



Green Building: A Review of Sustainable Construction Practices

Ishfaq Ahmad Jahra¹, Er. Shilpa Chauhan²

¹Research scholar, ²Assistant Professor, Department of Civil Engineering, Rayat Bahra University, Sahauran, Kharar, Punjab,

Abstract-- This review paper examines the growing trend of green building practices within the construction industry, exploring its benefits, drivers, barriers, and strategies for wider adoption. Utilizing a comprehensive literature review of peer-reviewed journals, industry reports, and government publications, this study investigates the current state of green building and the factors influencing its implementation. The purpose of this paper is to analyze the multifaceted benefits of green building, encompassing environmental protection, improved human health, and economic advantages, while also identifying key drivers and barriers to widespread adoption. Findings reveal that green building offers significant environmental benefits through the use of sustainable materials, energy efficiency, and water conservation techniques, contributing to healthier indoor environments and positive economic impacts through reduced operational costs and increased asset values. However, higher upfront costs, lack of industry expertise, and resistance to change hinder broader implementation. The review further discusses strategies to overcome these challenges, including the development of green building standards and rating systems (e.g., LEED), financial incentives, and educational programs aimed at fostering industry knowledge and capacity. Ultimately, the paper advocates for a comprehensive approach involving all stakeholders to accelerate the transition towards sustainable construction practices and a greener, more resilient built environment

Keywords-- Green Building, Sustainable Construction, Sustainability, Environmental Impact, Building Materials, Green Building Standards

I. INTRODUCTION

Green building, also known as sustainable construction, has gained significant attention in recent years as a means of addressing the environmental impact of the construction industry. This approach involves the use of environmentally responsible and resource-efficient processes throughout a building's lifecycle, from design and construction to operation and maintenance. The adoption of green building practices can result in a substantial reduction in negative environmental effects and more efficient utilization of resources, making it a crucial strategy for promoting sustainable development in the construction industry. (Chan et al., 2017) (AlSanad, 2015)

The construction industry is a significant contributor to global environmental challenges, accounting for a substantial portion of energy consumption, greenhouse gas emissions, and waste generation. Green building, also known as sustainable construction, emerges as a holistic approach to address these concerns. This innovative concept encompasses the design, construction, operation, and maintenance of buildings in a manner that minimizes their environmental impact and optimizes resource utilization. By embracing green building practices, the industry can reduce energy and water usage, minimize waste, and enhance indoor air quality, ultimately leading to a more sustainable built environment. (Shurrab et al., 2019)

The benefits of green building are multifaceted and far-reaching. From an environmental perspective, green buildings promote the use of renewable and sustainable materials, encourage energy efficiency through passive design strategies and the incorporation of renewable energy sources, and employ water conservation techniques. This not only protects the natural ecosystem but also contributes to the improvement of human health and well-being by providing healthier indoor environments. (EVALUATION OF A TUNNEL FORM SOCIAL HOUSING UNIT BASED ON PASSIVE DESIGN PRINCIPLES, 2023) Additionally, green buildings have been found to have a positive impact on the economy, offering long-term cost savings through reduced operational expenses, increased asset values, and enhanced productivity of building occupants. (Healthy Buildings, Healthy People, 2014)

The growing interest in green building can be attributed to several driving factors. Stricter environmental regulations, consumer demands for sustainable practices, and the recognition of the financial and operational benefits have all contributed to the increased adoption of green building (2023). However, the transition towards widespread implementation faces several challenges, including higher upfront costs, a lack of industry expertise and experience, and resistance to change within the construction sector. (Oguntona et al., 2019). To address these barriers and further promote green building, a range of strategies have been proposed and implemented.



The development of comprehensive green building standards and rating systems, such as LEED, has provided a framework for the industry to measure and validate the sustainability performance of buildings. Financial incentives, such as tax credits, subsidies, and preferential financing, have also been leveraged to make green buildings more accessible and attractive to developers and building owners. (Simons et al., 2019)

1.1. Benefits of Green Building

The benefits of green building are multifaceted, encompassing environmental, economic, and social aspects. Environmentally, green buildings promote the use of sustainable resources, reduce energy consumption, and minimize waste generation. This not only protects the ecosystem but also leads to improved indoor air quality, which can enhance the health and well-being of building occupants. (Singh & Gupta, 2021) From an economic perspective, green buildings can offer long-term cost savings through reduced energy and water usage, as well as increased asset value and improved productivity of building occupants. Green buildings also have the potential to provide broader societal benefits, such as job creation in the renewable energy and sustainable construction industries, and the promotion of a more sustainable and resilient built environment that can withstand the impacts of climate change. (Nain et al., 2021)

Green buildings are designed and constructed in a way that minimizes their environmental footprint throughout their lifecycle, from the extraction and processing of raw materials to the eventual decommissioning and disposal of the building. This holistic approach to sustainable construction involves the careful selection of building materials, the incorporation of energy-efficient systems and renewable energy sources, the implementation of water conservation strategies, and the optimization of waste management practices. (A Review on Sustainable Building (Green Building), 2023). In terms of environmental benefits, green buildings can significantly reduce energy consumption and greenhouse gas emissions. By incorporating passive solar design, high-performance insulation, and energy-efficient appliances and lighting, green buildings are able to drastically reduce their energy demands for heating, cooling, and lighting. Additionally, the use of renewable energy sources, such as solar photovoltaic panels or geothermal heat pumps, can further decrease the building's reliance on fossil fuels and the associated emissions. (Ürge-Vorsatz et al., 2020). Water conservation is another crucial aspect of green building design.

