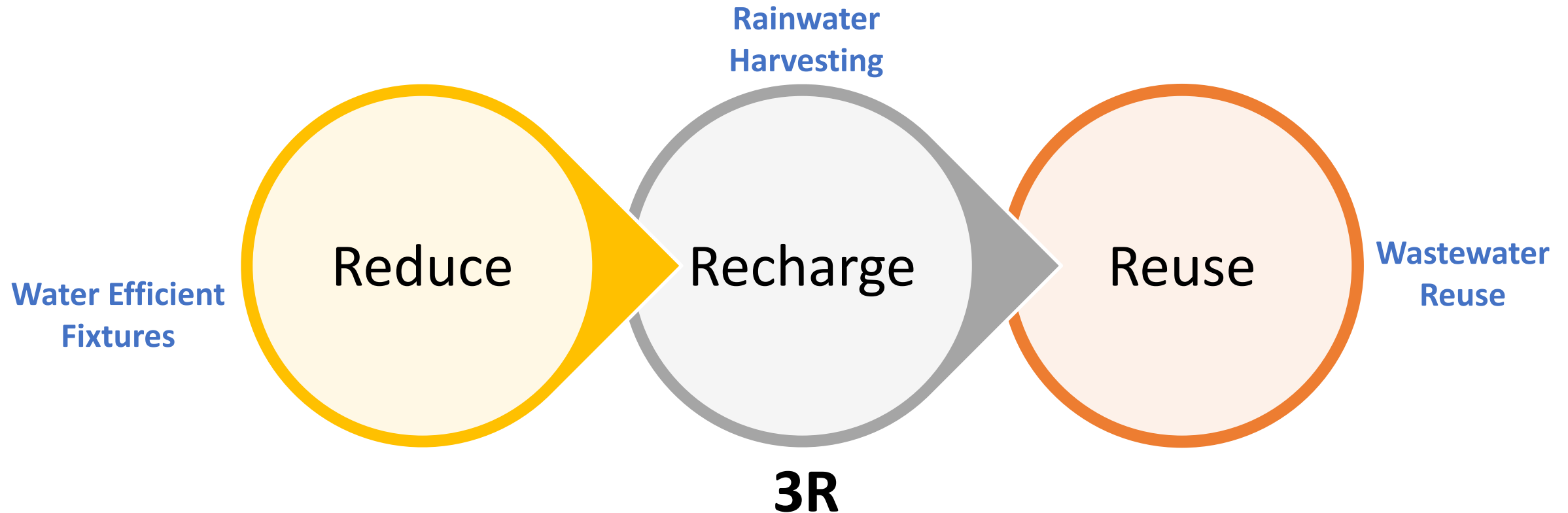
Green Buildings can remarkably **reduce the demand** of energy, water and cut down waste, GHG emissions.

Benefit s



Water

The goal of water efficiency can be achieved via application of 3R principle.



Water: Water Efficient Fixtures

To minimize indoor water usage by installing efficient water fixtures.



Automatic faucets

- Automatic sensor- based faucets reduces 50% of water at point of use.



Use of flow restrictors

- Flow restrictor to control water flow reduces water flow in taps by 60%.



Use of dual flush toilet

- A dual-flush toilet to flush different amounts of water.
- Reduces 50% of water consumed by flushes



Waterless Urinals

- These urinals do not require water for flushing.



Water Metering

- Water meters to monitor water consumption.

Water: Recharge &

Reuse
To recharge and reuse water available as surface run off.



Construction of Pond or water body

- To augment the surface run off in a low-lying areas within the premises.



Installation of Rainwater harvesting system

- Collect, store and utilize rainwater from roof top for multiple purposes.



Construction of Percolation pits

- To infiltrate stormwater through permeable soils into the groundwater aquifer.



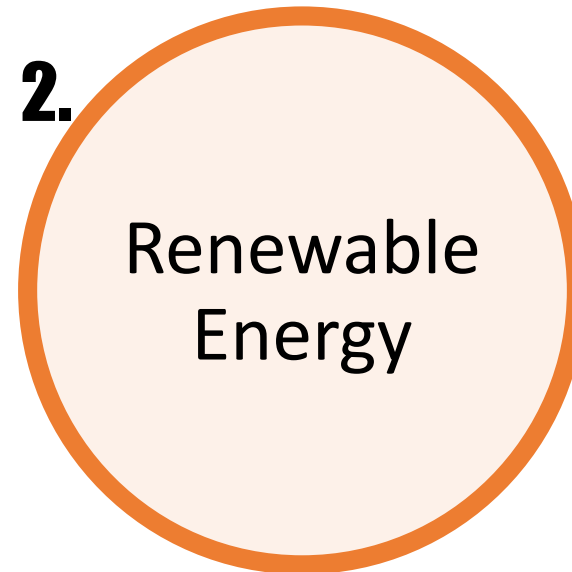
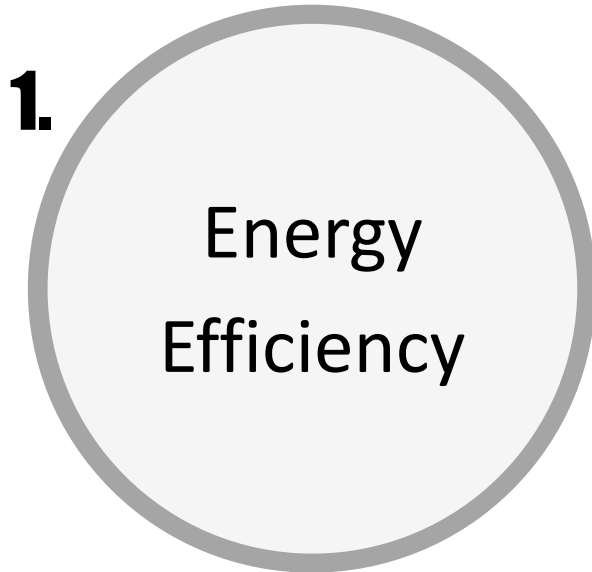
Provisioning of recharge well

- Ring like structure
- Takes water run-off from rooftops, paved areas and roads, filters it and sends it underground to increase the water table.

Energy

Y Green buildings are often proven to be low in energy demand as compared to conventional buildings, contributing to low GHG emissions.

This is made possible through incorporation of:



Energy : Energy



5-star Electric Appliances

- Procure 5 Star rated appliances for the Office.
- Mandate that the minimum set temperature for air conditioners does not go below 24°C.
- Do not install AC units on the west and south walls as these are exposed to direct sunlight through a major part of the day during summers



Switch to LED bulbs

- 75% reduction in the electricity consumption than incandescent bulbs.
- Replace the existing energy intensive halogen lighting with LED lighting. They can last up to 25 years



Set computer on sleep

- System that are set to sleep after a short period of non usage will reduce consumption by 70%.
- Set 15 minutes sleep mode for copiers and printers when not in use.



