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KEYWORDS	ABSTRACT
Sustainable Technologies, Sustainable Interior Design, Energy Efficiency, Sustainable Residential Design, Environment, Residential Interiors.	Future trends in home interior design are determined by the development and implementation of sustainable technologies. Concerns about the environment, high energy consumption, resource depletion, and new lifestyles demand environmentally friendly and energy-efficient residential interiors. This research investigates the role of sustainable technologies in contemporary and future home interior design using a qualitative approach. Data were collected from case studies exploring sustainable interiors to illustrate how sustainable interior design can be implemented in the local Pakistani context. This study demonstrates how sensors can monitor temperature, energy-efficient lighting can improve performance, air-quality management can enhance indoor conditions, and resource monitoring can shape the future of interiors through the efficient use of natural resources. The research focuses on sustainable technologies and design approaches such as energy-efficient lighting and appliances, energy systems, water-saving technologies, sustainable and recycled materials, passive design approaches, natural lighting, natural ventilation, waste management, and energy management systems. It was found that the proper use of these technologies reduces energy and water usage, minimizes negative environmental impacts, and improves indoor environmental quality and resource-use efficiency. Sustainable technologies allow the creation of comfortable, practical, adaptable, and environmentally friendly residential interiors. This study demonstrates how sensors can monitor temperature, energy-efficient lighting can improve performance, air-quality management can enhance indoor conditions, and resource monitoring can shape the future of interiors through the efficient use of natural resources. The research shows that the future of home interior design will depend on the use of sustainable technologies and resource-efficient approaches to design. These results can help interior designers, architects, researchers, and decision-makers develop environmentally friendly and energy-efficient homes. Data were collected from secondary sources such as research papers, books, academic journals, and reports published by well-known organizations.
ARTICLE HISTORY Date of Submission: 17-08-2026 Date of Acceptance: 18-09-2026 Date of Publication: 23-09-2026	
	2026 Journal of Social Research Development
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DOI	https://doi.org/10.59075/jsrd.v7i7.533
Volume/Issue	7(7), 2026, 313-330

Introduction

Research Background

The future of home interior design is influenced by sustainable technologies. Ecological risks, growing energy demands, rapid technological development, and changes in lifestyle have prompted research into the impact of sustainable technologies on the future of home interior design. Previous studies have focused on examining these factors separately, despite the synergistic effects of their combination. This article aims to analyze the role of sustainability in present-day home interior design using a qualitative research method. A review of secondary information sources consists of a discussion of published articles, books, reports, and works by academic researchers. An illustrative case study explores a sustainable house in Defence Housing Authority (DHA), Lahore. Data were collected from journals, articles, books, and reports published by recognized organizations, including the United Nations Environment Programme and the International Energy Agency. The results of this research suggest that sustainable design will impact the future of residential interiors through the use of recycled materials, passive design approaches, and waste reduction. The data collected through case studies explore sustainable interiors to illustrate how sustainable interior design can be implemented in the local Pakistani context. The results of the study provide a basis for further discussion and research on the impact of sustainable design on residential interiors in future society. Interior designers, architects, housing authorities, researchers, and policymakers can benefit from this study by considering options for creating eco-friendly, energy-efficient, comfortable, and convenient residential interiors.

Problem Statement

The growing emphasis on environmental sustainability has significantly influenced residential interior design. However, existing studies often examine sustainable interior design as separate disciplines, providing limited understanding of how it can improve residential performance, energy efficiency, occupant comfort, and environmental sustainability. This fragmented knowledge limits the development of comprehensive design strategies that effectively integrate ecological responsibility with intelligent technological systems. Therefore, there is a need to conduct an integrated investigation of sustainability to better understand its role in shaping the future of residential interiors.

Research Objectives

The objectives of this study are:

1. To ascertain the emerging sustainability trends impacting future residential interior design.
2. To examine how smart home technology can be applied to future residential interior design to make it more functional and sustainable.
3. To determine the effectiveness of incorporating sustainability practices and smart home technologies into future-ready residential interior design.

