

Assessment of the Green and Energy Saving Technology in Building Construction - A Review

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Abstract— Green building also known as green construction or sustainable building structure and therefore the application of processes that are environmentally responsible and resource-efficient throughout a building's life-cycle: from getting to design, construction, operation, maintenance, renovation, and demolition. The Green Building practice expands and complements the classical building design concerns of economy, utility, durability, and luxury. Construction industries have contribution to the worldwide warming because the activities of constructing buildings involve the usage of fossil fuels which cause the emission of greenhouse gases, especially the CO₂, lot of toxic gases which is harmful to humans and therefore the environment. The aim of this research is to use of energy-saving technologies in green buildings should run through the whole process of building design, construction and use, enabling green energy-saving technologies to maximize their effectiveness in construction. Besides, a construction corporation which has satisfactory sustainable solutions on the bottom have minimized energy consumption and operational costs which may be hamper to about 30%. A survey, administered by the Building Engineering Service Association (BESA, 2016) stated that almost 70% of office workers supposed poor air quality in their place of labor was having an adverse effect on their daily output and well-being. Absolutely, the green solution applied in construction projects would help to make sure a healthier working environment.

Keywords: Green Building, Green Technology, Greenhouse Gases, Energy, Cost, Sustainable Materials

I. INTRODUCTION

Green Building, also referred to as Sustainable Building, is that the practice of making structures and using processes that are environmentally responsible and resource efficient. It encompasses factors like site selection, design, construction, operation, maintenance, renovation, and deconstruction. Additionally, integrating green building materials into building projects can help reduce the environmental impacts associated with the extraction, transport, processing, fabrication, installation, reuse, recycling, and disposal of that building industry source. Green Building refers to a structure and employing a process that's environmentally responsible and resource efficient throughout a building's lifecycle. This quality-based philosophy is known as Total Quality Management (TQM). TQM was initially adopted in the manufacturing industry, and at the time, it was trying to get accepted into other jobs.

In the field of construction, unique to each project, diversity of staff, multiple stakeholders, and the effects of various factors such as weather conditions and formal rules

on projects make the use of TQM extremely difficult. Ac refers to a structure and employing a process that's environment throughout a building's lifecycle. Since buildings consume nearly 50% of World's Total Energy, Green Buildings, on the other hand, consume minimum amount of energy with the use of energy efficient materials. In India, there are predominantly three rating systems- Leadership in Energy and Environmental Design (LEED), the rating systems from Indian Green Building Council (IGBC) and therefore the Green Rating for Integrated Habitat Assessment (GRIHA).

Green Building as comparison to typical building seems same externally and in building use but differs within the operational savings and concerns for human comfort and indoor environment. Green Buildings enjoy the advantages of saving 40-50% energy by reducing CO₂ emissions into the atmosphere. It also saves about 20-30% water by using rain harvesting or grey water reuse techniques. But on the opposite hand, green buildings face many barriers just like the high initial investment required for construction, split incentives, whereby, the advantages of investing during a green building project is enjoyed by the people that actually use the building and not by the person investing on its construction cost. Since green buildings save approximately 50% of the energy, therefore the annual power consumption is additionally reduced significantly thus saving the electricity bill. Green buildings also are cost effective in terms of CER (Certified Emission Reduction) issued by the chief board of the CDM (Clean Development Mechanism) of United Nations framework convention on global climate change against 1 ton each of the CO₂ emissions saved. Sale of every CER would help earn a corporation 12 Euros each.

II. LITERATURE REVIEW

D. K. Swarnkar and S. Singh (2015): The most idea behind the study is to form the green concept assessable to the commoner in order that they will appreciate its importance. Construction industries have contribution to the worldwide warming because the activities of constructing buildings involve the usage of fossil fuels which emit tons of toxic gases and harmful to humans and therefore the environment. Furthermore, the buildings and projects constructed also contribute greatly to the worldwide warming because these buildings need power, and most of them are powered by conventional power plants which use also highly polluting fossil fuels like coal and oil. This mixture of environmental impact from the particular building construction itself and from the operation of those buildings after construction is one among many human activities that cause the emission of greenhouse gases, especially the carbon dioxide (CO₂). The aim of this research is to research the contractors'

understanding of green construction. The whole project revolves around the idea behind the subject which was to seek out the relevance of green concept and study the parameters and requirements of a green building. The thought is additionally to use these concepts within the design solution and obtain a first-hand experience in designing a green building and face the challenge [1].