Double Glazing of windows

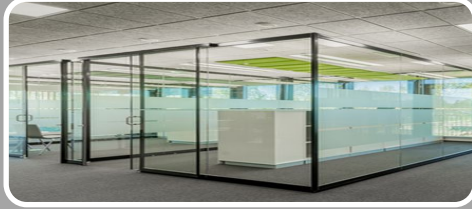
- Consists of two or more **glass** windowpanes separated by a vacuum or gas-filled(Argon) space to reduce heat transfer across a part of the building envelope.
- It blocks heat transfer.

Energy : Energy Efficiency



Utilize natural light

- 40% of electricity consumption of the average office building comes from artificial lighting.
- Lower blinds in the summer and raise them in the winter.



Glass Partition

- Use glass partitions to increase natural light penetration on building interior.



Opt for Smaller screens

- Reducing the screen size by 4 cm can reduce the energy consumption by 30%.



Provisioning of Task Lights

- Have task lighting at individual workstations

Energy : Energy Efficiency



Sub-Metering Devices

- Install sub-metering devices to monitor local electrical consumption.



Server Rooms

- The ventilation of server rooms is a huge cost in energy spending. If those can be stationed in a naturally ventilated area, it generates huge savings



Periodic Maintenance

- All electrical and electronic equipment periodically.
- For control of each lighting fixture through individual switches
- Clean light fixtures regularly to maintain illumination. Dirty tube lights and bulbs reflect ~ 50% less light.



Energy Audits

- Conduct appliance audit; remove unnecessary equipment.
- Perform a lighting audit for types and numbers of lights

Energy : Passive

Cooling

Passive cooling techniques in the building reduce overall reduction in Heat ingress in the buildings.



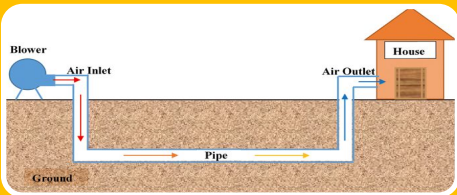
Roof Insulation

- Efficient in reducing the roof temperature.
- Contributing in the overall cooling demand.



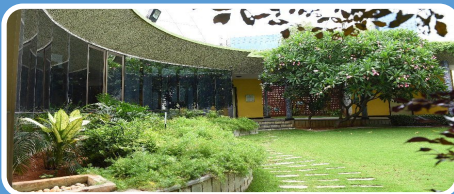
Shading Devices

- Fabric casting over the windows blocks sun rays and reduces heat gain in the buildings.



Earth Air Tunnels

- Installed below the Earth at a depth of about 4 meters
- Keep the indoor air cooler - During Summers and Warmer - During Winter
- Temperature reduction up to 8-10 °C, is possible.



Landscaping

- Vital in reducing the Heat island effect.
- Reducing the ambient air temperature.

Energy : Renewable

Energy

A key feature of the Green buildings is reliance on renewable energy sources.



Switch to non-renewable Source of Energy

- Switch to Solar energy.
- Install Solar Rooftop harvesting panels.

Energy Saving Reminder

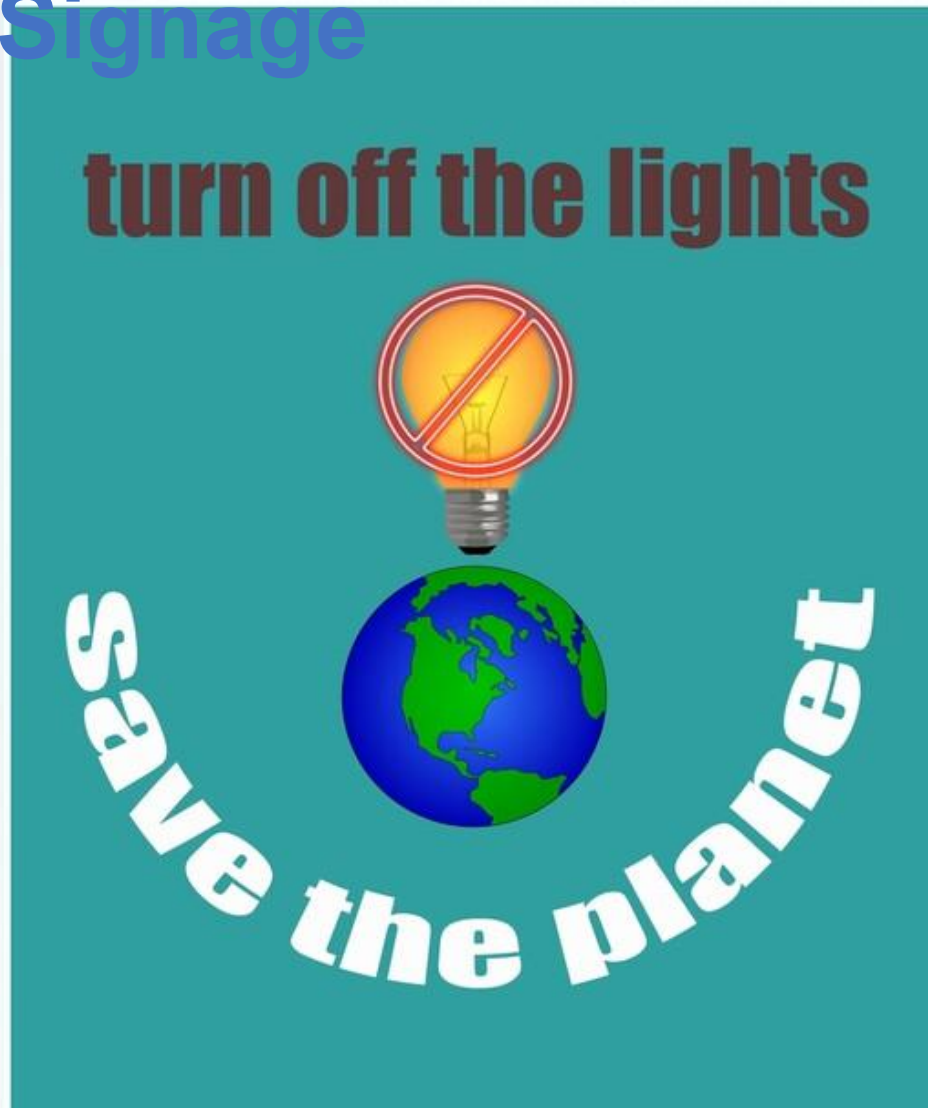
If you are the last to leave the room, please turn off the lights!



