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SUSTAINABLE INTERIOR DESIGN: STRATEGIES FOR CREATING ECO-FRIENDLY SPACES

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ABSTRACT

Recently, there has been a significant change in how interior environments are designed. The current design strategies emphasise creating healthy and sustainable spaces by using eco-friendly building materials and implementing suitable design solutions. This trend aims to promote environmentally responsible architecture and interior design (Alfuraty, 2020). When selecting materials and products for eco-friendly interior design, it is crucial to take into account various essential factors. These include low environmental footprint and impact, easy maintenance, high durability, adherence to budget constraints, comfort, safety, and flexibility (Jovanovic and Kekovic, 2019). The paper concludes that integrating sustainable design into interior architecture is essential for reducing environmental harm. Implementing measures to mitigate negative impacts is crucial (Ayalp, 2013). By using eco-friendly materials and following recommended selection criteria, designers can help create healthier and more sustainable interior spaces (Ayalp, 2013).

Keywords: Environmentally Sustainable Design, Sustainabilit, Interior Design, Sustainable Materials, Green Materials, Renewable Resources

1. INTRODUCTION

The worldwide environmental crisis emerged due to the rapid growth of industries and technologies, leading to enduring detrimental impacts on the environment. New construction and design systems are being created resulting of the growing global deciphering the worth of protecting the environment in which we live. Both the interior and exterior of a structure should undergo enhancements. An essential component of the overall design of a high-quality structure is interior design, or interior architecture (Alfuraty 2020). The idea of sustainability in the interior has become more prevalent. Achieving sustainable interior design involves fulfilling numerous essential requirements that play a crucial role in understanding and attaining an environmentally responsible indoor environment.

This essay focuses on analyzing factors related to sustainable materials and their properties. The environmental options available for interior design largely

depend on the features and requirements relevant to the operational life cycle of materials, products, machinery, and devices (Jovanovic and Kekovic, 2019). Over the last twenty years, public awareness of environmental issues has increased, leading to widespread the importance of reducing the ecological footprint of the built environment. With current technology and economies of scale, it is possible to exceed minimum standards and focus on best practice performance while preserving heritage values (Palich, Ramachandran, and Moxham, 2013).

In addition to its practical benefits, this essay considers the environmental damage and ethical issues related to human habitation of the earth. The Brundtland commission stresses the importance of designers adopting sustainability principles, which entail fulfilling present needs in a way that does not hide future generations from fulfilling their own requirements. Humans pose a significant threat to the planet due to our contributions to global warming and unsustainable resource consumption (O'Reilly, 2018). This article highlights the importance of eco-friendly and recycled materials in achieving sustainable interior design and provides examples of how these materials can be utilized in interior architecture (Jovanovic and Kekovic, 2019).

2. METHODOLOGY

The research utilized an analytical approach to examine the different elements of interior design and illustrate successful ways to achieve sustainability within these elements. The study validated its framework by presenting numerous examples from current practices and works in the field. It encompasses a range of criteria and factors pertaining to eco-friendliness, resource efficiency, and environmental impact. To gather data and insights, a combination of literature review, case studies, and expert consultations was employed. The forthcoming paper will present a structured method for assessing and contrasting sustainable interior design solutions, enabling designers to make well-informed choices in developing environmentally conscious spaces. The resulting paper will offer a systematic approach for evaluating and comparing sustainable interior design solutions, empowering designers to make knowledgeable decisions in the creation of environmentally responsible spaces.

3. RESULT AND DISCUSSION

Designers must take care to offer ecologically sensible energy-efficiency solutions that can lower the rate of energy and water use while delivering a comfortable space. They ought to Promote the adoption of enduring products that don't demand excessive amounts of upkeep and replacement. With a view to reducing pollution and environmental harm, designers should promote the decrease of building waste. They must make sure that the materials and solutions they specify are from local or foreign sources that have received certification. Therefore, in order to attain integrity in their design ideas, interior designers need to have defined selection criteria for sustainable items. Additionally, they require standards for high-performance, environmentally friendly interior design options (Rashdan and Ashour, 2017).

The aim of sustainable construction is to create and maintain a good built environment through proper use of resources and ecological design principles (Yan, 2022). Interior design is becoming more humane and environmentally responsible, and its popularity is on the rise. Besides impacting the natural environment, human

health, and economic growth, the advantages of sustainable building design can influence people's behavior and enhance productivity (Yan, 2022).

