

## **13. Green Construction: An Approach towards Environmental Sustainability**

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### ***Abstract:***

*India is a developing country with a massive scope in the construction sector as most of the population is still far away from the basic infrastructural facilities like healthcare, education, water supply, waste management, transportation facilities, etc. According to a Global Alliance for Buildings and Construction (Global ABC) report, the global construction industry accounted for 38% of total global energy-related CO<sub>2</sub> emissions in 2020. As a country with a population of more than 1.3 billion, and around 65% of the people residing in rural areas, most of the Green Construction is yet to come. A country with intellectual and widely available human capital has the collective responsibility of protecting biodiversity and the entire human race. Renewable energy sources can be a significant contributor to removing carbon footprint. 40% of the electricity generation in the country is still through thermal power, and Coal is also being used for energy generation while producing various construction materials. In the COP 26 UNFCCC meeting, PM Narendra Modi said, "Renewable energy capacity increased by 250% between 2014-2021." Since the upcoming commercial or residential projects will require tremendous energy, we cannot rely on non-renewable sources any further. The construction material industry, which has a predominant role in real estate and infrastructural facilities by being the manufacturer and supplier of the construction industry raw material, needs to revamp and rethink its approach for the complete elimination of embodied carbon. Embodied Carbon is the CO<sub>2</sub> generated during the manufacturing, transportation, and construction of green facilities.*

### ***Keywords:***

*Green Building, Carbon Footprint, UNFCCC COP, CO<sub>2</sub>, Embodied Carbon, Environmental Impact Assessment*

### **13.1 Introduction:**

According to a UN survey, it is estimated that by 2030, 40% of the country's population will stay in urban areas, meaning more and more infrastructural requirements. As a country with around 17.7% of the World's Population and an expectation of approximately 280 million people to be added to its urban population by 2040, tremendous scope lies in the construction industry. According to an International Finance Corporation (IFC) report, 70% of the buildings required by 2030 are yet to be constructed in India. The construction Industry also augments the demand for other support industries like the construction

material and equipment industry. With significant environmental issues like Global Warming, Climate Change, rise in sea levels, deforestation, etc., green construction or green building is the need of the hour, and of course, this can be possible only if the material used is eco-friendly. According to the World Green Building Council (WGBC), “A green building is a building that, in its design, construction, or operation, reduces or eliminates negative impacts, and can create positive effects, on our climate and natural environment. Green buildings preserve precious natural resources and improve the quality of life. Efficient use of water and energy, usage of eco-friendly construction materials, and enhancing the quality of life are some of the prominent features of green construction.

According to Indian Green Building Council (IGBC), currently, there are 7002 registered green building projects, and 7.97 billion square feet of green footprint has been created. The green construction or green building market in India is at a nascent stage, with only 5% classified as green. According to Gurmeet Singh Arora, Vice Chairman, IGBC, “What began as one green building project in the year 2001, the IGBC headquarters in Hyderabad, has become a national momentum which we have collectively generated over the past two decades and take the moment to the next higher level. The current pandemic has demonstrated the extraordinary ability of human beings to act as one when most needed. The green building fraternity too will come closer, and green movement shall emerge stronger from the experience.”

### **13.2 Why Green Construction?**

Industrial Revolution, which began somewhere around the mid-18<sup>th</sup> Century in the Western world, brought with itself not only the widest opportunities that humans could ever imagine but, at the same time, emerging challenges that painted a bleak picture. Mass urbanization required massive accommodation facilities. So, construction began at an unimaginable pace to support the workers working in the manufacturing units. Consumption of fossil fuel, especially Coal, grew by leaps and bounds as earlier it was required only in the manufacturing of goods and services, but now it began to be used as a heating resource for the construction industry material, and of course, its household demand rose predominantly for cooking and heating purpose in households. CO<sub>2</sub> is a major greenhouse gas that contributes immensely to global warming. The massive release of CO<sub>2</sub> and other hazardous gases like Sulphur-di-oxide (SO<sub>2</sub>), Methane (CH<sub>4</sub>), Nitrous Oxide, etc., in the atmosphere leads to menacing environmental problems like ozone layer depletion, global warming and climate change, realized a hundred years later.

Countries, through the initiative of the UN, started meeting and discussing climate issues. The main destructor was found to be the Carbon Footprints due to intense usage of the significant greenhouse gas CO<sub>2</sub> in both the manufacturing process of goods and services as well as the generation of electricity. The UNFCCC was formed in 1992 during the World Earth Summit to examine the global warming issue and how it could be tackled collectively. The body decides or works on its goals through Conference of Parties (COP) meetings held in various parts of the world. The 21<sup>st</sup> COP held in Paris, popularly known as Paris Summit, led to a new international climate agreement, applicable to all member countries, aiming to keep global temperatures this Century well below 2 degrees Celsius above the pre-industrial levels, a commendable initiative.