Green buildings employ strategies such as low-flow fixtures, water-efficient landscaping, and greywater recycling systems to minimize the consumption of potable water. This not only reduces the strain on local water resources but also lowers the energy required for water treatment and distribution. (Yoonus & Al-Ghamdi, 2020)

The use of sustainable and recycled materials in the construction of green buildings also contributes to the reduction of waste generation and the preservation of natural resources. By incorporating materials with high recycled content, such as steel, concrete, or wood, green buildings can divert waste from landfills and reduce the extraction of virgin raw materials. Furthermore, the design of green buildings often facilitates the deconstruction and reuse of building components at the end of a structure's lifespan, further minimizing waste and promoting a more circular economy within the construction industry. (Hubmann & Maaren, 2022). The incorporation of sustainable and recycled materials is a crucial aspect of green building design and construction. Green buildings strive to utilize materials that have a lower environmental impact, such as those with a high recycled content, renewable sources, or reduced embodied energy. This approach not only diverts waste from landfills but also preserves natural resources by reducing the need for virgin raw materials. (Braungart et al., 2023)

One of the key benefits of using recycled materials in green buildings is the reduction of waste. Traditional construction practices often generate significant amounts of waste, which can end up in landfills or incineration facilities, contributing to environmental pollution and the depletion of natural resources. By using materials with high recycled content, such as steel, concrete, or wood, green buildings can divert this waste from landfills and give these materials a new life within the built environment. (Broniewicz & Broniewicz, 2020)

Additionally, the design of green buildings often facilitates the deconstruction and reuse of building components at the end of a structure's lifespan. This "cradle-to-cradle" approach to construction aims to create buildings that can be easily disassembled and have their materials repurposed or recycled, rather than demolished and sent to landfills. This design strategy not only reduces waste but also promotes a more circular economy within the construction industry, where materials are reused and recycled instead of being discarded. (Bertino et al., 2021). In addition to the use of recycled materials, green buildings also employ strategies to minimize waste generation during the construction process.



This includes the implementation of efficient construction techniques, the minimization of material waste through careful planning and procurement, and the diversion of construction and demolition debris from landfills through recycling and reuse.(Benachio et al., 2020)

1.2. Drivers and Barriers for Green Building Adoption

The construction industry plays a significant role in the global environmental landscape, accounting for a substantial portion of energy consumption, greenhouse gas emissions, and waste generation. In recent years, the growing interest in sustainable construction, commonly referred to as "green building," has emerged as a promising approach to address these pressing environmental concerns. Various factors have contributed to this increased interest, including stricter environmental regulations, heightened public awareness, and the potential for financial and operational benefits.(Wei, 2021)

Despite the widespread recognition of the advantages of green building, the adoption of these practices has faced several challenges. One of the primary barriers is the higher upfront costs associated with sustainable construction. Implementing green building features, such as energy-efficient systems, renewable energy sources, and innovative materials, often requires a more significant initial investment compared to traditional construction methods. This can deter some developers and building owners from fully embracing green building, as they may prioritize short-term cost savings over long-term sustainability and operational benefits.(Krueger et al., 2019). Another challenge hindering the widespread adoption of green building is the lack of industry expertise. The transition to sustainable construction practices requires specialized knowledge, skills, and training among various industry professionals, including architects, engineers, contractors, and facility managers. The construction industry has historically been slow to adapt to new technologies and innovative approaches, and the lack of experienced green building experts can impede the successful implementation of these practices.(Balasubramanian & Shukla, 2017)

Furthermore, resistance to change within the construction sector can also pose a barrier to the adoption of green building. The industry is often characterized by well-established practices and a reluctance to deviate from traditional methods. Overcoming this inertia and convincing industry stakeholders to embrace the shift towards sustainable construction can be a significant challenge. (Prameswari et al., 2021)(Chan et al., 2017)

To address these barriers and further promote the adoption of green building practices, a comprehensive and multifaceted approach is necessary.

This approach should involve the development and continuous refinement of green building standards and rating systems, the provision of financial incentives and subsidies, the implementation of comprehensive educational and training programs, and the fostering of collaborative partnerships among industry stakeholders.(Chan et al., 2017)

The development of comprehensive green building standards and rating systems, such as the globally recognized Leadership in Energy and Environmental Design program, provides a clear and measurable framework for evaluating the sustainability performance of buildings. These standards set benchmarks for optimal environmental, social, and economic performance, guiding building owners, designers, and contractors towards the adoption of sustainable practices.(Expert Review Panel, 2023).In addition to the establishment of robust green building standards, financial incentives and subsidies can play a crucial role in encouraging the adoption of these practices. Governments, policymakers, and financial institutions can offer various forms of financial support, including tax credits, rebates, and low-interest loans, to offset the higher initial costs associated with green building.