Take appropriate awareness measures

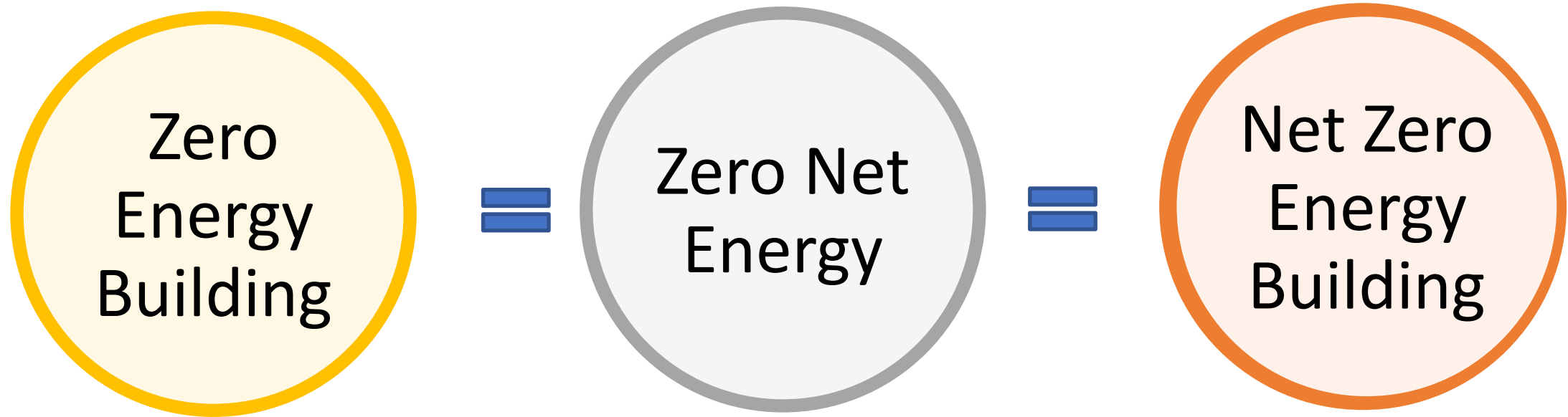
- Communicate importance of minimal energy conservation.
- Label light switches with "Please turn off lights when not in use" .
- Send 'Power Down' e-mails with Energy Saving Checklists before breaks and holidays

Awareness Signage



Net Zero Building Status

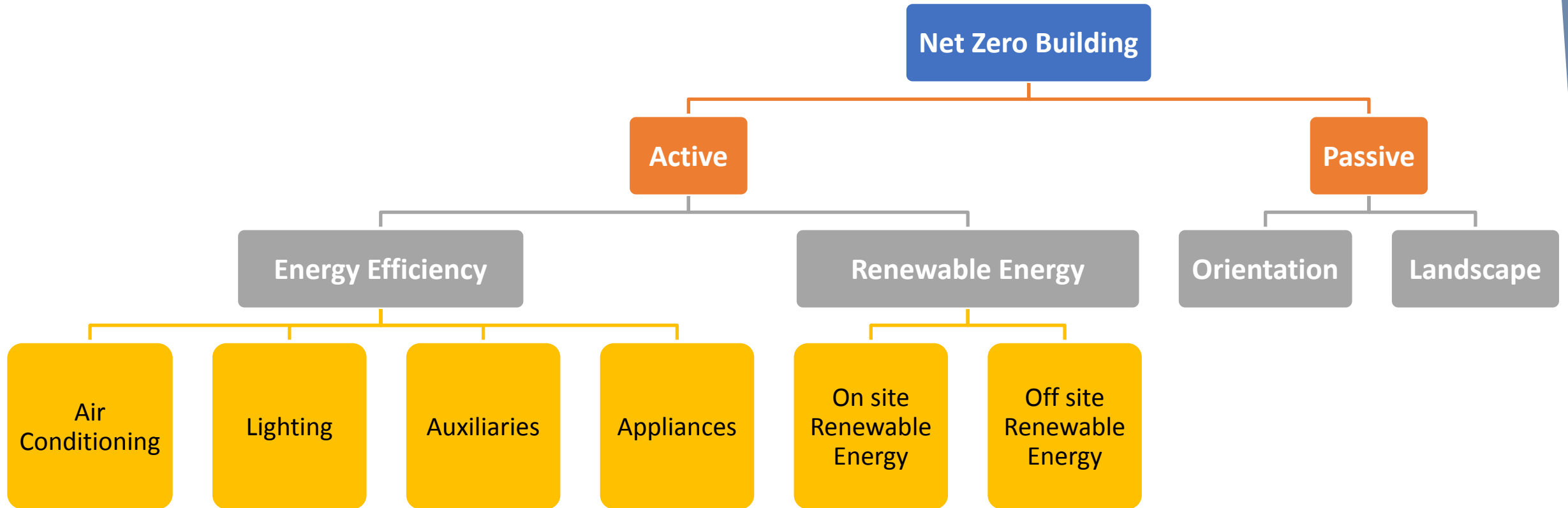
The total amount of **energy** used by the **building** on an annual basis is equal to the amount of **renewable energy created** on the site or by renewable energy sources off site.