India is progressing towards fulfilling the goal through implementing various renewable energy projects in different parts of the country, but still, there is a long way to go. The SDGs, or the Sustainable Developmental Goals, are the 17 interlinked objectives formed by UN General Assembly in 2015, and the timeline set for their achievement is 2030. SDGs 7 and 13 focus on affordable and clean energy and climate action. At a recently held COP 26, PM Narendra Modi said. “India would achieve net zero emissions by 2070, and he also added that 50% of the country's electricity generation would be from renewable energy resources by 2030.”

### **13.3 Collective Responsibility with Necessary Initiatives:**

On 27<sup>th</sup> January 1994, the Union Ministry of Environment and Forests, under the (Environmental Protection Act, 1986) released an Environmental Impact Assessment Notification (EIA) making Environmental Clearance (EC) mandatory for setting up a new project listed in Schedule 1 of the notification. For projects mentioned in Schedule 2, the EC had to be decided based on the project's impact on the environment. In an amended legislation in 2006, the government divided the tasks into two categories. Category A includes the ones mentioned in Schedule 1 and requires national-level appraisal, whereas Category B was again divided into two parts B1 and B2. B1 required mandatory EC at the state level, whereas B2 does not require EC or EIA report. EIA for the EC clearance at the state level is done by the State Level Environmental Impact Assessment Authority (SEIAA) and State Level Expert Appraisal Committee (SEAC). In contrast, at the national level, it is done by the Impact Assessment Agency (IAA) and Expert Appraisal Committee (EAC).

The Indian Green Building Council (IGBC), a part of the Confederation of the Indian Industry (CII), was formed in the year 2001 with a solid vision to enable a sustainable built environment by 2025. IGBC offers a wide array of numerous services, which include developing green building rating programs, green building training programs, and certification services. Its members include distinguished personalities from various industries relating to the construction sector, like architects, manufacturers of raw materials and equipment, etc. IGBC's ratings have been categorized into four parts, viz., Certified, Silver, Gold, and Platinum. There are around 7000 projects that have been registered as green buildings, but still, there is a long way to go.

TERI (The Energy and Resource Institute) has developed an instrumental Green Rating for Integrated Habitat Assessment (GRIHA). The GRIHA rating has been made mandatory for the new buildings of the government departments, and further, the buildings will have to comply with at least a 3-star rating under the scheme. The LEED or Leadership in Energy Efficiency Design (LEED India), administered by GBCI, is a nationally and internationally accepted benchmark for designing, constructing, and operating high-performance green buildings. CII Godrej IGBC building in Hyderabad became India's first Platinum-rated building. The green roof covers 55% of the 20000 square feet structure of the building in addition to the biological water treatment panels and high-performance windows etc.; around 90% of the building does not require lighting during the daytime. Olympia Tech Park in Chennai is one of India's largest gold LEED-rated Green Buildings. Similarly, Patni(I-GATE) Knowledge Centre, Noida, has been awarded the LEED Platinum rating.

Its campus has the most efficient water management systems like rainwater harvesting and drip irrigation facilities. Many more projects are moving towards green, but the real challenge lies in making the already cleared structures green.

Renewable Energy Sources, along with clean technology, can be a significant contributor to removing the carbon footprint as 40% of the electricity production is still through thermal power, which uses a tremendous amount of Coal during the production process leading to emitting tonnes of CO<sub>2</sub> and other greenhouse gases in the atmosphere. In June 2021, PM Narendra Modi stated that the renewable energy capacity increased by 250% between 2014 and 2021. Some big corporates are actively participating in this novel cause of 50% electricity generation through renewable sources by 2030. Tata Power Solar Systems is a part of the Tata Group and the largest Solar power player in the country.

It has three separate business segments- manufacturing of solar cells, engineering, procurement, and construction. As of now, it has installed over 17 utility-scale solar energy projects across 13 states of India. The installed capacity is 1.5 Gigawatts (GW). When we talk about Suzlon, one of India's leading Wind energy companies. It designs, develops,

and manufactures Wind turbine Generators (WTGs). It has installed projects with a capacity of over 12.8 GW in India, which makes up 34% of the country's wind installations. Similarly, many more companies are helping the country achieve its targets proposed through Intended Nationally Determined Contributions (INDCs), a part of the Paris Summit and off-course Sustainable development Objectives to be completed by 2030.