Z. Tong (2017): Green building refers to the green concept of environmental protection applied to the planning, construction and use of the building, through the mixture with the particular situation within the construction of reasonable use of green technologies and equipment to realize green building energy conservation, and ultimately to realize people and Natural coordination and sustainable development. In the green building so as to realize sustainable development, the maximum amount as possible for building energy saving and environmental protection technology for architectural design, construction and use of demand, reduce energy consumption, reduce people's natural disturbance, the ultimate construction suitable for people living within the building. Here is mainly stressed that there is need to reduce a variety of waste of resources. To protect the environment, where the main emphasis is to reduce environmental pollution and reduce the amount of carbon dioxide emissions. Green building from the planning, construction, use, maintenance to the demolition of every link features a sort of energy saving and environmental requirements. The use of energy-saving technologies in green buildings should run through the whole process of building design, construction and use, enabling green energy-saving technologies to maximize their effectiveness in construction. Realize the sustainable development of green building, reduce energy consumption, and reduce people's interference with the natural environment, suitable for people living in green building [2].

D. K. Swarnkar and S. Singh (2016): Green Building is different from the opposite buildings because it use a minimum amount of nonrenewable energy, produce minimal pollution, increases the comfort, health and safety of the people who work in them. It also minimizes the waste in construction by recovering materials and reusing or recycling them. The design, maintenance and construction of buildings have tremendous effect on our environment and natural resources. Green building, which is additionally referred to as a sustainable building is meant to satisfy some objectives like occupant health; using energy, water, and other resources more efficiently; and reducing the overall impact to the environment. Since buildings consume nearly 50% of World's Total Energy, Green Buildings, on the opposite hand, consume minimum amount of energy with the utilization of energy efficient materials. It is a chance to use the resources efficiently while creating healthier buildings that improve human health, build a far better environment, and supply cost savings. All the event projects cause over-consumption of natural resources. The government should support the green construction in each a part of the country, and put the principles or policy which will be understood easier. To promote the green construction within the firms that apply the green

construction should tend the incentives with various kinds to continue their green development [3].

A. Aboginije, Z. Mustapha C. Aigbavboa and D. Aghimien (2019): Green technology in construction is an efficient way of using resources which will provide energy efficiency, waste reduction, and sustainable systemic evolution. Green technology has become an integral part of sustainable construction projects when observing the vast impact made on the built environment. Its values are influential and all-inclusive, contributing noteworthy gains when utilized in innovative facilities also as current structures. The purpose of this paper is to point the worth of shift from conventional technology to green technology towards achieving sustainable modern construction projects, identify values and challenges of green technology adoption in construction. This paper utilizes a well-organized review of various literatures to expose the drifts of green technology applications from first solving conceptual sustainable design problems such as diminishing returns, unstable investment, waste prevention, etc. using sustainable design principle with a well-grounded understanding of the technology life cycle. From every indication, the standpoint of this paper show that solving sustainable designs problems is very pivotal in construction and the possibility of improved energy efficiency through elimination of unnecessary energy use and saving as much as 30% of costs on energy is made possible through the implementation of green technology in construction. In the wake of the 21st century, most attention is drawn towards sustainable development, and for any built environment in any country to realize its sustainable goals, it is approved that adoption of green technology in their construction projects is vital. In construction, the use of energy-efficient industrial materials which are products with less energy demand can help to reduce the greenhouse effect by decreasing greenhouse gas emissions. Such are of high necessity in construction projects and can only prioritize to achieve sustainable construction. According to the United State National Construction report, 2016 energy efficient materials is vital not only to the handler but the environment because non-renewable energy sources are not only costly but contaminate the environment. It is discovered that material that can be reused and recycled is best used in construction. Therefore, materials, methods, and system should be designed to ensure market values for secondary materials from construction waste [4].

A. Sinha, R. Gupta, and A. Kutnar (2013): The concept of green buildings is the measure of our efforts in attaining that idealistic sustainable construction practices. According to Environmental Protection Agency (EPA) within the US, Green Building is that the "practice of making structures and using processes that are environmentally responsible and resource-efficient throughout a building life-cycle from siting to style, construction, operation, maintenance, renovation, and deconstruction." This definition has evolved over the years. "Green Buildings" is an ever evolving, dynamic term. Green Building is the status of our efforts in attaining sustainability in construction practices. As technology evolves and new materials are developed, the status of our efforts are also changing. Hence, the essence of green buildings is changing.