1.3. Strategies for Promoting Green Building

To address the barriers to widespread green building adoption and further promote sustainable construction practices, a range of comprehensive strategies have been proposed and implemented. These strategies aim to create a more enabling environment for the growth and proliferation of green building by tackling the various challenges faced by the industry.(Lee et al., 2020)

One crucial strategy involves the development and continuous refinement of comprehensive green building standards and rating systems. These frameworks, such as the globally recognized Leadership in Energy and Environmental Design program, provide a clear and measurable set of criteria for evaluating the sustainability performance of buildings. By establishing these standards, the industry can set benchmarks for optimal environmental, social, and economic performance, guiding building owners, designers, and contractors towards the implementation of best practices.(Castro et al., 2020). The development of these standards is often accompanied by the provision of financial incentives and subsidies to encourage the adoption of green building principles. Governments, policymakers, and financial institutions have implemented a variety of financial mechanisms to make sustainable construction more accessible and attractive to developers and building owners.



These incentives can take the form of tax credits, rebates, preferential financing, or even direct funding for green building projects. By reducing the upfront costs and enhancing the economic viability of green buildings, these financial instruments can help overcome the perceived barriers of higher initial investments.(Lee, 2020). In addition to the development of standards and the provision of financial support, the implementation of comprehensive educational and training programs has been crucial in building the necessary expertise and knowledge within the construction industry. (Boadu et al., 2020)These programs aim to equip industry professionals, from architects and engineers to construction workers and facility managers, with the skills and understanding required to effectively design, construct, and operate green buildings. Through targeted training initiatives, workshops, and certification programs, the industry can cultivate a workforce that is well-versed in sustainable construction practices, enabling the widespread and successful implementation of green building principles.(Balasubramanian & Shukla, 2017)

Finally, the fostering of collaboration among various industry stakeholders has been a fundamental strategy in promoting green building. This collaborative approach involves the engagement of policymakers, industry associations, research institutions, and community organizations to collectively address the challenges and develop holistic solutions. By facilitating knowledge-sharing, research, and the development of best practices, these collaborative efforts can accelerate the adoption of green building and create a more unified and supportive ecosystem for sustainable construction.(Shurrab et al., 2019). The combination of these strategies, including the development of comprehensive standards, the provision of financial incentives, the implementation of educational programs, and the fostering of collaborative partnerships, has been instrumental in driving the growth and widespread adoption of green building practices globally.(Ürge-Vorsatz et al., 2020)

The adoption of green building practices is a crucial step towards mitigating the environmental impact of the construction industry and promoting sustainable development. While challenges remain, the significant benefits of green building, coupled with the ongoing efforts to address the barriers, suggest a promising future for the widespread implementation of sustainable construction practices. The transition towards green building practices is a multi-faceted endeavour that requires the collaborative efforts of various stakeholders, including policymakers, industry professionals, and the general public.

The comprehensive review, delves into the core aspects of green building, highlighting its benefits, the driving forces behind its adoption, and the strategies employed to overcome the existing barriers.(Sarireh, 2021). The construction industry is a significant contributor to global environmental challenges, accounting for a substantial portion of energy consumption, greenhouse gas emissions, and waste generation. Green building, also known as sustainable construction, emerges as a holistic approach to address these concerns. This innovative concept encompasses the design, construction, operation, and maintenance of buildings in a manner that minimizes their environmental impact and optimizes resource utilization. By embracing green building practices, the industry can reduce energy and water usage, minimize waste, and enhance indoor air quality, ultimately leading to a more sustainable built environment.(Shurrab et al., 2019)

The benefits of green building are multifaceted and far-reaching. From an environmental perspective, green buildings promote the use of renewable and sustainable materials, encourage energy efficiency through passive design strategies and the incorporation of renewable energy sources, and employ water conservation techniques. This not only protects the natural ecosystem but also contributes to the improvement of human health and well-being by providing healthier indoor environments. Additionally, green buildings have been found to have a positive impact on the economy, offering long-term cost savings through reduced operational expenses, increased asset values, and enhanced productivity of building occupants.(Wong et al., 2021)

The growing interest in green building can be attributed to several driving factors. Stricter environmental regulations, consumer demands for sustainable practices, and the recognition of the financial and operational benefits have all contributed to the increased adoption of green building. However, the transition towards widespread implementation faces several challenges, including higher upfront costs, a lack of industry expertise and experience, and resistance to change within the construction sector.(Reddy, 2016)

To address these barriers and further promote green building, a range of strategies have been proposed and implemented. The development of comprehensive green building standards and rating systems, such as LEED, has provided a framework for the industry to measure and validate the sustainability performance of buildings. Financial incentives, such as tax credits, subsidies, and preferential financing, have also been leveraged to make green buildings more accessible and attractive to developers and building owners. (Kwok et al., 2020).