3.1. SUSTAINABLE INTERIOR DESIGNS

Sustainable design solutions stand apart from conventional ones by promoting health-conscious environments and optimizing resource and energy usage. Ethical interior design solutions should offer a coherent and step-by-step approach to crafting healthy, functional, and comfortable interiors that are environmentally sustainable, without sacrificing aesthetic considerations. Moreover, these solutions should align with the clients' requirements, budget, timeline, and design aspirations (Rashdan and Ashour, 2017). Environmental concerns have become a major issue today, leading to an increasing trend of using expensive materials that are difficult or impossible to dispose of. Consequently, there has been an expanding trend in the demand for green designers in recent times (Bauer, Mösle, and Schwarz, 2010). Some argue that sustainable design should be viewed as an essential component of quality design. Considerations such as promoting a healthy environment and enhancing energy efficiency are expected to be inherently integrated into good design (Bauer, Mösle, and Schwarz, 2010).

Climate change stands as the most urgent environmental challenges confronting humanity. Human actions, such as combustion of fossil fuels, deforestation for timber or agricultural purposes, and waste disposal in landfills, are the main contributors to this issue. These activities release excessive greenhouse gases (carbon dioxide and methane), intensifying the natural greenhouse effect (Ayalp, 2013). There's a growing trend of humans draining natural resources faster than they can be naturally replenished, leading to an unsustainable situation. Some resources, like fossil fuels and certain minerals, are finite, and once exhausted, many essential resources will become inaccessible to future generations (Ayalp, 2013).

The construction industry has a notable impact on the environment, with designers' decisions playing a crucial role in the environmental challenges mentioned previously. Buildings contribute to roughly 30% of worldwide greenhouse gas (GHG) emissions and are the main source of CO2 emissions in developed nations. Additionally, buildings consume about 40% of global energy, the highest among all industrial sectors. The energy invested in constructing buildings originates from activities like mining, processing, and manufacturing new materials (Ayalp, 2013).

There are many challenges interior space designers face in achieving sustainable internal environments, and this is where smart strategies for the allocation of spaces within the interior space come into play. “Sustainable interior environments can be achieved through the interior design process”, “for example, by designing spaces that are flexible, designed to respond to space events”. As a result of reducing material consumption, multiple uses of elements, flexibility, and the ability to develop and grow, sustainable environment in interior design: design by choosing sustainable material (Alfuraty, 2020).

3.1.1. ENERGY EFFICIENCY

Energy conservation serves as a fundamental principle in sustainable interior design, encompassing two main approaches: meticulous design and choice of energy-efficient equipment and the utilize of renewable energy sources. Architects and interior designers play pivotal roles in improving a building's energy efficiency by deducting energy consumption for heating, cooling, lighting, and appliances,

while also incorporating renewable energy answers that are not carbon-based. Strategies for decreasing energy usage in lighting include maximizing natural light through skylights or atriums, optimizing window configurations, using light shelves, employing energy-efficient lighting fixtures, and implementing lighting control systems. Natural ventilation is also essential for reducing energy needs, and passive systems, specialized windows, and curtains can aid in minimizing heat loss and lowering energy usage for heating and cooling. Finally, embodying renewable energy sources such as solar, wind, and geothermal energy can meet a substantial portion or all of the occupants' energy needs (Ayalp, 2013).

3.1.2. WATER CONSERVATION

In interior design, water usage can be minimized through the collection of rainwater, filtration of wastewater, and careful selection of plumbing fixtures. Interior designers have a role in specifying water-efficient sinks and smart faucets to decrease water consumption. It is important for them to promote plumbing systems that facilitate the reuse of greywater for purposes such as toilet flushing or irrigation. By adopting such practices, the energy essential for water purification can be reduced, and valuable potable water resources can be conserved in the long run (Ayalp, 2013).

3.1.3. HEALTHY INTERIOR ENVIRONMENT

The majority of our time, around 90%, is spent indoors, where we are exposed to potential health risks such as allergies, asthma, and Sick Building Syndrome due to the off gassing of chemicals present in furniture and finishes. Research in the US has shown that indoor air toxins levels are almost three times higher than those found outdoors. The principle of health conservation in interior design focuses on three main criteria: enhancing air quality, ensuring thermal, visual, and acoustic comfort, and utilizing non-toxic materials. A key approach to improving indoor air quality is by allowing adequate natural ventilation. Additionally, avoiding the use of harmful and volatile substances like radon and formaldehyde contributes to creating a healthier indoor environment (Ayalp, 2013).

