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Analyzing Effective Carbon Neutral Strategies For 5-Star Hotels Of Maharashtra.

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Abstract: This study looks at how 5-star hotels in Maharashtra, India, can develop good carbon neutral plans. The hospitality industry is becoming a bigger part of carbon emissions, so it's important to find ways to reduce that. As the world works to stop climate change, hotels need to use methods that are good for the environment without hurting their business. The research tries to create real steps for becoming carbon neutral by looking at rules, standards, and what other hotels are doing. Information was gathered through research, guidelines from IGBC, and examples from ITC Grand Central and Orchid Hotel in Mumbai, focusing on how they save energy both actively and passively. The results show that using renewable energy, efficient technology, sustainable water and waste systems, and educating staff and guests can greatly cut down on carbon emissions. The outcome of study analyzing carbon neutrality based on comparing different approaches, which helps the environment and sets a good example for hotels in India.

Index Terms – 5-star hotel, carbon neutrality, strategies for development, Maharashtra

I. INTRODUCTION

The global hospitality industry is changing a lot because sustainability is becoming very important, especially with the effects of climate change. Hotels are one of the main sectors that produce greenhouse gases because they use a lot of energy, water, and create a lot of waste. As people become more aware of the environment and rules get stricter, hotels especially high-end ones like 5-star hotels need to find ways to reduce their carbon footprint without affecting the quality of service or comfort for guests. Because of this, many hotels are aiming for carbon neutrality, which means they balance the carbon they release by using methods like clean energy, efficient technology, and eco-friendly ways of running their business. In India, especially in the fast-growing state of Maharashtra, hotels are facing more pressure to follow green practices that meet both national and international environmental standards. (tourism, n.d.)

II. RELEVANCE OF THE STUDY

Achieving carbon neutrality is very important because it helps reduce the big problems caused by climate change. It also brings many good things like less pollution, better health for people, and more jobs in the green economy. It also helps with food security by making sure climate changes don't mess up food production. Plus, it helps protect nature and the oceans. In this situation, the hotel industry is growing fast and uses a lot of energy, which means it produces a lot of carbon emissions. Because of this, it's really important to find good ways to lower the carbon footprint of the hospitality sector. (Change, 2021)

III. AIM

The aim of this research is analyzing the effective carbon neutral strategies for 5-star hotels in Maharashtra region.

IV. OBJECTIVES

- To study and understand the concept, norms & standards of carbon neutrality while considering climatic conditions.
- To collect the data from various hotels for effective carbon neutral strategies.
- To analyze the collected data from various case study hotels.
- To make a broad conclusion based on the analysis for the development of the effective carbon neutral strategy.

V. RESEARCH METHODOLOGY

- To study and understand the concept of carbon neutral strategies and factor affecting it from literature study, ECBC, government publications.
- To collect the data from selected hotels for effective carbon neutral strategies by using quantitative and qualitative methods like case study, interview questioner.
- To analyze the collected data from case study hotels using comparative analysis methods.
- To make a broad conclusion based on the analysis for the development of the effective carbon neutral strategy for hotels in Maharashtra region.

VI. DATA COLLECTION

A. IGBC (Indian Green Building Council)

India's infrastructure and building industry are expanding rapidly. One of the greatest financial divisions in India is the development industry, which is growing rapidly. Since the industry is growing rapidly, securing the environment presents a number of challenges. The Indian Green Building Council (IGBC) was established by the Confederation of Indian Industry to back the naturally cognizant building sector.

IGBC is a non-profit organization that speaks to the building industry and is driven by agreement. It has over 1,710 committed individuals. To improve the financial and environmental performance of buildings, the Council promotes the design, construction, and operation of green and net-zero buildings by builders, engineers, proprietors, planners, specialists, and temporary workers. With the objective of helping India become one of the driving countries in the transition to Net Zero by 2050, IGBC established the "Net Zero" initiative. IGBC has made specialized grading systems for Net Zero Energy, Net Zero Water, and Net Zero Waste to Landfill as portion of its goal to help buildings and the built environment embrace Net Zero principles. Another significant step in this heading to lower operational and embodied emissions is the creation of the IGBC Net Zero Carbon (pilot Version) rating system. All pertinent parties agreed and supported the improvement of the grading system. (Rating, 2023)

The Net Zero Carbon Rating System of the IGBC

The Net Zero Cabon Technical Committee was established by IGBC to create the rating system. Architects, builders, developers, owners, consultants, institutions, manufacturers, and representatives of the industry were among the important players on this group. The committee's varied experience and expertise have improved the grading system's methodology and substance.

a. Features

Consensus is the basis for the optional IGBC Net Zero Carbon rating framework.

The rating system's core goals are to promote the use of low-embodied carbon materials, optimize building execution through passive features and technologies, and utilize carbon sequestration and on-site and off-site renewable energy systems to lower or offset carbon emissions related to the buildings and the encompassing environment.