The aim of this paper is to discuss sustainability with respect to green buildings, its importance in one of the world's leading Green Building program - LEED certification from the perspective of sustainable material selection, and governing policies in LEED. Furthermore, the role of Life Cycle Assessment (LCA) in assessing the sustainability claims of green buildings and building materials is introduced. Moreover, the potential for including LCA within the scheme of Green Building scoring system is critically evaluated. LCA is a rational, quantified approach to determining specific environmental impacts of a product or system through its entire life cycle. As solutions are sought to scale back the impacts of buildings, LCA is seen as an objective measure for comparing building designs. LCA clearly has an important role to play in assessing the sustainability of green buildings and it is a valuable tool in decision-making. Therefore, research, development and innovation associated with green buildings should specialize in LCA analysis altogether product stages, from primary processing and use to disposal, and integrate knowledge and experience from various disciplines, engaging scientists from areas like engineering, material science, forestry, ecology, architecture, marketing, and business. The activities should be oriented towards new product development from renewable materials, and utilization of the whole wood value chain, engineering solutions, and cradle to cradle concept [5].

F. Shadram (2018): Green Building Technology deal with the earlier point of design phase, where there is a need to identify optimal materials and components to minimize the building's LCE (Life Cycle Energy) use. Once these optimal materials and components have been identified, the LCE assessment method developed and could be used to identify suitable suppliers (i.e. those manufacturing the optimal material or component) to reduce the building's LCE use. Consequently, Green Technology also relevant to the detailed design phase. It also extends the methods developed to explore the relationship between the building's LCE use and various EEMs including building shape, orientation, and WWR, as well as the choice of materials used in the building envelope. The study addresses optimization and comparison of LCE use with respect to EEMs that are implemented during both the early and the detailed design phases. As such, the scope green technology includes the entire design process. The analysis also indicated that EEMs that can be implemented and modified during the early design phase can reduce a building's LCE significantly more than those implemented during the later or detailed design phase [6].

Xiaosen Huo, Ann T. W. Yu (2018): Green building is an effective way of building a sustainable built environment, and this concept has attracted increasing attention worldwide. Green building design and construction is based on adherence to the principle of sustainable development. Notably, the term "green building" seems to be regarded as interchangeable with "sustainable building" or "high performance building". The aim of green building is to incorporate energy-saving features, water conservation, wastes minimization, pollution prevention, resource efficiency, and enhance indoor environmental quality throughout the building's whole life cycle. The principles

and methods underlying green building apply at all stages of the building's life, including the siting, design, construction, operation, maintenance, renovation, and deconstruction. The analyzed research topics were found to group into five themes: green building management generally, the advantages and barriers to green building development, green building performance, stakeholder behavior with reference to green buildings, and green building strategies. According to Wu and Issa (2014) and Inyim et al. (2015), methods for the integration of information technology, such as Building Information Modeling and economic and environmental impact analysis, can help decision-making in design and at the construction stage [7].

Mohammed Noori Hussein Allhashimi (2018): Green buildings and eco-friendly buildings are more economical than the traditional lines that arise from the use of traditional materials. The conservation process is the result of recycling and use of waste for construction purposes. Due to the evolution of life in the last century and the continuing development to the present time, in addition to the increase in the presence of factories and laboratories and modern means of transport and increase the requirements of living such as housing and work and the resources of consumption of food, water and energy. All these things led to a large pollution in the environment in which we live. And the increase in the consumption of fuel and energy will lead to an increase in the proportion of harmful substances that will be put in the environment as a result of the consumables we use in our daily lives. Hence, there is an urgent need to preserve the environment and to detoxify harmful substances and human waste. Green technology is an environmentally friendly technology that prevents pollution that harms human health and living organisms. This technology provides energy sources and alternative resources to sources and resources that cause damage to the environment. The world has large natural resources that can be used to produce green technology. Some of these resources have been fully depleted and others are still available. The term green technology refers to the use of healthy resources and clean energy sources that do not contain harmful residues when used. One of the areas in which green technology is involved is the engineering fields, especially structural engineering, so that waste recycling and its use for construction purposes can be achieved in addition to building environmentally friendly facilities. This paper presents a review of the use of green technology in the fields of civil engineering [8].

