

Activities contributing to Carbon Footprint generated by Hotels; measures hotels can take for Promoting Sustainable Development

Jasmine Kaur M.Kohli and Medha Naik

Department of Architecture & Jawaharlal Nehru Engineering College

Abstract -Global warming and climate change are pressing current issues which are directly impacted by GHG (greenhouse gas) emissions. The tourism industry contributes 8% of global GHG emission and the hospitality industry is the most important subset of this sector contributing an estimated 58 million metric tonnes of GHGs per annum restoring the ecological balance by reducing the carbon footprint is a pressing global concern and the hospitality sector can play an important role in the future. This research paper outlines some of the major activities within the Hospitality sector leading to a higher carbon footprint - by dividing the activity areas that represent the hotel's operations and services along with their impact; and also outlines the measures that must be taken to reverse or offset their environmental impact.

Key Words: Hospitality, GHG, carbon footprint, environment, global warming.

1. INTRODUCTION

A primary global concern of our generation is environmental protection and reduction in carbon footprint. As per the World Meteorological Organization (WMO), 2019 was the second warmest year on record and the end of the warmest decade (2010-2019) ever recorded, and this trend is expected to continue. WMO Secretary-General Petteri Taalas in a recent press release has said, "On the current path of carbon dioxide emissions, we are heading towards a temperature increase of 3 to 5 degrees Celsius by the end of century."

Fossil fuels, especially oil and coal are the main elements through which carbon dioxide is generated by burning them for obtaining energy. CO₂ has the largest share among all the greenhouse gases (5). As a result, emissions of other greenhouse gases (CH₄, N₂O, HFC, PFC, SF₆) are converted in units of CO₂ equivalent (CO₂e), using the warming potential related to each gas.

Rising carbon emissions are accelerating climate change with devastating impacts on communities and biodiversity. The hotel sector accounts for around 1% of global emissions and though this may seem small, growth in the sector means that the sector will increase its negative environmental impacts if it does not start to measure and reduce its carbon emissions.

Why act? The hotel sector needs to account for and reduce its climate impact. Energy demand, security of supply and the likely impact on costs in the future

International tourism partnership (ITP) has derived a methodology: The Hotel Carbon Measurement Initiative (HCMI) and tool which enables hotels to measure and report on carbon emissions in a consistent way.

2. BODY OF PAPER

The scope was limited only to resources used for operations measurement; limitation has led to leave customer travel from this study's scope - since that would differ from case to case. Behavior patterns also vary too much to distil assumptions and thereby polish estimates: Thus, even though this impact may be significant, it is impossible to calculate it accurately enough to be included in this study's scope.

A growing number of studies and research, such as the IPCC, 2018: Summary for Policy makers reveals a direct connection between climate change and CO₂ emissions. In fact, Climate Action has long since been a leading priority in the Sustainable Development Goals outlined by the UN.

The Stockholm Conference in 1972 was the first global gathering to discuss the human environment and climate change. Following the Stockholm Conference, the Kyoto protocol was linked to UNFCCC. As per the UNFCCC website the Kyoto Protocol is based on the principles and provisions of the Convention and follows its annex-based structure. It only connects developed countries and places a heavier burden on them under the principle of CBDR, Common but differential responsibilities, because it recognizes that they are largely responsible for the current high levels of GHG emissions in the atmosphere.

In its Annex B, the Kyoto Protocol sets binding emission reduction targets for 36 industrialized countries and the European Union. Overall, these targets add up to an average 5 per cent emission reduction compared to 1990 levels over the five year period 2008–2012 (the first commitment period). The second commitment period was called the DOHA Amendment and was meant to last from 2013 to 2020, however has not yet been entered into force.

As per the UNFCCC website, under the Protocol, the national measures can be reached through, countries meeting their targets. However, the Protocol also offers them an additional means to meet their targets by way of three market-based mechanisms:

1. International Emissions Trading
2. Clean Development Mechanism (CDM)
3. Joint implementation (JI)

When a country does not fulfil its reduction target, surpassing the assumed rate, it is forced to buy allowances from countries that have not consumed theirs. Thus, the obligatory market for carbon certificates was created. Firstly, the root concerned in generating GHG emissions is the energy industry. Burning fossil fuels to obtain energy generates most GHG emissions; enterprises should initiate processes to reduce these emissions. Experts believe that the market for trading carbon emissions can be beneficial for both – the countries and also for the planet in the long term, because it involves an efficient and rapid method for emissions reduction in the energy industry.

Unfortunately, the ineffectiveness of Kyoto protocol is due to an emergence of carbon leakage generated by imports as well as carbon emission reallocation.