Approaches for achieving Net Zero Building

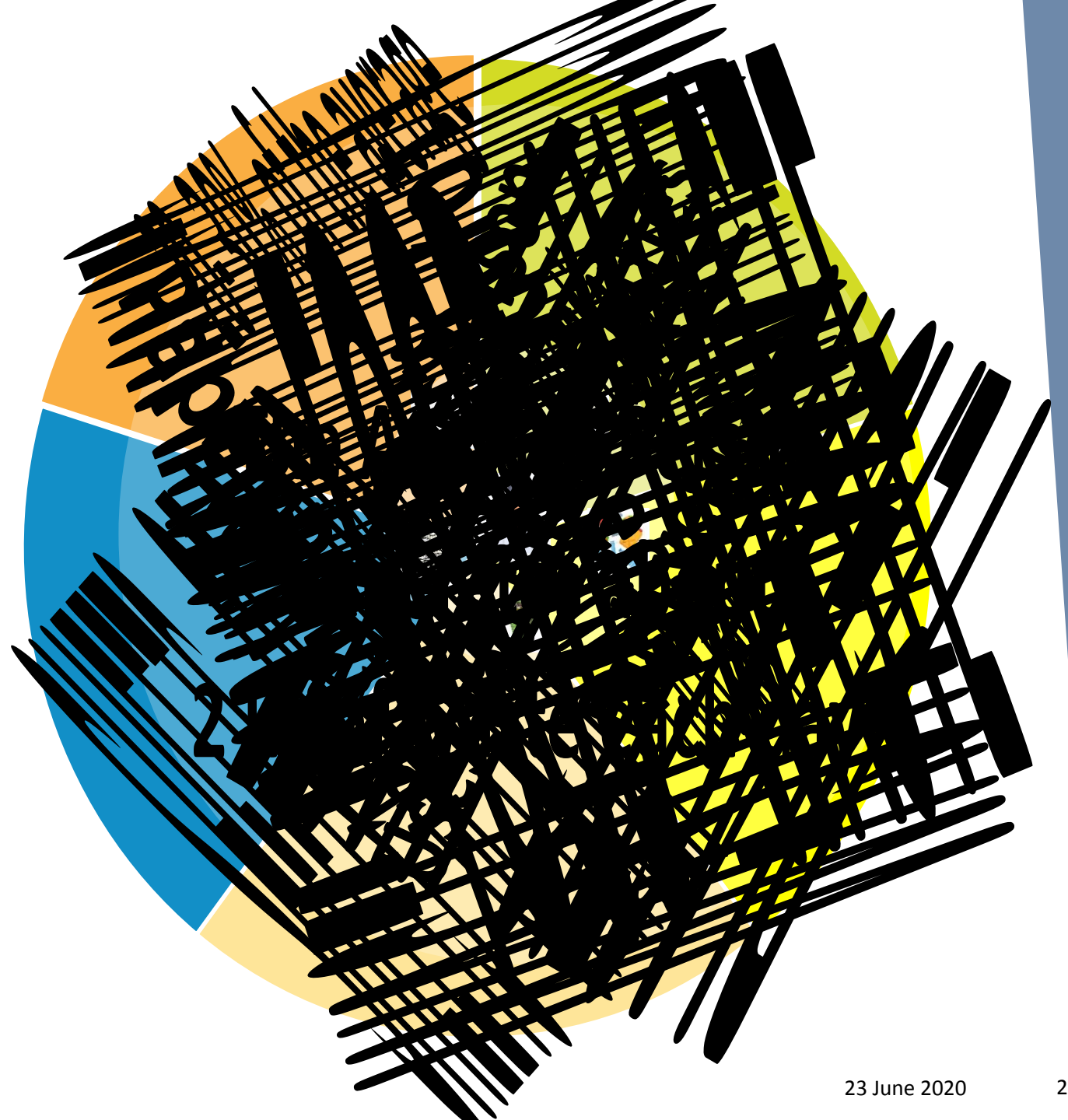
Status

There are two ways to achieve the Net Zero Building status i.e. Active and Passive



Waste Management

The average officer workers' waste generation amounts to a huge quantum if seen in conjunction with total staff strength.



Waste : Reduction

Waste reduction and segregation at source are key measures of waste management in offices.



Waste Reduction

- One of the key measures in waste reduction is reduce consumption of paper and other goods at source. For e.g. Double-sided printing, use of reusable containers.



Waste Segregation

- Provisioning separate colored waste bins for different types of waste.



Measure

- The amount of waste generated daily



Conduct Waste Audit

- Types of waste stream, Estimated quantity of each waste stream
- How the waste was generated ? Why the waste was generated ? Where the waste was generated; and How the waste was managed after being generated ?

Indoor Environment

A healthy indoor environment has been shown to contribute to greater employee retention and productivity, and a more pleasurable experience for customers.



Use eco-friendly paints

- Use water based interior paints with low or no volatile organic compounds (VOCs)



Use Green Cleaning supplies

- Purchase Green Seal or Environmental Choice certified cleaning supplies



Measure

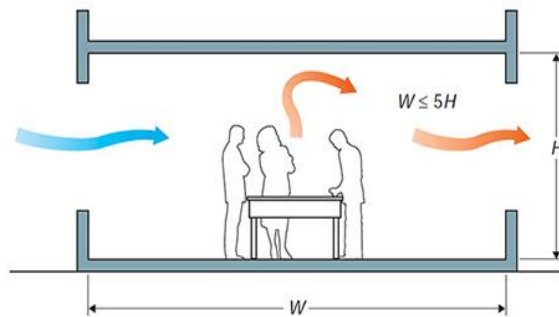
- Recycle at least 50% of remodeling or construction waste.
- Encourage use of materials that have a high recycled content
- Options include use of plastic recycled tiles, recycled gypsum or recycled bricks*

Indoor Environment

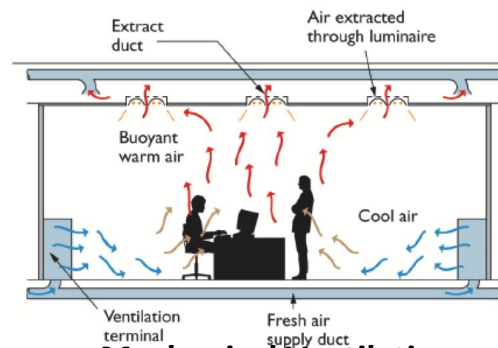


Use indoor plants

- Use indoor plants that can purify air generated daily.
- The requirement is to have at least one plant in every 100 sq. ft of carpet area.



Natural Ventilation



Mechanical Ventilation

Install Medium for Ventilation of Indoor air

- Rely more on Natural Ventilation.
- Install Ventilation Terminals and Extract ducts in existing buildings.

Materials Management

Material Management is a key component to reduce overall carbon footprint of the building.



Have reusable mugs, dishware and silverware available in break rooms and kitchens



Use biodegradable products for disposable plates, cups and bowls



Do not purchase Styrofoam products



2-sided printing

Set all office computers to default print double sided



Reduce bottled water and canned soft drink purchases by 80%



Encourage re-usable containers for bag lunches



Convert paper forms to electronic forms to reduce paper usage



Refill toner and printer cartridges



Cancel unwanted paper publications and subscriptions or register for e-newsletters



Replace paper towels for hand dryers



Use teleconferences and videoconferences to reduce travel

Rating of Green Offices

Green Rating Agencies



The U.S. Green Building Council



Green Co Rating System



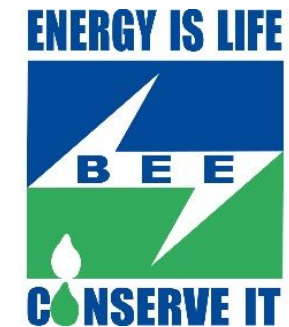
Green Rating for Integrated Habitat Assessment