Research Questions

This study addresses the following research questions:

1. What sustainability trends will influence the future of residential interior design?
2. How do the smart home technologies affect the future function and purpose of residential interior design?
3. How do sustainability and smart home technologies together drive future residential interior design?

Significance of the Study

The significance of the study for the field of interior design is that it helps to understand how sustainability influences future home interiors. The results of the study will benefit interior designers and architects by guiding them in creating sustainable homes that are comfortable for occupants and improve the overall quality of living. The findings will also be valuable for the scientific community, as they form a basis for future research in this field. Finally, the study can benefit housing developers and policymakers by motivating them to promote and adopt energy-efficient technologies and interiors in houses built under their programs.

Literature Review

Sustainability has become a popular topic of research. Changing societal and environmental needs have caused the focus of residential interior design to shift from adding value to property to creating habitats that are resource-efficient, energy-efficient, and incorporate cutting-edge technology. Studies have shown that future interior design will focus on creating sustainable homes, reducing negative effects on the environment, saving resources, and improving human living standards.

Smart Technology and Sustainable Interior Design

Abdullah (2026) addresses the role of smart technology in attaining sustainable interior design by comparing buildings with various degrees of technology integration. The author demonstrates how smart technology, including the Internet of Things (IoT), sensors, smart lighting, automated ventilation, and heating and air-conditioning systems, among others, could be leveraged to enhance the environment and performance of interiors. Smart technology is effective in creating responsive environments because it replaces traditional fixed systems with adaptable ones. Abdullah (2026) contends that smart technology could be incorporated into interior design to increase occupants' sustainability by reducing energy use and waste. For instance, sensors, smart lighting, and HVAC systems could optimize energy use while being environmentally responsive. Moreover, smart technology could help regulate and maintain a comfortable indoor climate, thus promoting a high-quality indoor environment. Other sustainability considerations include water, materials, and comfort.

Furthermore, Abdullah (2026) asserts that smart technology could improve the functionality of interior spaces by enhancing user-centered design and providing flexibility. Smart technology could be utilized to create connected, responsive environments that are more personalized and adaptive to occupants' needs. The author reports a positive association between the level of technology integration and building performance. Specifically, the study found that smart building technology could enhance energy performance, indoor environmental quality, functionality, and user experience.

A close examination of Abdullah's (2026) work shows that the author focuses on advanced technologies and innovations in green buildings, with little attention to occupants' lifestyles and behavior. Although the author emphasizes creating more comfortable, adaptive, and energy-efficient built environments, he overlooks the role of interior design in balancing technology and ignores the importance of using recycled and natural resources and low-volatile-organic-compound materials in sustainable interior design.

For instance, Abdullah does not address the role of personal attitudes, perceptions, behaviors, and activity levels in the successful implementation of smart building technology. However, the author identifies key variables that should be considered in smart building technology, including occupants, the environment, and cost-benefit analysis. Therefore, Abdullah advocates combining some smart technologies with passive design to achieve sustainability, specifically in developing countries.

Overall, Abdullah's (2026) work is an insightful article that provides ideas for creating smart and sustainable interiors. The author emphasizes the potential of smart technology to enhance sustainability and functionality in residential, commercial, and educational buildings. However, the article could have addressed the application of smart technology to residential buildings directly rather than to buildings in general. Nevertheless, the author's work is relevant to the current research because it explicitly demonstrates the relationship between smart technology and sustainability. However, further research is needed to address how emerging trends could be integrated into residential interiors to enhance sustainability.

Smart Technologies and Future Residential Interior Design

Ashour and Rashdan (2024) note that, with the advent of smart technologies, interior design is transforming into something more fitting, functional, and advanced for residential settings. Interior design involves the application of technologies such as IoT, sensors, automation, and AI to create an inhabitable structure that is adaptive and responsive to occupants' needs.