The obligatory requirement for carbon certificates, which allows the owner of a certificate to offset one tonne of CO₂e emission, based on the fact that the certificate was issued after a project is operational for reducing emissions with one tonne in the atmosphere.

Discretionary market has the advantage that supports financially the research-development- innovation projects, in the field of carbon emissions, having concrete results for new and sustainable technologies (renewable energy). Technologies and materials that generate fewer gases should be used as a substitute for emission reduction, but also through counteracting the generated emission, by creating absorption capacity for carbon emissions. Trees convert carbon dioxide into oxygen and other organic compounds necessary for life through the process of photosynthesis. Thus, serious efforts towards afforestation must be made to reduce the effects involved by GHG emissions.

The tourism industry contributes 8% of global GHG emission and the hospitality industry is the most important subset of this sector contributing an estimated 58 million metric tonnes of GHGs per annum.

Even small-scale hotels can have an adverse impact on the environment. They consume water and energy, while also creating large quantities of waste. Even the

transportation of tourists contributes to local emitting properties which indirectly lead to climate change. The use of chemicals for cleaning and in HVAC systems can discharge harmful emissions – resulting in further depletion of the ozone layer.

In this research paper The Hypothesis is that over time, an environmental management programmed for a hotel project can help reduce the global carbon footprint, while also leading to increased efficiency and cost savings within the sector. Additionally, by making proactive initiatives players within the hospitality industry can also be better organized to meet future regulations, and other external demands.

Taking a larger view and building systems keeping in mind ecological issues often helps to reduce costs - for example – monitored energy and water consumption, substitution of chemical cleaning products with organic alternatives, and building sustainable and better waste management systems – while maybe cumbersome to implement and cost intensive in the short term, can lead to exponential ecological and financial rewards over the longer term. Moreover, consumers also find ecologically conscientious business more appealing.

Hospitality activities contributing to carbon footprint are:

1. Food & Beverages
2. Cooling equipment
3. Cleaning products
4. Energy consumption
5. Employee travel
6. Room equipment
7. Water management
8. Laundry

As per research and analysis there are 8 major activities that lead to the biggest environmental impact through these 5 key operating factors:

1. **Energy Consumption:** Resources such as oil, gas, coal, the sun, etc. which are used to produce energy. The total amount of resources that an operation extracts is an indicator measures from the environment, i.e. primary energy. The energy consumed and released during production and distribution phases are also the factors to be considered.
2. **Water consumption:** This statistic incorporates all the supplies taken from the environment with one exemption - water that does not travel through hotel meters (well water and rainwater).
3. **Waste production:** Human activities generating waste, effecting the environment depends whether it is organic (biodegradable), plastic (slow to decompose), heavy metals (toxic) or

other substances. This indicator measures the ultimate waste from hotel life cycles. In other words, it factors in recycled waste, incinerated waste and wasted routed to landfills.

4. **Climate change due to GHG emissions:** Calculating climate change, is yet an unknown formula by human activities, which releases enormous amount of carbon into the atmosphere, which used to be stored in fossil fuels and forests. What we do know, on the other hand are the gases that source this phenomenon. They are usually bundled into a single yardstick: tonnes of co₂ equivalent, the unit we are using here.

5. **Water pollution (eutrophication):** Excessive nutrient input in water environment provocative algae growth reduces oxygen from the water, in process of Eutrophication. Nitrogen and Phosphates from farms and factories account for the bulk of this phenomenon. Like climate change, the yardstick to measure eutrophication is an equivalent. Measured in tonnes of po₄³⁻ equivalent ions.

operations apply to the entire building site and includes all emissions outlined below:

- Direct (Scope 1) emissions from the combustion of fossil fuels
- Direct (Scope 1) fugitive emissions from the leakage of refrigerants from base building HVAC systems with a capacity of 19 kW (5.4 tons) or greater
- Indirect (Scope 2) emissions from purchased electricity, heating, or cooling
- Embodied carbon (Scope 3) emissions that are associated with new structural envelope, building materials and activities.

Parameter	STUDY DIRECTIVE FOR RESULT
Direct (Scope 1) emissions from the combustion of fossil fuels	GHG protocol for calculation carbon emission HCM Carbon calculation tool
Direct (Scope 1) fugitive emissions from the leakage of refrigerants from base building HVAC systems with a capacity of 19 kW (5.4 tons) or greater	HVAC system in the hotel building, refrigerants resulting to carbon emission. GHG protocol excel sheet for carbon calculation
Indirect (Scope 2) emissions from purchased electricity, heating, or cooling	energy calculations from design builder model Purchased electricity bills
Embodied carbon (Scope 3) emissions that are associated with new structural envelope, building materials and activities.	Design builder model generated to extract building structural envelope and material carbon emission, and give comparative material to reduce carbon emission for same component.