### **13.4 Why Can Be the Solutions?**

The UN Forecasts that more than 50% of India's population will reside in cities by 2046, and since only 5% of the building have been classified green to date, tremendous opportunities lie ahead. According to a report by World Business Council, Cement manufacturing alone contributes to over 7% of global emissions. Since Cement's content is Limestone, which breaks into Calcium Oxide (CaO) and Carbon-Di-Oxide (CO<sub>2</sub>) when heated in the manufacturing process. CO<sub>2</sub> being a greenhouse gas contributes to Global Warming. Also, the kiln used for heating the material is powered by fossil fuels like Coal, which again leads to the release of CO<sub>2</sub> in the atmosphere. Concrete is a highly used construction material in the world only after the water has cement content, contributing to the greenhouse effect and, thereby, global warming. When we talk about brick, it has Clay, Concrete, and Sand as its main ingredients. The intense use of Clay leads to erosion of topsoil, whereas Concrete is a Carbon Contributor. Talking about the flooring options for a home, one has many choices. Wooden Floors, Carpeting, using Tiles, etc., can be some. Wooden floors and specially laminated flooring might include formaldehyde, a potentially dangerous household Volatile Organic Compound (VOC). Tiles can be the best option as most of them do not include any synthetic elements. Also, some of them require going through very low temperatures in the manufacturing process. Noting the alarming figure of cement production and alarming carbon emissions, the civil engineering faculty at Jamia Millia Islamia (JMI) and Aligarh Muslim University (AMU) have developed an eco-friendly version. This version consists of fly ash (remains of fossil fuel) and silica fumes. The same has also received patents from the Indian and Australian governments. Although many cement manufacturers are going for eco-friendly Cement with its main content as fly

ash in place of Limestone, the challenge also lies in the fuel used in heating the kilns. Although many substitutes like wood waste, agricultural waste, oil sludge, etc., can be used for the heating process, the chemical composition of the Cement can be impacted due to the compounds released while heating these alternative sources. Several companies, like ACC cement, Navaratan cement, etc., have started manufacturing eco-friendly Cement by using fly ash as one of this content apart from Gypsum. The issue will only be resolved when eco-friendly fuel is used during heating.

Fly ash Brick Technology eliminates energy usage during production, and the brick content does not contain Clay and Cement, thus preventing the erosion of topsoil and eliminating carbon emissions. So, this technology can be a game changer in the long run and can help towards net zero emissions by 2050. The construction material industry plays a predominant role in the construction industry. If raw materials like Cement, Concrete, bricks, steel, aluminum, etc., are manufactured using eco-friendly sources like renewable energy (Solar, Wind, and Hydro) and raw materials, then only in a complete sense can we commit to eliminating CO<sub>2</sub> emissions. If we are using alternative sources like various wastes, then also a lot of pollution is generated. So if we want to emerge as a nation of green environment, we need not only to focus on eliminating CO<sub>2</sub> but also other pollutants dangerous for the human race and biodiversity. Urbanization is a major concern leading to overpopulated cities, which is making it challenging for governments to provide infrastructural facilities to such a huge crowd. The focus should be on containing migration and adopting sustainable practices in both urban and rural areas. If a well-planned rural industrialization policy is made and implemented, keeping in mind the environmental, economic, and social aspects, then the management of both the towns and rural areas would be easier. At this moment, the major problem is the unequal density of the population in both cities and villages, leading to failed planning. Migration can be easily contained if job opportunities are generated in the rural areas and work on basic infrastructural facilities like health care, schools, water supply, houses, transport, etc., is carried out in a planned way, and for that, a prudent industrialization and development policy for the backward areas is indispensable.

### **13.5 Conclusion:**

According to Invest India (National Investment Promotion and Facilitation Agency), by 2025, the construction business market in India is expected to emerge as the third largest globally, and real estate contribution to the GDP will be more than 13%. The hour must make at least one of the ratings (LEED, IGBC Green Ratings, GRIHA) mandatory for all upcoming projects. Since they are voluntary, most new construction projects are neither energy, water, or raw material efficient. When discussing environmental clearance, only large-scale and critical projects must prepare an EIA report and get EC done. If all the upcoming new projects fall under the EC, then only in a true sense can we move towards net zero emissions. Also, a meticulous policy should be framed for projects which have already been established but need green criteria.

Other criteria can be established and made mandatory when discussing the already constructed projects. In this way, all the structures will be covered, and not only zero carbon emissions can be achieved, but even zero emissions can be attained.

As far as the awareness regarding the modern green technology to be used while the manufacturing process of raw material and during the time of construction, gaining knowledge about the cost savings methods and promotion techniques is concerned, effective training programs for all parties involved in the construction industry can be created and conducted. Undoubtedly, IGBC, the nodal agency for Green Construction in the country, is playing a predominant role in running training programs; the only thing required is expanding the scope of these programs. As far as creating awareness among customers is concerned, it must deeply analyze which factors influence their buying decision. It could include the price, awareness level, education qualification, etc. Proper research is required, and at the same time, it is needed to be evaluated what could be the roadmap for bridging the gap between customer awareness towards green buildings and, eventually, their conversion(sale) towards green buildings. With the collective role of the government, architects, builders, and customers, we can save our planet from all sorts of pollution, be it the water, air, soil, forest, etc. Renewable energy can be a single weapon, as almost every form of air or water pollution has resulted from non-renewable resources' contribution. Also, along with environmental sustainability other aspects of economic and social factors should be given equal importance as this will lead to a balanced development of the society.

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