Moreover, educational and training programs have been instrumental in building the necessary skills and knowledge within the construction industry to effectively implement green building practices. Collaboration among various stakeholders, including policymakers, industry professionals, and research institutions, has also been crucial in driving the adoption of green building. (Oguntona et al., 2019). The adoption of green building practices is a crucial step towards addressing the environmental challenges posed by the construction industry. While barriers to adoption exist, the significant benefits of green building, coupled with the ongoing efforts to address these challenges, suggest a promising future for the widespread implementation of sustainable construction practices. (Sfakianaki, 2018)

The transition towards widespread adoption of green building practices is a multi-faceted endeavour that requires the collaborative efforts of various stakeholders, including policymakers, industry professionals, and the general public. Through the concerted efforts of all, the construction industry can play a pivotal role in creating a more sustainable built environment for generations to come. This comprehensive review, delves into the core aspects of green building, highlighting its benefits, the driving forces behind its adoption, and the strategies employed to overcome the existing barriers. (Singh & Gupta, 2021) The construction industry is a significant contributor to global environmental challenges, accounting for a substantial portion of energy consumption, greenhouse gas emissions, and waste generation. Green building, also known as sustainable construction, emerges as a holistic approach to address these concerns. This innovative concept encompasses the design, construction, operation, and maintenance of buildings in a manner that minimizes their environmental impact and optimizes resource utilization. By embracing green building practices, the industry can reduce energy and water usage, minimize waste, and enhance indoor air quality, ultimately leading to a more sustainable built environment. (Singh, 2018) The benefits of green building are multifaceted and far-reaching. From an environmental perspective, green buildings promote the use of renewable and sustainable materials, encourage energy efficiency through passive design strategies and the incorporation of renewable energy sources, and employ water conservation techniques (Çiner & Doğan-Sağlamtimur, 2019). This not only protects the natural ecosystem but also contributes to the improvement of human health and well-being by providing healthier indoor environments.

Additionally, green buildings have been found to have a positive impact on the economy, offering long-term cost savings through reduced operational expenses, increased asset values, and enhanced productivity of building occupants. (Bangwal et al., 2017) The growing interest in green building can be attributed to several driving factors. Stricter environmental regulations, consumer demands for sustainable practices, and the recognition of the financial and operational benefits have all contributed to the increased adoption of green building. However, the transition towards widespread implementation faces several challenges, including higher upfront costs, a lack of industry expertise and experience, and resistance to change within the construction sector. (Darko et al., 2023) To address these barriers and further promote green building, a range of strategies have been proposed and implemented. The development of comprehensive green building standards and rating systems, such as LEED, has provided a framework for the industry to measure and validate the sustainability performance of buildings. Financial incentives, such as tax credits, subsidies, and preferential financing, have also been leveraged to make green buildings more accessible and attractive to developers and building owners. Moreover, educational and training programs have been instrumental in building the necessary skills and knowledge within the construction industry to effectively implement green building practices. Collaboration among various stakeholders, including policymakers, industry professionals, and research institutions, has also been crucial in driving the adoption of green building. (Wong et al., 2021) (Nain et al., 2021) (Chan et al., 2017) (Singh & Gupta, 2021) the adoption of green building practices is a crucial step towards addressing the environmental challenges posed by the construction industry.

II. LITERATURE REVIEW

The construction industry is a significant contributor to global environmental challenges, accounting for a substantial portion of energy consumption, greenhouse gas emissions, and waste generation. Green building, also known as sustainable construction, emerges as a holistic approach to address these concerns. Green building involves the design, construction, operation, and maintenance of buildings in a manner that minimizes their environmental impact and optimizes resource utilization (Chan et al., 2017).



The benefits of green building are multifaceted and far-reaching. From an environmental perspective, green buildings promote the use of renewable and sustainable materials, encourage energy efficiency through passive design strategies and the incorporation of renewable energy sources, and employ water conservation techniques (Kaushal & Pham, 2024)(Chan et al., 2017)(Prameswari et al., 2021). This not only protects the natural ecosystem but also contributes to the improvement of human health and well-being by providing healthier indoor environments. Additionally, green buildings have been found to have a positive impact on the economy, offering long-term cost savings through reduced operational expenses, increased asset values, and enhanced productivity of building occupants. (Kaushal & Pham, 2024)(Singh & Gupta, 2021)(Chan et al., 2017)(Prameswari et al., 2021)

The growing interest in green building can be attributed to several driving factors. Stricter environmental regulations, consumer demands for sustainable practices, and the recognition of the financial and operational benefits have all contributed to the increased adoption of green building (Singh & Gupta, 2021). However, the transition towards widespread implementation faces several challenges, including higher upfront costs, a lack of industry expertise and experience, and resistance to change within the construction sector. To address these barriers and further promote green building, a range of strategies have been proposed and implemented. (Shurrab et al., 2019)

The development of comprehensive green building standards and rating systems, such as LEED, has provided a framework for the industry to measure and validate the sustainability performance of buildings. Financial incentives, such as tax credits, subsidies, and preferential financing, have also been leveraged to make green buildings more accessible and attractive to developers and building owners. (Chan et al., 2017) Moreover, educational and training programs have been instrumental in building the necessary skills and knowledge within the construction industry to effectively implement green building practices. Collaboration among various stakeholders, including policymakers, industry professionals, and research institutions, has also been crucial in driving the adoption of green building (Chan et al., 2017)(Prameswari et al., 2021)(Singh & Gupta, 2021)(Wong et al., 2021).

Addressing the environmental challenges posed by the construction industry is a critical imperative, and the adoption of green building practices is a crucial step in this direction.