The Indian Green Building Council

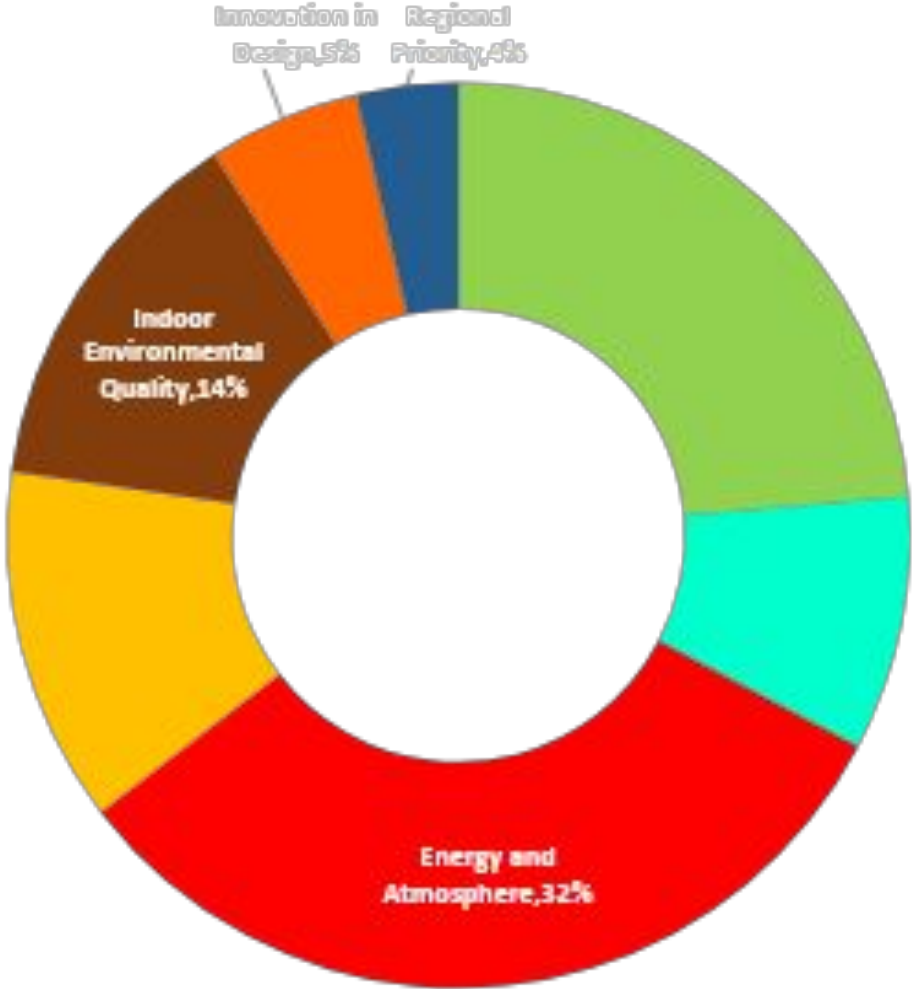


Green Habitat Accomplished Rating



BEE certification

IGBC Rating Systems



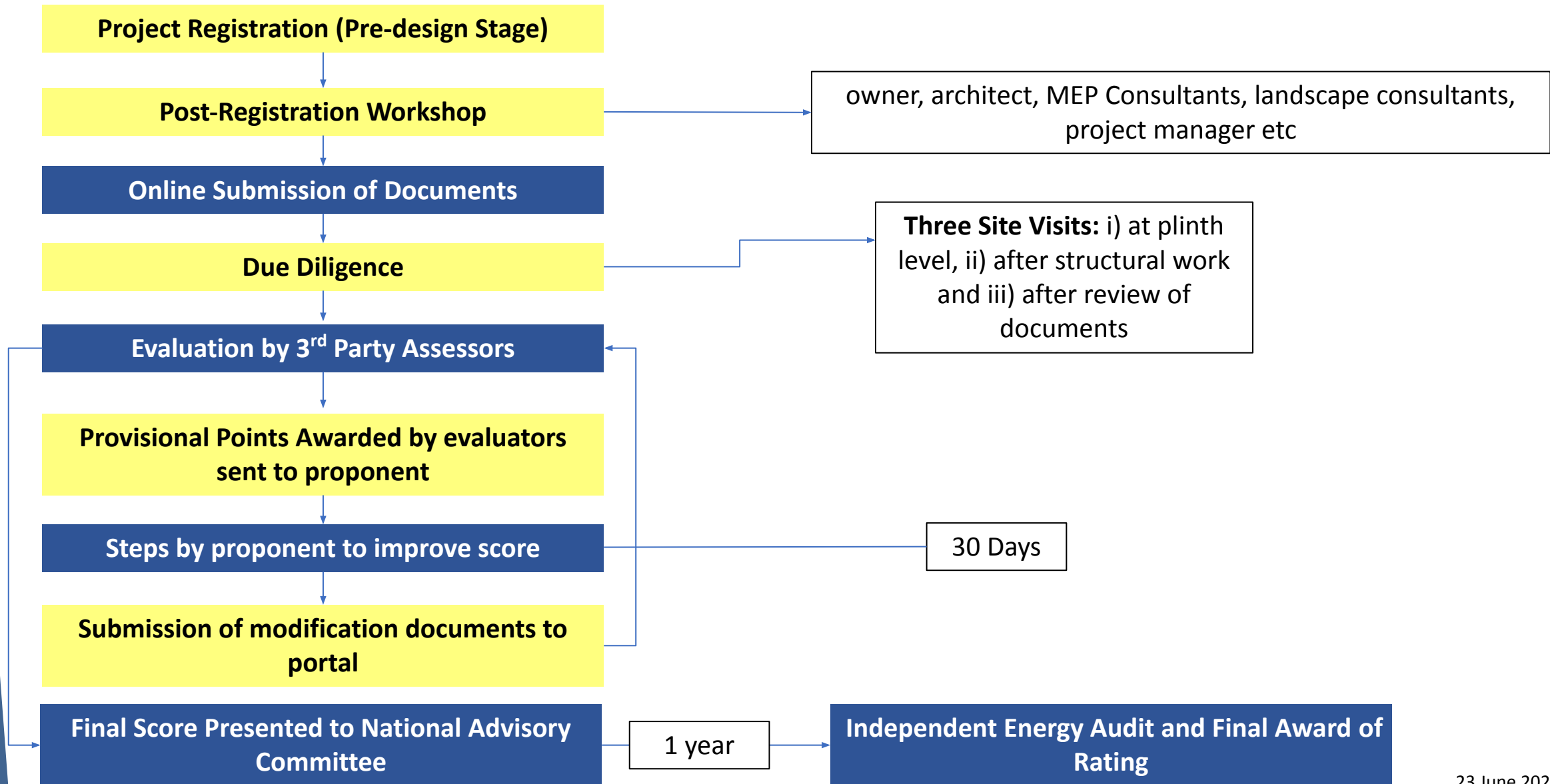
Overall Rating: 110 Points

Highest Weightage:
Energy and Atmosphere
Sustainable Sites
Indoor air Quality
Materials and Resources

The IGBC rating system gives high weightages to energy efficiency and sustainable sites.