3.2. SUSTAINABLE MATERIALS

To advance sustainability, it's vital for interior design materials to enhance indoor air quality by preventing pollution, decreasing the need for raw materials and energy, and reducing waste. Moreover, these substances must meet functional, durable, and aesthetic standards to fulfill client demands. Therefore, interior designers need to stay updated on the latest sustainable materials and techniques in both local and global markets. Sustainable interior design goals can be achieved by integrating refurbished, recycled, upcycled, locally obtained, renewable, or certified materials (reham and eldin, 2017).

3.2.1. REFURBISHED MATERIALS

Refurbished materials refer to materials that have been saved from destroyed or renovated buildings. They can be used in their original form or with some maintenance work, without undergoing significant alterations. During the renovation of a house, various elements can be salvaged, including walls, floors, ceilings, doors, cabinets, and millwork. These refurbished items have the prospective to be incorporated into old, renovated, or even new houses. There are

local companies, stores, and online platforms, both nonprofit and for-profit, where these materials can be obtained or exchanged. The responsibility of the interior designer is to assess the condition, quality, and style of existing refurbished materials, in order to determine their suitability for reuse and achieve the desired aesthetic for the client (Reham and Eldin, 2017).

3.2.2. UPCYCLED AND RECYCLED MATERIALS

Upcycling involves transforming a refurbished or discarded material into something new with a different purpose. On the other hand, recycling involves breaking down or deconstructing an old product to revert it back to its original form and creating something new from it. Recycling helps extend the lifespan of materials instead of disposing of them, thereby decreasing the environmental result of producing new materials and conserving resources for coming generations. By using recycled materials, the energy costs associated with extracting, transporting, and making new or virgin materials are also minimized. Examples of substances that contain recycled content include ceiling tiles, steel, countertops, wallboards, flooring, carpets, and tiles (Reham and Eldin, 2017).

3.2.3. RENEWABLE MATERIALS

Renewable materials are those that can naturally replenish within a timeframe of fewer than 10 years. Opting for these materials instead of non-renewable ones offers environmental benefits by ensuring the long-term availability of resources for future generations minimizing impacts on the natural ecosystem. Examples of rapidly renewable materials comprise bamboo, cotton, and hemp furnishings, cork or linoleum flooring, wool carpet and upholstery, and wheat straw cabinetry (Reham and Eldin, 2017).

3.2.4. LOCAL MATERIALS

Incorporating materials that are produced or sourced locally helps reduce the energy consumed during transportation and lowers associated costs. It also contributes to a decrease in pollution generated during the manufacturing process. Furthermore, the use of specific local adhesives, paints, and sealants can significantly improve the indoor environmental quality of a house. Local materials can encompass a range of options, including new, refurbished, upcycled, recycled, renewable, or certified materials, depending on their availability and the choices made by interior designers (Reham and Eldin, 2017).

3.3. CASE STUDY

This study evaluated occupant satisfaction and productivity using Herman Miller's TQM metrics. The outcome show that the introduction of a new sustainable building positively affected occupants' well-being, job satisfaction, sense of belonging, and other work life aspects that directly influence individual job performance. Additionally, the study indicated a slight increase in organizational productivity after moving to the new building (wdbg, 2001).

- **Findings:** The Green House, designed by William McDonough and Partners in Charlottesville, Virginia, integrates a manufacturing plant with office and showroom spaces for Herman Miller, Inc., a furniture manufacturer.

Located in Holland, Michigan, this 290,000-square-foot facility features numerous sustainable attributes, such as:

Figure 1

Figure 1 The Green House (WDBG, 2001)

- Extensive use of natural light, including an interior daylit "street," windows, skylights, and roof monitors within the manufacturing plant.
- Windows that can be opened in both the manufacturing plant and office areas.
- All areas within the building offer picturesque views of the surrounding countryside.
- Energy-saving glass and lighting systems.
- Lighting controls that regulate electric lighting based on the presence of adequate daylight.
- Employment of occupancy detectors.
- Improved filtration of particles and higher air turnover rates in the manufacturing facility.
- Implementation of non-hazardous adhesives and a dedicated ventilated painting zone within the manufacturing facility.
- Restoration of the site with prairie landscape and a wetland.
- Thorough recycling of waste produced by the cafeteria, office, and manufacturing facility.
- Careful positioning of the building to reduce its visibility from the road.
- On-site fitness center (WDBG, 2001).