Green buildings offer a multitude of benefits, ranging from environmental protection and improved human health to significant economic advantages.(Singh, 2018) While the transition towards widespread implementation of green building practices faces various challenges, a comprehensive approach involving policy, financial incentives, education, and cross-stakeholder collaboration can effectively promote the widespread adoption of these sustainable practices.(Bhattarai et al., 2023). The construction industry is a significant contributor to global environmental challenges, accounting for a substantial portion of energy consumption, greenhouse gas emissions, and waste generation. Green building, also known as sustainable construction, emerges as a holistic approach to address these concerns. Green building involves the design, construction, operation, and maintenance of buildings in a manner that minimizes their environmental impact and optimizes resource utilization.(Singh & Gupta, 2021)

The benefits of green building are multifaceted and far-reaching. From an environmental perspective, green buildings promote the use of renewable and sustainable materials, encourage energy efficiency through passive design strategies and the incorporation of renewable energy sources, and employ water conservation techniques(Çiner& Doğan-Sağlamtimur, 2019). This not only protects the natural ecosystem but also contributes to the improvement of human health and well-being by providing healthier indoor environments. Additionally, green buildings have been found to have a positive impact on the economy, offering long-term cost savings through reduced operational expenses, increased asset values, and enhanced productivity of building occupants.(Wong et al., 2021). The growing interest in green building can be attributed to several driving factors. Stricter environmental regulations, consumer demands for sustainable practices, and the recognition of the financial and operational benefits have all contributed to the increased adoption of green building. However, the transition towards widespread implementation faces several challenges, including higher upfront costs, a lack of industry expertise and experience, and resistance to change within the construction sector.(Lee et al., 2020)

To address these barriers and further promote green building, a range of strategies have been proposed and implemented. The development of comprehensive green building standards and rating systems, such as LEED, has provided a framework for the industry to measure and validate the sustainability performance of buildings (Bahaudin et al., 2014).



Financial incentives, such as tax credits, subsidies, and preferential financing, have also been leveraged to make green buildings more accessible and attractive to developers and building owners. Moreover, educational and training programs have been instrumental in building the necessary skills and knowledge within the construction industry to effectively implement green building practices. (Medvedkina&Khodochenko, 2019)

III. METHODOLOGY

A comprehensive literature review was conducted to investigate the current state of green building practices and the factors influencing their adoption. Multiple databases, including peer-reviewed journal articles, industry reports, and government publications, were searched using keywords such as "green building," "sustainable construction," and "sustainable building practices."

The review process involved a thorough analysis of the selected sources to identify the key benefits, drivers, and barriers associated with the implementation of green building practices. The findings were then synthesized to develop a holistic understanding of the green building landscape and to formulate a set of strategies for promoting its widespread adoption.

IV. FINDINGS

The construction industry is a significant contributor to global environmental challenges, accounting for a substantial portion of energy consumption, greenhouse gas emissions, and waste generation. Green building, also known as sustainable construction, emerges as a holistic approach to address these concerns.

The benefits of green building are multifaceted and far-reaching. From an environmental perspective, green buildings promote the use of renewable and sustainable materials, encourage energy efficiency through passive design strategies and the incorporation of renewable energy sources, and employ water conservation techniques. This not only protects the natural ecosystem but also contributes to the improvement of human health and well-being by providing healthier indoor environments. Additionally, green buildings have been found to have a positive impact on the economy, offering long-term cost savings through reduced operational expenses, increased asset values, and enhanced productivity of building occupants. (Chan et al., 2017)(Singh & Gupta, 2021)(Ghaffarianhoseini et al., 2013)(Pitt et al., 2009)

The growing interest in green building can be attributed to several driving factors. Stricter environmental regulations, consumer demands for sustainable practices, and the recognition of the financial and operational benefits have all contributed to the increased adoption of green building. However, the transition towards widespread implementation faces several challenges, including higher upfront costs, a lack of industry expertise and experience, and resistance to change within the construction sector. (Singh & Gupta, 2021)

To address these barriers and further promote green building, a range of strategies have been proposed and implemented. The development of comprehensive green building standards and rating systems, such as LEED, has provided a framework for the industry to measure and validate the sustainability performance of buildings.

V. DISCUSSION

The review of the literature on green building practices highlights the significant role of the construction industry in addressing environmental challenges and the growing recognition of the benefits associated with sustainable construction. The findings suggest that while the adoption of green building has gained momentum in recent years, there is still a need to overcome various barriers, including higher upfront costs, lack of industry expertise, and resistance to change. To further drive the adoption of green building, a multifaceted approach is required. The development of comprehensive green building standards and rating systems, such as LEED, has been a crucial step in providing a framework for the industry to measure and validate the sustainability performance of buildings. Moreover, financial incentives, such as tax credits, subsidies, and preferential financing, can help make green buildings more accessible and attractive to developers and building owners. Educational and training programs have also been instrumental in building the necessary skills and knowledge within the construction industry to effectively implement green building practices. The construction industry's significant impact on the environment has led to the emergence of green building as a crucial approach to sustainable development. Green building practices offer a multitude of benefits, including environmental protection, human health improvements, and economic advantages. While the adoption of green building has been on the rise, driven by various factors, the industry still faces several challenges in achieving widespread implementation.