The grading system uses a performance-based approach for a few credit points and necessary requirements and a prescriptive approach for others. (Rating, 2023)

B.Case Studies

Sr. No.	Category	Case study 1 ITC hotel, Mumbai	Case study 2 Orchid hotel, Mumbai
1	Type of Building	5-star hotel	5-star hotel
2	Orientation	North-South	North-South
3	Number of floors	30	7
4	Plot Area	10258 sq.m	4871 sq.m.
5	Year of Completion	2004	2005
6	Maximum Monthly Electricity units	984521 units	657177 units
7	Building Envelope	R.C.C. frame structure, brickwork, cement plaster	R.C.C. frame structure, brickwork, cement plaster
8	Vegetation	Yes	Yes
9	Type of Roof	Flat	Flat
10	Mechanical Cooling Device	HVAC system	HVAC system
11	Outdoor Temperature	34° C	35° C
12	Indoor Temperature	24° C	26° C

(Source: Primary data)

VII. DATA ANALYSIS

A. Interview questioner analysis

Question	ITC Grand Central	Orchid	Remark
Which type of renewable energy is used in hotels?	Wind energy	Wind energy	ITC is fully depended on renewable energy but Orchid hotel uses small amount of conventional energy.
What is the equipment's where large amount of energy is consumed?	Boiler, Dryer etc.	Boiler, Dryer etc.	In both hotels large amount of energy is used by water boilers and dryers.
Have energy audits are done consistently in hotel?	Yes	Yes	Both hotels do energy audits regularly.

What are the main sources of energy?	Wind energy	Wind energy and minimum amount of natural gas, electricity	Orchid hotel partially depends on renewable energy while ITC hotel depends fully on renewable energy
Aee there any government rules and regulations to meet carbon neutrality?	Yes	Yes	Both hotels follow the rules and regulations
Does government provide subsidies?	Yes	Yes	Government provides subsidies for renewable energy use.
How much daily electricity is consumed?	20000 approx.	11500 approx.	Both hotels consume large amount of energy.
How much use of plastic is done in hotel?	Not single use plastic	Plastic is banned	ITC hotel doesn't use single use plastic while in Orchid hotel plastic is banned.
Are hotels staff is aware about sustainable development?	Yes	Yes	Staff of both ITC and Orchid hotel is aware about sustainable development.
Is your hotel have certification of carbon neutrality?	Yes	Yes	ITC hotels is certified carbon net zero while Orchid hotel is certified Ecotel hotel.
Is there any STP provided for water saving?	Yes	Yes	Both hotels have STP for recycling of water.
Are electrical tools and equipment's used energy efficient?	Yes	Yes	Both the hotels use energy efficient tools and equipment's.
Have your hotel done proper waste management system?	Yes	Yes	Both hotels have proper waste management system.

Is there EV station provided in hotels premises?	Yes	Yes	Both hotels have EV charging station in premises.
Are your staff and guest aware about sustainable development?	Yes	Yes	Staff of both hotels is aware about sustainable development.

(Source: Primary data)

B.Analysis of active and passive strategies used in hotel

Approach	Class	Subclass	Types	ITC hotel	Orchid hotel
Active	On site energy harvesting facilities	Photovoltaic (PV) panel	Polycrystalline Monocrystalline Thin film	✓	✓
		Solar thermal collector Wind turbine	Flat plate Evacuated tube Horizontal axial vertical axis Vertical axial Savonius	✓	✓
	Energy efficient ventilation systems		Direct/indirect evaporative cooling Ground source cooling Heat pumps etc.	✓	✓
	Energy storage systems		Storage tanks Aquifer systems Borehole thermal storage HVAC system	✓	✓
	Water facilities	Reclaiming water system	Physical treatment biological treatment Chemical treatment STP	✓	✓
	Others	Efficient lighting and appliances		✓	✓

		Waste management Guest and staff awareness			

Approach	Class	Subclass	Types	ITC hotel	Orchid hotel
Passive	Building materials	Envelope material	Insulation materials Phase change materials	✓	✓
	Building characteristics	Building shape and orientation	–	✓	✓
		Envelope related options	Air tightness Glazing type Window to wall ratio Window shading Skylight	✓	✓
	Passive cooling/heating	Natural ventilation	Stack ventilation Cross ventilation	✓	✓
		Thermal Mass Heat recovery ventilation	Crossflow HRV Plate Heat exchange etc.	✓	✓
		Green roof and green walls	Green roof Green wall Green façade Living walls	✓	✓

(Source: Primary data)

VIII. Conclusion

This research shows how important it is for the hospitality industry, especially 5-star hotels in Maharashtra, to develop strategies that reduce carbon emissions. By comparing ITC Grand Central and Orchid Hotel in Mumbai, the study shows that using both active and passive methods can greatly help hotels cut down their carbon footprint. Key areas that make a big difference include using renewable energy, managing water and waste efficiently, using eco-friendly building materials, and educating both staff and guests about sustainability.

ITC Grand Central, which is certified as a Net Zero Carbon hotel, shows a strong commitment to energy efficiency and environmental protection.

Orchid Hotel, with its Ecotel certification, also does a great job in maintaining sustainability. Both hotels show that following IGBC and ECBC standards can lead to real environmental improvements and better hotel operations.

The research suggests that with the right mix of technology, creative design, meeting legal requirements, and changing behaviors, 5-star hotels can move towards carbon neutrality without affecting the comfort or quality of service for guests.

This study provides useful ideas for people in the industry and sets a standard for sustainable practices in the Indian hospitality sector. It also helps the country reach its environmental goals.

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