In summary, the Green House incorporates numerous sustainable features, ranging from maximizing natural light to implementing environmentally conscious practices throughout its design and operations (WDBG, 2001).

- **Conclusion:** A slight increase of 0.22% was noted in overall productivity, along with minor enhancements ranging from 1% to 2% in other TQM measurements. Despite their modest nature, these advancements are noteworthy given the organization's already high-performance levels of 98% to 99% across all TQM criteria. Interestingly, there was no decrease in productivity following the move to the new facility, a phenomenon often observed during relocations or significant changes. Surprisingly, there weren't any noticeable variations in the TQM indicators among different manufacturing shifts, despite differences in perceptions and subjective outcomes. This discovery implies that the connection between performance

and subjective experiences is more complex than currently acknowledged (WDBG, 2001).

3.4. SURVEY

Despite increased awareness, there are often notable gaps in implementing sustainable housing initiatives, as indicated by surveys. Many existing housing structures lack essential features like energy efficiency, integration of renewable energy, and eco-friendly building materials. This underscores the necessity for further efforts to promote and incentivize sustainable construction and retrofitting practices. Surveys demonstrate a growing recognition among individuals and communities regarding the significance of sustainable development goals and housing. People acknowledge the multiple benefits of sustainable practices, including energy efficiency, reduced carbon footprint, improved health, and enhanced property value. Additionally, these surveys offer valuable insights into the effectiveness of current policies and help identify areas requiring improvement, such as strengthening energy performance standards or providing increased financial support for sustainable housing projects.

Figure 2

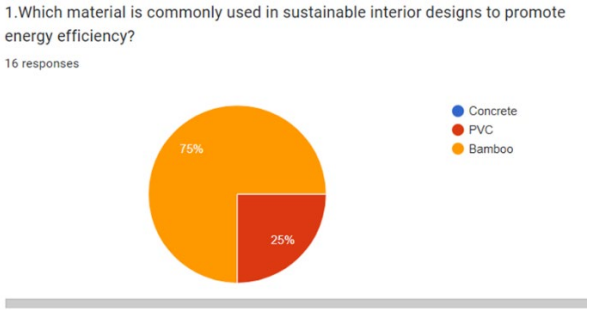

Figure 2 Material Commonly Used
Source Author

In Fig. 2, the author tries to acknowledge the material which is commonly used in sustainable interior designs to promote energy efficiency between concrete, PVC, and bamboo. According to the responses, the conclusion came out to be 75% of the people think that bamboo is the most regularly used sustainable material in interior design but the other 25% thinks that PVC is sustainable for interior design.

Figure 3

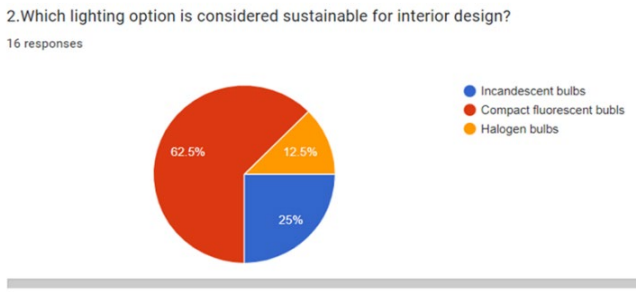

Figure 3 Sustainable Lighting
Source Author

In Fig. 3, the author tries to know about the sustainable lighting option for interior design. The results came out to be that 62.5% consider Compact fluorescent bulbs are sustainable for interior while 25% says that Incandescent bulbs are sustainable, and the rest states Halogen bulbs are sustainable.

Figure 4

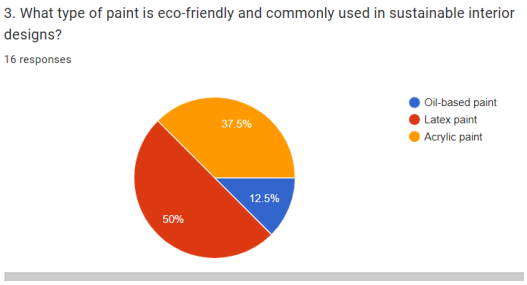

Figure 4 Eco-Friendly Paint
Source Author

In Fig. 4, the author tries to find out what type of paint is ecofriendly and commonly used in interior sustainable designs. 50% think that Latex paint is sustainable and 37.5% thinks it is acrylic paint and the other 12.5% thinks it is oil-based paints.