In addition, the study emphasizes the relationship between smart technology and sustainability. Using smart technology can help monitor occupancy and the surrounding environment, thereby eliminating unnecessary use of energy and resources. Moreover, using smart materials, such as switchable privacy glass, can increase the adaptability of interiors and eliminate the need for additional interior components.

Overall, the integration of the two aforementioned elements can contribute to designing interiors that are energy-efficient, more adaptable, comfortable, and fit for the future. However, the study discusses smart interior design in general. Therefore, there is a need for additional research on the implications of integrating sustainability and smart home technologies into the future of residential interior design.

Integration of Sustainability and Smart Home Technologies

The perspective is that sustainability and smart home technologies need not be seen as independent design approaches; rather, they could be complementary strategies for realizing future-ready residential interiors. The use of smart technologies supports sustainable design by optimizing energy use, conserving water, monitoring indoor environmental quality, and enabling more efficient building functions through automation (International Energy Agency, 2023), while sustainable interior design provides the environmental framework within which technologies could function more efficiently.

Researchers argue that the concomitant use of environmentally friendly materials to build structures amenable to intelligent monitoring systems would create homes that are fit for purpose, energy-efficient, healthy, comfortable, and cost-effective over their life cycle (UNEP, 2023). For example, smart lighting systems, when used in tandem with daylight-responsive designs, would help reduce electricity consumption, while climate-control systems would increase comfort without using extra energy. These measures would result in lower carbon emissions and more livable, functional, and pleasing buildings.

Research Gap

Although previous studies have attempted to relate the concepts of sustainability and smart technologies, there is limited research on how they may converge in the interior and building design fields and impact future residential interiors. For example, most prior research, such as Abdallah's (2026), has focused on smart building technologies, sustainability, indoor environments, and building performance, leaving residential interior design, materials, aesthetics, and occupants' lifestyles and behaviors understudied. Similarly, the work of Ashour and Rashdan (2024) demonstrated the role of smart technologies in adaptive interiors, but their paper, like Abdallah's (2026), provided only a general overview of those technologies and did not consider their long-term implications for residential interiors.

Moreover, there is limited academic research exploring how new smart technologies could be incorporated into residential interiors to promote future sustainability through the use of energy-efficient technologies, low-VOC materials, natural materials, daylight maximization, water-saving technologies, biophilic design, passive design, and other sustainability-focused approaches. The relationships between technologies, occupants' behavior, comfort, aesthetics, and environmental friendliness are also understudied.

Therefore, there is a need for further research to fully incorporate the concepts of sustainability and smart homes into future residential interiors in order to make them energy-efficient, adaptive,

comfortable, healthy, cost-effective, and environmentally friendly. This study aims to fill this gap by outlining emerging sustainability and smart-home trends and their potential contribution to future residential interior design.

Methodology

Research Design

This study was conducted using a qualitative research design that included a systematic analysis of secondary data and one local case study to identify future trends in home interior design. The choice of a qualitative study was justified by the exploratory nature of the research question. Indeed, the primary objective of this study was to expand understanding of how future home interior design could be guided by the principles of sustainability and supported by a variety of smart technologies. Therefore, it was necessary to assess existing trends in residential interior design in terms of their energy efficiency and potential environmental benefits. Additionally, one local case study was required to ensure that these concepts could be implemented in the Pakistani context.

Sampling

The study will employ purposeful sampling to select relevant secondary sources, including journal articles, books, conference proceedings, and reports, with a preference for reputable sources such as UNEP and IEA. The study will prioritize recently published material (2020–2025) but may include older foundational works. A single sustainable smart residence in DHA Lahore will be purposefully selected to investigate the integration of smart and sustainable features.

Research Instrument

The initial research methodology involved developing a document analysis tool that would allow comparison of the information retrieved from the selected literature. The analysis tool included categories such as sustainable materials, energy-efficient design, smart home technologies, artificial intelligence (AI), the Internet of Things (IoT), and home energy management.