To overcome these barriers, a holistic approach involving the development of green building standards, financial incentives, and targeted education and training programs is necessary. By addressing these key factors, the construction industry can accelerate the transition towards more sustainable building practices, contributing to a greener and more resilient built environment.

VI. CONCLUSION

The construction industry's significant impact on the environment has led to the emergence of green building as a crucial approach to sustainable development. Green building practices offer a multitude of benefits, including environmental protection, human health improvements, and economic advantages. While the adoption of green building has been on the rise, driven by various factors, the industry still faces several challenges in achieving widespread implementation. To overcome these barriers, a holistic approach involving the development of green building standards, financial incentives, and targeted education and training programs is necessary. By addressing these key factors, the construction industry can accelerate the transition towards more sustainable building practices, contributing to a greener and more resilient built environment.

The construction industry is a major contributor to global environmental challenges, accounting for a substantial portion of energy consumption, greenhouse gas emissions, and waste generation. Green building, also known as sustainable construction, has emerged as a holistic approach to address these concerns. Green building involves the design, construction, operation, and maintenance of buildings in a manner that minimizes their environmental impact and optimizes resource utilization. The benefits of green building are multifaceted and far-reaching. From an environmental perspective, green buildings promote the use of renewable and sustainable materials, encourage energy efficiency through passive design strategies and the incorporation of renewable energy sources, and employ water conservation techniques. This not only protects the natural ecosystem but also contributes to the improvement of human health and well-being by providing healthier indoor environments. Additionally, green buildings have been found to have a positive impact on the economy, offering long-term cost savings through reduced operational expenses, increased asset values, and enhanced productivity of building occupants.

The growing interest in green building can be attributed to several driving factors. Stricter environmental regulations, consumer demands for sustainable practices, and the recognition of the financial and operational benefits have all contributed to the increased adoption of green building. However, the transition towards widespread implementation faces several challenges, including higher upfront costs, a lack of industry expertise and experience, and resistance to change within the construction sector. To address these barriers and further promote green building, a range of strategies have been proposed and implemented. The development of comprehensive green building standards and rating systems, such as LEED, has provided a framework for the industry to measure and validate the sustainability performance of buildings.

REFERENCES

- [1] A Review on Sustainable Building (Green Building). (2023). https://papers.ssm.com/sol3/papers.cfm?abstract_id=2968885
- [2] AlSanad, S. (2015). Awareness, Drivers, Actions, and Barriers of Sustainable Construction in Kuwait. In *Procedia Engineering* (Vol. 118, p. 969). Elsevier BV. <https://doi.org/10.1016/j.proeng.2015.08.538>
- [3] Bahaudin, A. Y., Elias, E. M., & Saifudin, A. M. (2014). A Comparison of the Green Building's Criteria. In *E3S Web of Conferences* (Vol. 3, p. 1015). EDP Sciences. <https://doi.org/10.1051/e3sconf/20140301015>
- [4] Balasubramanian, S., & Shukla, V. (2017). Green supply chain management: an empirical investigation on the construction sector. In *Supply Chain Management An International Journal* (Vol. 22, Issue 1, p. 58). Emerald Publishing Limited. <https://doi.org/10.1108/scm-07-2016-0227>
- [5] Balasubramanian, S., & Shukla, V. (2017). Green supply chain management: the case of the construction sector in the United Arab Emirates (UAE). In *Production Planning & Control* (Vol. 28, Issue 14, p. 1116). Taylor & Francis. <https://doi.org/10.1080/09537287.2017.1341651>
- [6] Bangwal, D., Tiwari, P., & Chamola, P. (2017). Workplace Design Features, Job Satisfaction, and Organization Commitment. In *SAGE Open* (Vol. 7, Issue 3). SAGE Publishing. <https://doi.org/10.1177/2158244017716708>
- [7] Benachio, G. L. F., Freitas, M. do C. D., & Tavares, S. F. (2020). Circular economy in the construction industry: A systematic literature review. In *Journal of Cleaner Production* (Vol. 260, p. 121046). Elsevier BV. <https://doi.org/10.1016/j.jclepro.2020.121046>
- [8] Bertino, G., Kisser, J., Zeilinger, J., Langergraber, G., Fischer, T., & Österreicher, D. (2021). Fundamentals of Building Deconstruction as a Circular Economy Strategy for the Reuse of Construction Materials. In *Applied Sciences* (Vol. 11, Issue 3, p. 939). Multidisciplinary Digital Publishing Institute. <https://doi.org/10.3390/app11030939>
- [9] Bhattarai, B., Chimoriya, D., & Bhattarai, B. S. (2023). Green Building Approach Towards Achieving Sustainability in Nepal. In *American Journal of Modern Energy*. Science Publishing Group. <https://doi.org/10.11648/j.ajme.20230902.11>