Figure 5

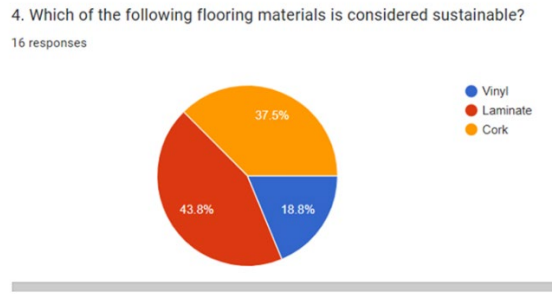

Figure 5 Flooring Material
Source Author

In Fig. 5, the author tries to acknowledge the sustainable flooring materials. 43.8% states that laminates are sustainable flooring materials, 37.5% says cork is another sustainable material while the rest 18.8% states Vinyl.

Figure 6

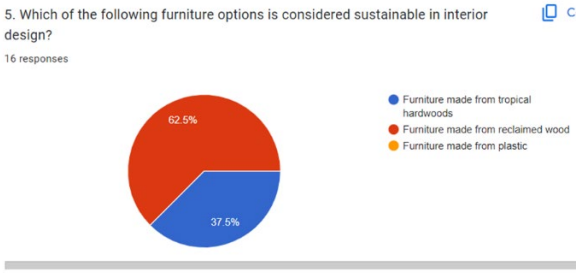

Figure 6 Furniture Material
Source Author

In Fig. 6, the author tries to find out about the sustainable furniture in interior design. 62.5% states that furniture made from reclaimed wood is more sustainable than furniture made from plastic. The other 37.5% thinks the furniture made from tropical hardwoods is sustainable.

Figure 7

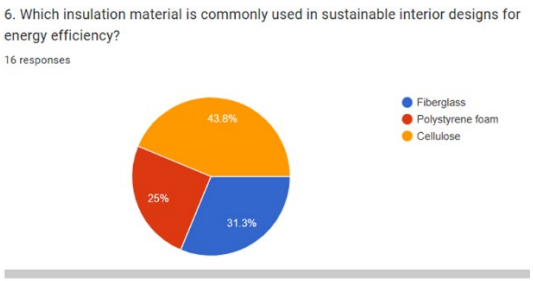

Figure 7 Insulation Materials
Source Author

In Fig. 7, the author tries to find out which are the insulation materials commonly used in sustainable interior designs for energy efficiency. 43.8% think that Cellulose is the best insulation material more than the Fiberglass which is 31.3% and at last 25% is Polystyrene foam.

Figure 8

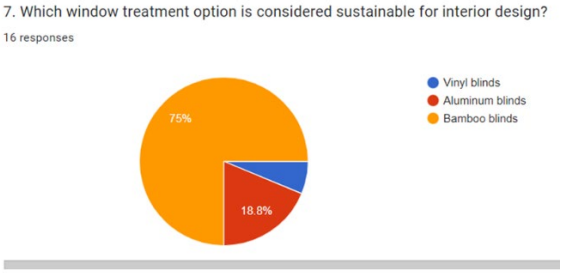

Figure 8 Window Treatment
Source Author

In Fig. 8, the author tries to find out what window treatment option is considered sustainable for interior design. 75% thinks that Bamboo blinds are more sustainable than Aluminum which is 18.8%. The rest are Vinyl blinds.

Figure 9

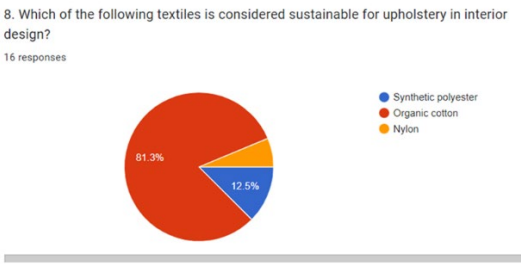

Figure 9 Textiles
Source Author

In Fig. 9, In this graph, the author tries to find out which textiles are considered sustainable for upholstery in interior design. 81.3% think that Organic cotton is sustainable while 12.5% thinks that synthetic polyester is sustainable. The rest thinks Nylon is sustainable.