For the case study, an observation checklist was created to evaluate the following sustainable and smart design elements:

- Electrically efficient lighting
- Smart lighting and climate control
- Smart security
- Use of renewable energy (if any)
- Use of sustainable materials
- Water-saving technologies

- Residential environment
- Home automation.

Data Collection Procedure

A close examination of Abdallah's (2026) work shows that the author focuses on advanced technologies and innovations in green buildings, with little attention to occupants' lifestyles and behavior. Although the author emphasizes creating more comfortable, adaptive, and energy-efficient built environments, he overlooks the role of interior design in balancing technology and ignores the importance of using recycled and natural resources and low-volatile-organic-compound materials in sustainable interior design.

Case Study: Sustainable Smart Home in DHA Lahore

A contemporary residence located in Defence Housing Authority (DHA), Lahore, was selected as the case study because it incorporates several sustainable design strategies and modern smart home technologies. The residence includes features such as smart lighting controlled through mobile applications and voice assistants, as well as automated heating, ventilation, and air-conditioning (HVAC) systems.

- Smart security systems with remote monitoring.
- Motion sensors and occupancy-based lighting.
- Light-emitting diode (LED) lighting to reduce electricity consumption.
- Low-volatile-organic-compound interior finishes and environmentally friendly building materials.
- Large glazed openings that maximize natural daylight and reduce dependence on artificial lighting.
- Water-efficient sanitary fixtures to reduce domestic water consumption.
- Energy-saving appliances with low electricity usage.

The case study illustrates how the combination of sustainable interior design and smart home automation can improve occupant comfort, reduce operating costs, and improve energy efficiency.

- Water-efficient fixtures to reduce domestic water consumption.

The case study shows how the combination of sustainable interior design and smart home automation can improve occupant comfort, reduce operating costs, improve energy efficiency, and promote environmentally responsible residential living.

Data Analysis

The data are organized into two major themes:

- Sustainability in residential interior design
- Smart home technologies in residential interiors

Limitations of the Study

The research has a number of limitations. First, it is based on secondary information, and only one case study was used for practical implementation. Therefore, the results cannot be fully applied to all residential projects in Pakistan. Second, the selected case study from DHA Lahore may not reflect housing conditions in other socioeconomic or geographical contexts. Third, rapidly evolving smart home technologies may lead to new developments that were not captured in the reviewed literature. Finally, only English-language publications were included in the study, which may have excluded relevant research published in other languages. Despite these limitations, the study provides a comprehensive understanding of the integration of sustainability and smart home technologies into future residential interior design.

Case Study

The USGBC Headquarters in Washington, D.C.

This building is an outstanding example of how to integrate technology into a contemporary interior environment. Not only does the project emphasize the use of recycled or natural materials in its construction, but it also implements the latest innovations in smart building technology. The headquarters were designed to maximize energy performance and indoor environmental quality while minimizing waste. The headquarters were certified as LEED Platinum for Commercial Interiors and now boast LEED, WELL, and TRUE Platinum certifications for their ongoing performance.

One of the headquarters' key energy-saving systems is its occupancy- and daylight-responsive lighting, which reduces power consumption without sacrificing comfort or convenience. Photosensors signal to the building's lighting system whenever daylight is present and adjust the intensity of the artificial light accordingly. Sensors also detect when workers leave a room and automatically turn off the lights when nobody is present. At the same time, however, workers can manually control the intensity of the lighting. This technology provides the occupants of the headquarters with high levels of comfort and convenience while still reducing the building's energy footprint. The headquarters also make use of automated shading and carefully planned daylighting strategies to prevent overexposure to sunlight while still maximizing natural lighting.