- [10] Boadu, E. F., Wang, C., & Sunindijo, R. Y. (2020). Characteristics of the Construction Industry in Developing Countries and Its Implications for Health and Safety: An Exploratory Study in Ghana. In *International Journal of Environmental Research and Public Health* (Vol. 17, Issue 11, p. 4110). Multidisciplinary Digital Publishing Institute. <https://doi.org/10.3390/ijerph17114110>
- [11] Braungart, M., McDonough, W., & Bollinger, A. (2023). Cradle-to-cradle design: creating healthy emissions - a strategy for eco-effective product and system design. <https://www.sciencedirect.com/science/article/pii/S0959652606002587>
- [12] Broniewicz, F., & Broniewicz, M. (2020). Sustainability of Steel Office Buildings. In *Energies* (Vol. 13, Issue 14, p. 3723). Multidisciplinary Digital Publishing Institute. <https://doi.org/10.3390/en13143723>
- [13] Castro, M. de F. M. de A. e, Andrade, J. B., & Bragança, L. (2020). Building Sustainability Assessment Methods: current update. In *IOP Conference Series Earth and Environmental Science* (Vol. 588, Issue 2, p. 22028). IOP Publishing. <https://doi.org/10.1088/1755-1315/588/2/022028>
- [14] Chan, A. P. C., Darko, A., & Ameyaw, E. E. (2017). Strategies for Promoting Green Building Technologies Adoption in the Construction Industry—An International Study. In *Sustainability* (Vol. 9, Issue 6, p. 969). Multidisciplinary Digital Publishing Institute. <https://doi.org/10.3390/su9060969>
- [15] Çiner, F., & Doğan-Sağlamtimur, N. (2019). Environmental and sustainable aspects of green building: A review [Review of Environmental and sustainable aspects of green building: A review]. *IOP Conference Series Materials Science and Engineering*, 706(1), 12001. IOP Publishing. <https://doi.org/10.1088/1757-899x/706/1/012001>
- [16] Darko, A., Chan, A. P. C., Ameyaw, E. E., He, B.-J., & Olanipekun, A. O. (2023). Examining issues influencing green building technologies adoption. <https://www.sciencedirect.com/science/article/pii/S0378778816314578>
- [17] EVALUATION OF A TUNNEL FORM SOCIAL HOUSING UNIT BASED ON PASSIVE DESIGN PRINCIPLES. (2023). https://www.academia.edu/29219568/EVALUATION_OF_A_TUNNEL_FORM_SOCIAL_HOUSING_UNIT_BASED_ON_PASSIVE_DESIGN_PRINCIPLES
- [18] Expert Review Panel. (2023). <https://www.unclearn.org/wp-content/uploads/library/unep207.pdf>
- [19] Ghaffarianhoseini, A., Dahlan, N. D., Berardi, U., Ghaffarianhoseini, A., Makaremi, N., & Ghaffarianhoseini, M. (2013). Sustainable energy performances of green buildings: A review of current theories, implementations and challenges [Review of Sustainable energy performances of green buildings: A review of current theories, implementations and challenges]. *Renewable and Sustainable Energy Reviews*, 25, 1. Elsevier BV. <https://doi.org/10.1016/j.rser.2013.01.010>
- [20] Healthy Buildings, Healthy People. (2014). <https://www.epa.gov/indoor-air-quality-iaq/healthy-buildings-healthy-people-vision-21st-century>
- [21] Hubmann, G., & Maaren, V. van. (2022). Circular Material Systems: anticipating whole-system design in architecture and construction. In *IOP Conference Series Earth and Environmental Science* (Vol. 1078, Issue 1, p. 12002). IOP Publishing. <https://doi.org/10.1088/1755-1315/1078/1/012002>
- [22] Kaushal, V., & Pham, A. (2024). Towards Sustainable Construction Development: A Qualitative Review [Review of Towards Sustainable Construction Development: A Qualitative Review]. <https://doi.org/10.20944/preprints202405.0643.v1>
- [23] Krueger, K., Stoker, A., & Gaustad, G. (2019). “Alternative” materials in the green building and construction sector. In *Smart and Sustainable Built Environment* (Vol. 8, Issue 4, p. 270). Emerald Publishing Limited. <https://doi.org/10.1108/sasbe-09-2018-0045>
- [24] Kwok, G., Lai, A., Cheung, F., & Li, L. (2020). Portfolio Approach in Green Building Certification. In *IOP Conference Series Earth and Environmental Science* (Vol. 588, Issue 3, p. 32043). IOP Publishing. <https://doi.org/10.1088/1755-1315/588/3/032043>
- [25] Lee, J. W. (2020). Green Finance and Sustainable Development Goals: The Case of China. In *Journal of Asian Finance Economics and Business* (Vol. 7, Issue 7, p. 577). Korean Distribution Science Association. <https://doi.org/10.13106/jafeb.2020.vol7.no7.577>
- [26] Lee, M. S. N., Masrom, M. A. N., Mohamed, S., Goh, K. C., Sarpin, N., & Manap, N. (2020). Examining Risk as Guideline in Design Stage for Green Retrofits Projects: A Review [Review of Examining Risk as Guideline in Design Stage for Green Retrofits Projects: A Review]. *IOP Conference Series Materials Science and Engineering*, 713(1), 12043. IOP Publishing. <https://doi.org/10.1088/1757-899x/713/1/012043>
- [27] Lee, Y. Y., Azmi, M. S. I., & Lee, Y. H. (2020). A study on the challenges of implementing green building concept in Sarawak, Malaysia. In *IOP Conference Series Materials Science and Engineering* (Vol. 943, Issue 1, p. 12022). IOP Publishing. <https://doi.org/10.1088/1757-899x/943/1/012022>
- [28] Medvedkina, Y. A., & Khodochenko, A. V. (2019). Market power of green buildings in sustainable development goals. In *IOP Conference Series Materials Science and Engineering* (Vol. 698, Issue 7, p. 77045). IOP Publishing. <https://doi.org/10.1088/1757-899x/698/7/077045>
- [29] Nain, A., Banerjee, A., & Melkania, N. P. (2021). Effects of Green Buildings on the Environment (p. 477). <https://doi.org/10.1002/9781119792079.ch15>
- [30] Oguntona, O. A., Akinradewo, O., Ramorwalo, D. L., Aigbavboa, C., & Thwala, W. D. (2019). Benefits and Drivers of Implementing Green Building Projects in South Africa. In *Journal of Physics Conference Series* (Vol. 1378, Issue 3, p. 32038). IOP Publishing. <https://doi.org/10.1088/1742-6596/1378/3/032038>
- [31] Pitt, M., Tucker, M., Riley, M., & Longden, J. (2009). Towards sustainable construction: promotion and best practices. In *Construction Innovation* (Vol. 9, Issue 2, p. 201). Emerald Publishing Limited. <https://doi.org/10.1108/14714170910950830>
- [32] Prameswari, F. R., Rachamawati, F., Wiguna, I. P. A., & Rohman, M. A. (2021). Importance and Performance Ratings Analysis for Implementation of Green Construction on Building Project. In *IOP Conference Series Earth and Environmental Science* (Vol. 799, Issue 1, p. 12015). IOP Publishing. <https://doi.org/10.1088/1755-1315/799/1/012015>
- [33] Reddy, V. S. (2016). Sustainable Construction: Analysis of Its Costs and Financial Benefits. In *International Journal of Innovative Research in Engineering & Management* (Vol. 3, Issue 6, p. 522). <https://doi.org/10.21276/ijirem.2016.3.6.12>
- [34] Sarireh, M. (2021). Review of Green Buildings Spreading and Levels. In *Advances in Science and Technology – Research Journal* (Vol. 15, Issue 4, p. 81). Society of Polish Mechanical Engineers and Technicians. <https://doi.org/10.12913/22998624/142663>