Tab 1 -emissions according to GHG PROTOCOL and its study methodology

	Energy Resource consumption	Water consumption	Waste production	Climate change due to GHG emissions	Water pollution (eutrophication)
Food & Beverage	Source 1, Source 2 (direct emission)	Fresh water	Dry waste and wet waste	Electricity Emissions due to direct (source1&2), food travel emission (source	Used water for gardening and flushing
Cooling equipment	Source1 and 2 Fossil fuels used	Fresh water	Dry waste if equipment not in use	Emissions due to?? (source 1&2) and indirect	Used water to be reused for cooling equipment
Cleaning products	Source 1 and 2 and indirect sources	Fresh water	Dry and wet waste	Emissions due to direct (source1&2)	Used water for ground water recharge.
Energy	Source 1&2 and indirect sources	Fresh water	Dry and wet waste generated	Emissions due to (source 1&2) and indirect	Used water for ground water recharge or reuse
Employees travel	Indirect scope 3 emissions	If organization owned - then used to sanitize vehicle	Automobile spare parts not in use solid waste generated	Source 3 emission indirect means	Groundwater recharge
Room equipment	Source 3 emissions	-	Dry waste or recycled waste generated	Source 3 emissions	-
Water	Electrical energy, from grid or green for storage and usage	Fresh water	Wet waste can be recycled	Water co2 emissions depending on use	Used water for ground water recharge or reuse
Laundry	Electrical energy, from grid or green for storage and usage. Coal used as a medium	Water used to wash laundry	Dry and wet waste generated	Source 3 emissions	Used water for ground water recharge or reuse

Tab -2: shows result analysis of activities and resource consumption.

4. CONCLUSIONS

As a part of the Environment Management Program, a thorough “environmental review” of the business is a necessary first step. Post the review, the main environmental impacts should be outlined and addressed by the hotel, based on the assessment method of input and output thereby reducing their impacts.

Aspects that need consideration include:

- Total energy consumption (including sourcing and use)
- Water consumption, quality and wastewater treatment
- Waste management (including opportunities for avoidance, re-use, recycling and disposal)
- Air - including indoor air quality, air emissions, noise)
- Food safety reviews
- Purchasing and Supply chains
- Usage, storage and disposal of hazardous materials and chemicals
- Refurbishment activities and care of the open landscape area
- Compliance with environmental regulations (local, regional, national or international)
- The impact of the hotel on the local community, wildlife habitats and the landscape.

Opportunities to reduce the carbon footprint of operations of hospitality sector can be as following:

1. Compost food waste: Globally, food waste makes up just over a third of all waste that's thrown into landfills. Composting the waste food will give organic fertilizer to the landscape and reduce carbon footprint to a major extent.
2. Adopt efficient technologies: Electricity used on site can be used from a renewable source either generated on site or purchased. The electrical appliances used in the building should be star rated and mostly green label products.
3. Reduce water waste: Star labelled or water saving technologies like water saving efficient washing machines can save up to 80% of water handling. Lowering the energy required for transport and electricity required for heating water reduces the carbon footprint.
4. Recycle and Reuse as much as possible: it reduces the waste generated as well as the cost in totality.
5. Buy from local: Product miles as a major hidden aspect, which contributes to carbon footprint, local buying can reduce in fuel used in transport as well as

The International Tourism Partnership (ITP) a global organization, collectively adheres to all the hotelier members to embrace the Paris Agreement.

ACKNOWLEDGEMENT

I would like to express my sincere thanks to Ar. Sunil Patil Head of Architecture Department for extending valuable source of information during the course of these studies. I offer profound thanks towards Honorable Principal Dr. S. D. Deshmukh, and Vice Principal Dr. H.H. Shinde M. G. M's Jawaharlal Nehru Engineering College, Aurangabad for providing me all the excellent academic facilities required to complete this work. Last but not least, I am thankful to all Staff of Architecture Department, all my friends, family members for time to time support, encouragement, help and motivation.

REFERENCES

1. Tze .K N, Raymond M. H. Y, Tony N.T. L, Vincent C :Design and commission a zero-carbon building for hot and humid climate, International Journal of Low-carbon Technologies, DOI:10.1093/IJLCT/CTT067
2. E. Hertwich, G. Peters: Carbon footprint of nations: a global, trade-linked analysis, Environmental science & technology, Published 2009
3. Eunha .M, Amy Mc.C, Lan Li: Environmentally related research in scholarly hospitality journals: Current status and future opportunities, International Journal of Hospitality Management 31 (2012) 1264– 1275