The facilities also have an abundance of electrical submeters and sensors that measure the consumption of various electricity categories. These tools allow managers to assess the consumption patterns of different buildings and make adjustments where needed. The USGBC headquarters cut their electricity use by 48% since 2011 and saved 47% of their electrical costs compared with the time of opening, according to a USGBC facility-management case study. Adjustments to heating and air-conditioning schedules and equipment use also helped the headquarters lower the costs associated with building operations. For instance, the equipment was turned off when the building was not occupied by workers.

The headquarters also incorporate energy-saving technology into the individual workspaces of their employees. Some outlets are turned off by motion sensors when a workspace is unoccupied and

can be turned on again when the worker returns. The same principle is used for some smaller appliances and equipment. This technology helps minimize the consumption of energy by large electronics and machinery when they are not in use. Overall, the headquarters make use of numerous small adjustments to the building's energy use in order to minimize its footprint and contribute to environmental sustainability.

As mentioned above, the USGBC headquarters prioritize natural lighting in the building's interiors. However, the interior designers complement the fenestration with elegant yet functional interior structures. The headquarters are organized around a number of private offices, which house rotating exhibitions and installations, and open-plan workspaces. Daylight is funneled into the workspaces via clerestories, while larger display rooms have glass curtain walls. The structural elements of the building, including the roof and walls, are made with repurposed materials that minimize the ecological impact of construction. In particular, the walls are constructed with bricks made from recycled tin. The headquarters also feature abundant vegetation, both in the form of gardens and houseplants. The plants help clean the air in the building and create a healthier environment for the workspace. Overall, the interior designers of the headquarters prioritize the use of natural lighting and materials when designing the interior spaces of the building.

Suzlon One Earth, Pune in India

It is an example of how advanced technology and sustainable design can be integrated to create an environmentally conscious working environment. This project aimed to reduce the environmental impact of an extensive corporate campus and ensure the well-being of those who use the space. Sustainability was embedded into the project at different levels, from energy generation and water management to building operations, material selection, and the indoor environment. Instead of relying on one particular approach to achieving sustainability, the project utilizes a number of passive and active systems that work together to enhance the overall performance of the building.

One of the most important aspects of Suzlon One Earth is the use of renewable energy sources. Solar photovoltaic panels and wind turbines are installed across the campus to create a local supply of clean energy and reduce the building's reliance on the traditional electricity grid. The project makes use of its extensive site and suitable environment to adopt a design that embeds the generation of renewable energy into the architecture and interior spaces of the building. The incorporation of renewable technologies exemplifies their potential integration into the built environment as a constituent component rather than as an isolated engineering venture. The use of these sources is supported further by an emphasis on energy-efficient lighting, heating, air-conditioning, and building management systems, which reduces the demand for power from other sources.

Smart technologies play an essential role in managing and controlling building services. Suzlon One Earth makes use of an Integrated Building Management System (IBMS), which means that building services within different parts of the campus can be monitored and controlled from one centralized location. Lighting, air-conditioning, power, and other systems can be managed according to the needs and requirements of different areas within the building. Sensors detect

whether spaces are occupied and therefore reduce lighting and other systems in unoccupied areas, resulting in reduced energy use. Such systems mean that manual control of building services is not required and allow the building to actively manage its performance throughout the day.

Indoor environmental quality is another key feature of the project. Sensors that detect CO₂ levels allow interior air quality to be monitored and managed effectively. These sensors highlight the importance of considering the indoor environment in relation to the people who occupy the space. Increased levels of CO₂ indicate when greater levels of ventilation are required, and the use of such sensor technology allows the building to react accordingly. This is especially relevant with regard to enclosed office interiors, which are heavily reliant on mechanical systems for ventilation and require sufficient airflow for the comfort of the people within the space.

Daylight is another passive design strategy that has been prioritized in this project. By incorporating daylighting into the architectural and interior design of the building, the demand for artificial lighting is reduced. Natural light not only reduces energy use within the building but also has a positive effect on the visual comfort of the building's occupants. The use of daylight is complemented by smart lighting technologies and automatic controls, which allow natural and artificial light to be combined effectively. The use of passive design strategies in conjunction with active technologies illustrates how the two can be used together to enhance building performance.