Figure 10

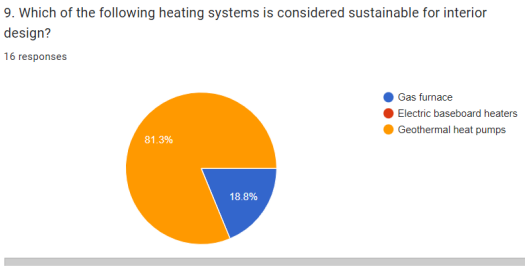

Figure 10 Sustainable Heating Systems
Source Author

In Fig. 10, the author acknowledges which type of heating system is considered sustainable for interior design. 81.3% thinks geothermal heat pumps are sustainable and other 18.8% thinks Gas furnace is sustainable.

Figure 11

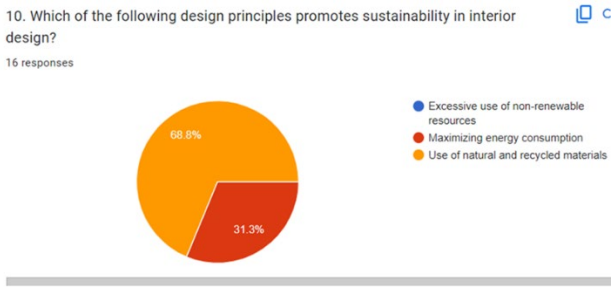

Figure 11 Design Principles
Source Author

In Fig. 11, the author tries to find out which design principles promote sustainability in interior design. 68.8% thinks that use of natural and recycled materials is sustainable while the other 31.3% thinks that maximizing energy consumption is sustainable.

In conclusion, the use of sustainable materials in interior design, including sustainable heating systems, organic cotton, bamboo blinds, cellulose, furniture made from reclaimed wood, laminate, and bamboo, is of paramount importance in promoting a greener and more responsible approach to designing our living spaces. By incorporating these eco-friendly materials, we can notably reduce our environmental impact and contribute to the conservation of our planet for future generations.

Sustainable heating systems, powered by renewable energy sources, along with minimize greenhouse gas emissions but leads to lower energy consumption, resulting in reduced overall environmental burden. Organic cotton, bamboo blinds, and cellulose-based products ensure that harmful chemicals and pesticides are eliminated from our living spaces, safeguarding the health of both occupants and the environment.

Moreover, furniture crafted from reclaimed wood and sustainably sourced materials aid in minimizing deforestation and encourages the recycling of valuable resources. By opting for laminate and bamboo, which are rapidly renewable materials, we contribute to the conservation of forests and promote sustainable forestry practices. Embracing these sustainable choices not only enhances the aesthetic appeal of our interiors but also provides a sense of purpose and responsibility in our design decisions. As consumers and designers, it is our collective duty to prioritize sustainable materials and practices, as they play a pivotal role in fostering a more sustainable and ecologically conscious world. By making mindful choices, we can shift our living spaces into harmonious sanctuaries that reflect our commitment to preserving the planet and its natural resources for generations to come.

4. CONCLUSION

Interior designers have a responsibility to advocate for and select materials and products that are ecofriendly and promote good health. Interior designers and contractors should strive to expand their design abilities and seek inventive approaches to attain energy efficiency. The ultimate objective should revolve around crafting net-zero-energy interiors that not only enhance the well-being of clients but also contribute to environmental restoration. Integrating sustainable practices consistently into their design solutions is crucial for interior designers and contractors, as they should lead their teams in embracing sustainability principles as an integral part of their regular work (Rashdan and Ashour, 2017).

This paper summarizes that sustainable interior design solutions play a crucial role in addressing the environmental and health challenges we face today. By integrating principles such as energy efficiency, use of renewable materials, improved indoor air quality, and water conservation, interior designers can generate spaces that meet the functional and aesthetic needs of clients but also contribute to a healthier and more sustainable future. Through careful consideration of materials, technology, and design strategies, sustainable interiors can minimize the environmental impact, enhance occupant well-being, and promote resource conservation. However, it is important for designers, contractors, and stakeholders to collaborate and embrace sustainability principles as an integral part of their everyday practices. By giving precedence to sustainability, we can lay the foundation for a future built environment that is more robust, balanced, and accountable for the well-being of future generations.

CONFLICT OF INTERESTS

None.

ACKNOWLEDGMENTS

None.

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