Lowest Weightage
Regional Priority
Innovation & Design
Water Efficiency

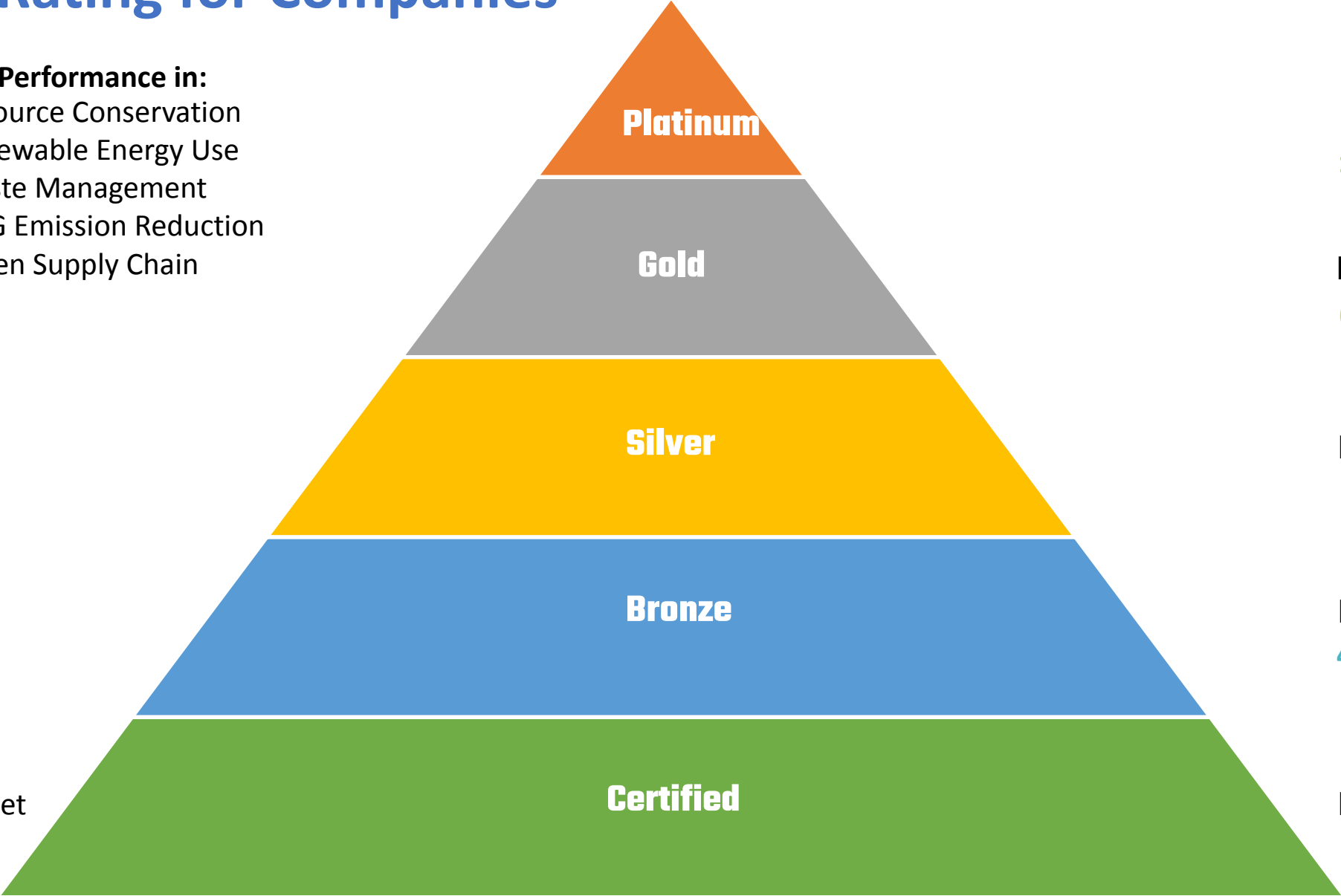
GRIHA Certification Process



Green Co Rating for Companies

Exemplary Performance in:
Resource Conservation
Renewable Energy Use
Waste Management
GHG Emission Reduction
Green Supply Chain