III. METHODOLOGY OF WORK

This paper utilizes an organized review of various literatures which sources are from renowned conference papers, journal articles and government reports to expose the drifts of green technology applications from first solving conceptual sustainable design problems like diminishing returns, unstable investment, waste prevention, etc. using sustainable design principle with a well-grounded understanding of the technology life cycle. The next step is to identify the need for study or feasibility of the literature gap. Collection of information needed for the complete green and energy saving technology of construction

projects. This data collection is based on a questionnaire and in-depth interviews with various industry professionals. Analysis work must be done. It means that the analysis of the data collected above is made up of details of derived from the above work is analyzed with the help of interpretation and definition of reliability.

IV. CONCLUSION

From the above review it is concluded that there is great potential for green building in the construction industry. Green building may be a new architectural concept, also because the development direction of recent housing industry, it will be the sunrise technology concept of housing industry in recent years. From every indication, the standpoint of this paper shows the likelihood of improved energy efficiency through elimination of unnecessary energy use and saving the maximum amount as 30% of costs on energy which makes green technology of utmost importance. Current building codes encourage the application of EEMs to reduce buildings' operational energy use but neglect the impact of embodied energy. Policy makers and governmental bodies should therefore update regulations and building codes to reflect the impact of embodied energy on the LCE use of new and retrofitting building projects. Improved regulations on embodied energy will encourage contractors to select materials with better embodied energy performance and provide incentives to reuse, repair, and remanufacture materials and components in new and retrofitting building projects. From the results and analysis, it observed that in India, as far as present situation is concerned the transition from regular marketing to green brand is difficult. There is a hesitant fraction of investors, owners, architects and clients in the construction industry in India, who are not willing to invest in or build green homes due to the common acceptance of the belief that green buildings cost more. However, we cannot ignore the savings through green building features as costs in green buildings are associated with energy efficiency for a greener future tomorrow. So, it is necessary to educate people about its immense benefits toward a greener future which has long term effect on both economic and environment performance. The results obtained also indicated that EEMs that can be implemented and modified during the early design phase can reduce a building's LCE (Life Cycle Energy) significantly more than those implemented during the later or detailed design phase.

ACKNOWLEDGMENT

Success is the manifestation of diligence, inspiration, motivation and innovation. I attribute my success in this venture to my guide, Department of Civil Engineering, G.H. Raisoni University, Amravati who showed the guiding light at every stage. I am indebted to him for sharing expertise, sincere and valuable guidance and encouragement extended to me. I am also thankful to all my friends who help me directly or indirectly to accomplish the work.

REFERENCES

- [1] D. K. Swarnkar & S. Singh, "Analysis of Green Technology Application in Construction," *International Journal of Engineering Research & Management Technology*, Vol. 2, Issue-6, pg. 147-150, November-2015.
- [2] Z. Tong, "Review of the Application of Green Building and Energy Saving Technology," *International Global on Renewable Energy and Development (IGRED 2017) IOP Conference Series: Earth and Environmental Science*, pg. 1-4, 2017.
- [3] D. K. Swarnkar & S. Singh, "Investigating The Green Technology Function in Construction Perspective," *International Journal of Engineering Research & Management Technology*, Vol. 3, Issue-1, pg. 144-148, January-2016.
- [4] Aboginije, Z. Mustapha C. Aigbavboa & D. Aghimien, "The Application of Green Technology in the Modern Day Construction Projects-A Review," <https://www.researchgate.net/publication/334884433>, pp 1-10, August-2019.
- [5] Sinha, R. Gupta, & A. Kutnar, "Sustainable Development and Green Buildings", *DRVNA INDUSTRIJA*, Vol. 64 Issue-1, pp. 45-53, 2013.
- [6] F. Shadram, "Assessment and Optimization of Life Cycle Energy used in Building" *Luleå University of Technology, Graphic Production*, pg 1-69, 2018.
- [7] Xiaosen Huo, Ann T. W. Yu, "Analytical Review of Green Building Development Studies", *Journal of Green Building*, Vol. 12, Issue-2, pp 130-148, 2018.
- [8] Mohammed Noori Hussein Allhashimi, "A Review of Using Green Technology in Civil Engineering," *International Journal of Science and Engineering Applications*, Vol. 7, Issue-9, pp 284-286, 2018, ISSN:- 2319-7560.