International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435 (Online) Volume 15, Issue 04, April 2026)

- [35] Sfakianaki, E. (2018). Critical success factors for sustainable construction: a literature review [Review of Critical success factors for sustainable construction: a literature review]. *Management of Environmental Quality An International Journal*, 30(1), 176. Emerald Publishing Limited. <https://doi.org/10.1108/meq-02-2018-0043>
- [36] Shurrab, J., Hussain, M., & Khan, M. (2019). Green and sustainable practices in the construction industry. In *Engineering Construction & Architectural Management* (Vol. 26, Issue 6, p. 1063). Emerald Publishing Limited. <https://doi.org/10.1108/ecam-02-2018-0056>
- [37] Sidney M Levy. (2023). Green and sustainable buildings. <https://www.sciencedirect.com/science/article/pii/B9781856175487000094>
- [38] Simons, R. A., Robinson, S., & Lee, E. (2019). A Market-Driven Green Office Building Index. In *Journal of Real Estate Portfolio Management* (Vol. 25, Issue 1, p. 77). Taylor & Francis. <https://doi.org/10.1080/10835547.2019.12090025>
- [39] Singh, A., & Gupta, S. K. (2021). AN OVERVIEW OF THE GREEN BUILDING CONSTRUCTION IN INDIA. In *International Journal of Engineering Applied Sciences and Technology* (Vol. 6, Issue 2). IJEAST. <https://doi.org/10.33564/ijeast.2021.v06i02.022>
- [40] Singh, C. S. (2018). Green Construction: Analysis on Green and Sustainable Building Techniques. In *Civil Engineering Research Journal* (Vol. 4, Issue 3). <https://doi.org/10.19080/cej.2018.04.555638>
- [41] Üрге-Vorsatz, D., Khosla, R., Bernhardt, R., Chan, Y. C., Vérez, D., Hu, S., & Cabeza, L. F. (2020). Advances Toward a Net-Zero Global Building Sector. In *Annual Review of Environment and Resources* (Vol. 45, Issue 1, p. 227). *Annual Reviews*. <https://doi.org/10.1146/annurev-environ-012420-045843>
- [42] Wei, Y. (2021). The development of green building technology. In *IOP Conference Series Earth and Environmental Science* (Vol. 812, Issue 1, p. 12011). IOP Publishing. <https://doi.org/10.1088/1755-1315/812/1/012011>
- [43] Wong, S. Y., Low, W., Wong, K., & Tai, Y.-C. (2021). Barriers for green building implementation in Malaysian construction industry. In *IOP Conference Series Materials Science and Engineering* (Vol. 1101, Issue 1, p. 12029). IOP Publishing. <https://doi.org/10.1088/1757-899x/1101/1/012029>
- [44] Yoonus, H., & Al-Ghamdi, S. G. (2020). Environmental performance of building integrated grey water reuse systems based on Life-Cycle Assessment: A systematic and bibliographic analysis. In *The Science of The Total Environment* (Vol. 712, p. 136535). Elsevier BV. <https://doi.org/10.1016/j.scitotenv.2020.136535>