Environmental
Performance to meet
requirements &
Standards



>750 points

LEVEL 4
650-749 points

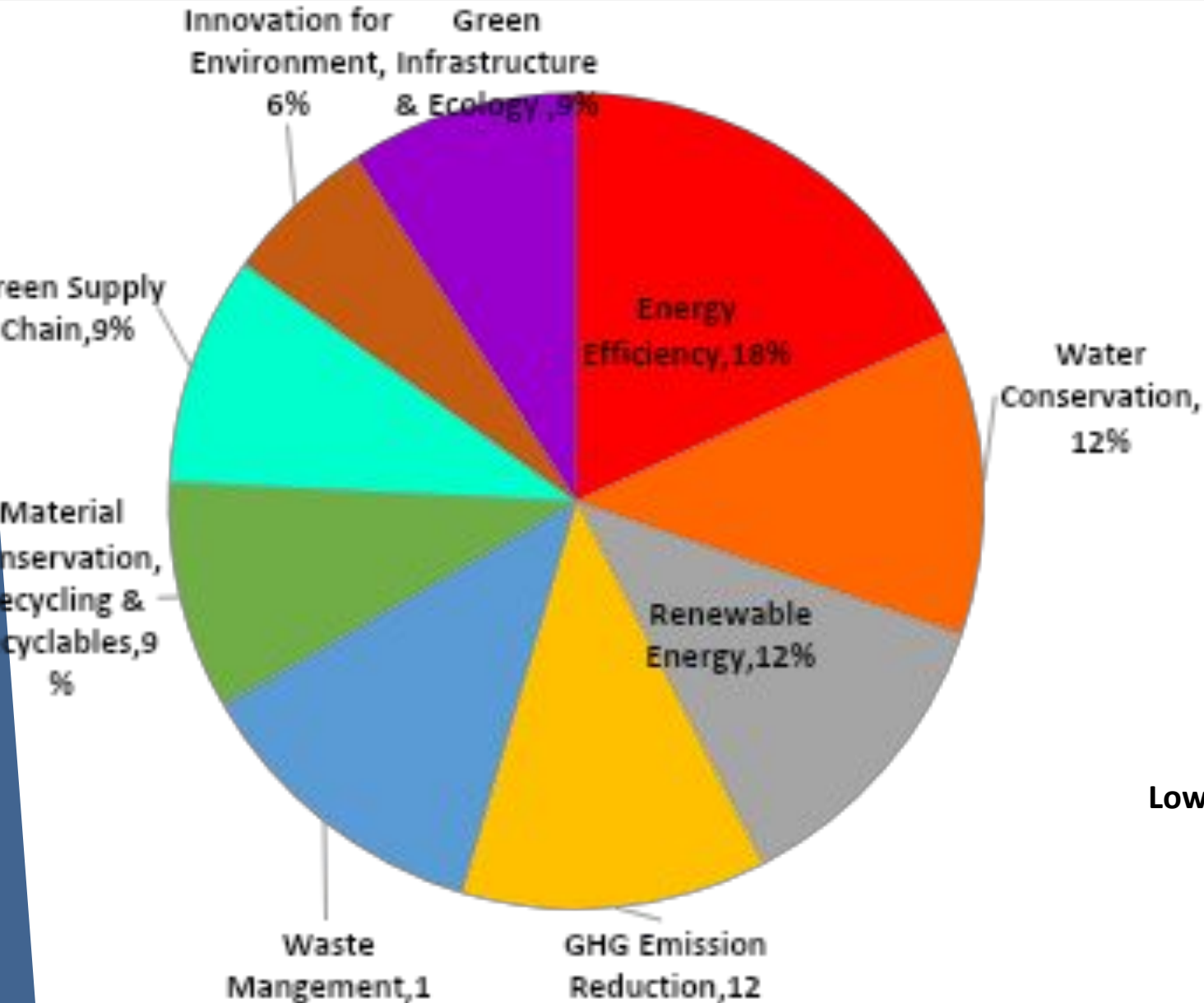
LEVEL 3
550-649 points

LEVEL 2
450-549 points

LEVEL 1
350-449 points

Overall Rating: 1000 Points

Green Co Rating System for Commercial spaces



Highest Weightage:

Energy Efficiency
Water Conservation
Renewable Energy
Waste Management

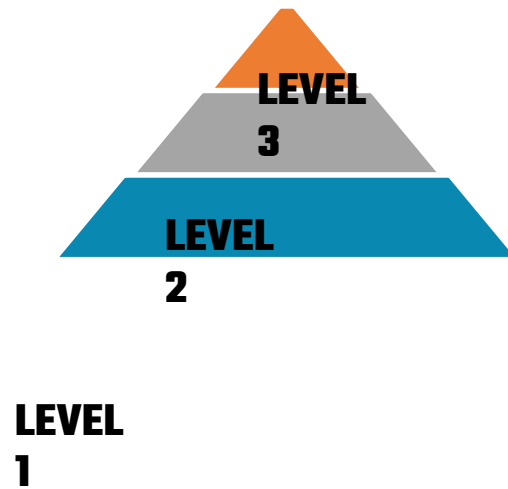
The GreenCo rating system gives high priority to **energy efficiency, water conservation, renewable energy, GHG emission reduction and waste management, respectively.**

Lowest Weightage

Green Infrastructure
Innovation
Green supply Chain

GHAR Rating System

1. **50% marks** are to be scored in each criterion before considering for Rating.
2. The rating once awarded shall remain **valid for 5 years**.
3. For buildings **constructed by CPWD, no fee shall be levied for processing of application**, assessing and awarding the rating.

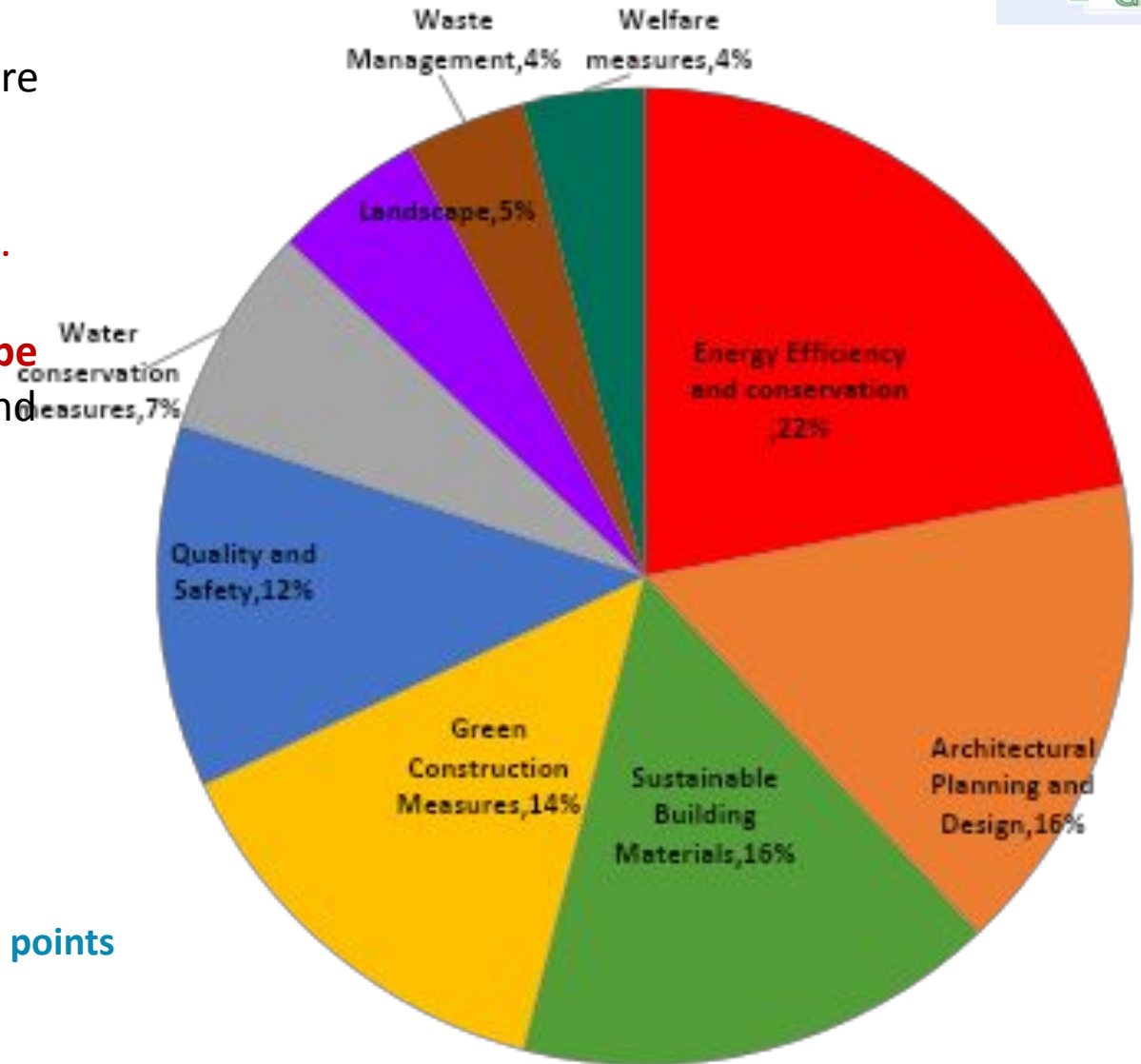


86-100 points

71-85 points

55- 70 points

Overall Rating: 100 Points



Comparison of GRIHA and IGBC Certifications

Point of Distinction	GRIHA (Green Rating for Integrated Habitat Assessment)	IGBC (Indian Green Building Council)
Origin	TERI (The Energy And Resource Institute) and MNRE (Ministry of New and Renewable Energy) Joint Initiative	CII (Confederation of Indian Industries) adopted form US-based LEED Certification
Rating System	<p>A 5-Star Rating System</p> <ul style="list-style-type: none"> • 50-60 points is certified as a 1-star GRIHA rated building, • 61-70 is a 2-star GRIHA rated building, • 71-80 is a 3-star GRIHA rating building, • 81-90 is a 4-star GRIHA rated building and • 91-100 is a 5-star GRIHA rated building 	<p>Four Category Rating System</p> <ul style="list-style-type: none"> • Certified – 40 - 49 points • Silver – 50 - 59 points • Gold – 60 - 79 points • Platinum – 80 points and above
Standards Used	<ul style="list-style-type: none"> • Energy Conservation Building Code, 2007 • Water quality based on IS 10500 – 1991 (drinking) and IS 11624 – 1986 (irrigation) • Outdoor and Indoor noise levels based on Central Pollution Control Board–Environmental Standards • Solid Waste Management and handling Rules, 2000 of the MoEFCC 	<ul style="list-style-type: none"> • No Indian Standard is being used. • ASHRAE standards are used. • Emissions are tested based upon the emission standards of ICC Evaluation Service (ICC-ES) Evaluation Guideline.

Comparison of GRIHA and IGBC Certifications

Point of Distinction	GRIHA (Green Rating for Integrated Habitat Assessment)	IGBC (Indian Green Building Council)
Assessment Criteria	<p>GRIHA assesses a building based on 4 categories and awards points on a scale of 100.</p> <ul style="list-style-type: none"> • Site Selection – 9 criteria, 24 points • Building Planning and Construction – 22 criteria, 74 points • Building Operation and Maintenance – 2 criteria, 2 points • Innovation (bonus) – 1 criteria, 4 points <p>Furthermore, some criteria are mandatory and others are partly mandatory.</p>	<p>IGBC assesses a building based on 5 major categories for a total of 100 points.</p> <ul style="list-style-type: none"> • Sites – 9 credits, 26 points • Water efficiency – 4 credits, 10 points • Energy and Atmosphere – 7 credits, 35 points. • Building Materials and Resources – 8 credits, 14 points • Indoor Air Quality – 9 credits, 15 points • Bonus (Innovation in Design) – 2 credits, 6 points • Bonus (Regional Priority) – 1 credit, 4 points

Case Studies

Rail Nirman Nilayam



Rail Nirman Nilayam – The first Green Building in Indian Railways which has been accorded three star.



ENERGY

- **40% per cent glazing area** and with two cutouts to give more lighting, thus reducing the energy demand.
- Lighting is designed optimally and help in **saving the power to an extent of 20%** when compared to similar buildings.
- Energy Efficient centralized air conditioning through VRF (Variable refrigerant flow) technology with the facility of controlling each indoor unit centrally as well as individually.
- **Use of Energy management system for comprehensive electrical parameters reporting,** comparative and performance analysis and remotely switching ON/OFF facility of each equipment.

Rail Nirman Nilayam: Water & Renewable Energy

WATER CONSERVATION



- **Daily water** consumption in the building has been **reduced by about 50 %**.
- Use of **low flow sensor-based urinals, taps and dual flushing tanks**.
- **RWH** is provided for full quantity of rainwater coming from **the roof top and circulation areas which is about 48 lakh litres** a year against consumption of about 25 lakh litres per year.
- The **wastewater is treated to tertiary standards in the Sewage Treatment Plant** which works on FAB technology. The treated wastewater is used for lawn and plant watering.

RENEWABLE ENERGY



- Stand alone **solar street lighting** system with **programmable day light sensing controller** for outdoor lighting have been used.
- **37.5 KW grid connected solar generating system** was provided in the shadow free area of 7,500 sq. ft. on the roof of Rail Nirman Nilayam.
- The daily average energy consumption of whole building is around **900 units, out of which, on an average 150 units is being generated from Solar Energy**.

Indian Railways Institute of Civil Engineering



Indian Railways Institute of Civil Engineering (IRICEN) has been rated five star by GreenCo.



Extensive use of Renewable Energy

- Building Integrated photovoltaic(BIPV) of 40 KW capacity
- Roof mounted solar panels



100% daylight in regularly occupied FDK spaces

- Skylight in open courtyard



Reused salvaged materials

- Railways sleeper wood, wood beam post, tiles & flooring

Eco Office Singapore



- Eco-Office is a joint initiative between **Singapore Environment Council (SEC)** and **City Developments Limited (CDL)** and was launched on 5th June 2002 to mark World Environment Day.

PHASE I

Distribution of **ECO-Office Kits**, which contained materials to help companies raise awareness and cultivate environment-friendly habits within the workplace.

PHASE II

Eco-Office is the online **Eco-Office Rating System** which enables offices to perform a self-audit based on simple metrics, such as

- corporate environmental policy and commitment, purchasing practice,
- waste minimization measures,
- level of recycling





Caring for the environment and fighting climate change

Green Offices & SDG

- Enhances Employee's Health and wellbeing
- Creates Jobs and boosts the economy
- Key to sustainable Communities
- Help in combating Climate Change
- Creates strong and global partnerships



- Use renewable energy, cheaper to use.
- Catalyse innovation and Climate Resilient
- Work on circularity principle, lesser waste.
- Enhance biodiversity and save forests.

Green Offices have an important role to play in fulfilment of SDG

Quiz

State whether the statements are True/ False:

- i) We should encourage re-usable containers for bag lunches.** **True**

- ii) Printing double-sided and/or using recycled paper causes photocopiers to jam and makes you use more paper.** **False**

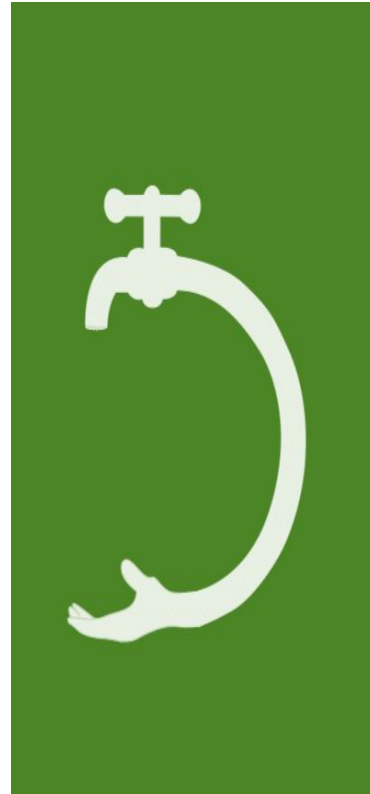
- iii) Replacing paper towels for hand dryers has no impact.** **False**

- iv) Screen savers save energy.** **False**

- v) Refilled toner or ink cartridges leak everywhere and make an incredible mess** **False**

- vi) Green offices ensures increase the quality of environment and sustainability.** **True**

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