Water conservation is another key feature within Suzlon One Earth and is used extensively throughout the campus. Rainwater harvesting and wastewater treatment systems allow water to be reused and therefore reduce the strain on water supplies. Water-efficient fittings reduce the amount of water used unnecessarily, highlighting their value in a wide range of commercial developments.

Contemporary Residential House, DHA Rahbar, Lahore.

The selected house design is a 10-marla contemporary house in DHA Rahbar, Lahore. The design of the house includes a basement level, the ground floor, and the first floor. Despite the fact that the house seems very modern and luxurious, many of its design features can be used in sustainable house design in terms of natural lighting, ventilation, efficient space usage, and occupant comfort.

One of the most obvious sustainable elements of the selected house is the use of large windows and floor-to-ceiling glass openings. Such openings let daylight into the house's interior and thus reduce the need for artificial lighting during the day. In addition, they provide views of the outside world and support natural ventilation. In this way, such an approach will not only increase comfort but will also reduce the need to use mechanical systems.

An open-plan organization of the living room, dining room, and kitchen is another element of efficient space usage. The spaces are visually interconnected, which improves circulation and brings more daylight into the spaces. The kitchen is well equipped with appliances and storage and has a comfortable layout.

Lighting design is yet another important element of the house. Recessed ceiling lights, hidden LED strips, pendant lights, task lights, and accent lights are chosen based on the type of activity being carried out. Natural and artificial light together offer versatility and may prevent unnecessary use of lighting.

The choice of interior materials, such as marble, walnut wood, glass, and textured finishes, makes for a coherent and durable interior language. However, there is no data in the available house-visit report regarding the recycled or locally sourced nature of these materials, their low-VOC finishes, or their life-cycle performance.

The house also offers potential for smart sustainable integration. Smart lights and occupancy-sensor systems could control lighting based on room usage and the presence of natural light. Smart blinds could control the amount of sunlight and glare. Smart HVAC and energy monitoring could help control energy use. None of these features is mentioned in the house-visit report, but they could potentially be integrated into the existing design.

In general, the house called DHA Rahbar is a good example of how sustainable architecture can be applied to residential buildings using factors such as passive architecture, space planning, daylight, ventilation, and resource management. The incorporation of these techniques together with advanced technologies could make this modern building much more energy-efficient.

Discussion

Figure 4.1. Living Room of the Sustainable Smart Residence in DHA Lahore

Source: Author's photograph (2026).

Figure 4.1 illustrates a contemporary living room that incorporates sustainability and smart-home technologies. The large ceiling in the two-story house not only creates an open space but also ensures the free movement of warm air upwards, thus removing it from the living area. This architectural feature also allows more daylight into the house, reducing the need for artificial lighting during the day, which, in turn, improves living conditions (Kibert, 2022; United Nations Environment Programme [UNEP], 2023).



The large windows at floor and ceiling level allow the outside in while also reducing the electricity needed to heat or light the room. Using daylight as a source of illumination reduces the carbon

footprint of a house and is therefore a hallmark of a sustainable home (International Energy Agency [IEA], 2023; UNEP, 2023).

The living room is also equipped with remote-controlled motorized curtains that allow the amount of natural light, glare, and heat to be regulated. Smart home technologies like these help balance the effects of sunlight with the comfort of the home's occupants while reducing the energy costs associated with blinds or curtains (International Energy Agency [IEA], 2023).

Finally, the house utilizes energy-saving recessed lighting and decorative pendant lamps that use LED technology. LED lamps are much more energy-efficient and have a longer lifespan than traditional light bulbs. Moreover, their use in combination with a smart home allows electricity consumption for lighting to be reduced by providing illumination only when and where it is needed (International Energy Agency [IEA], 2023).

The sustainability of the contemporary living room is further enhanced by the decorative yet durable interior made of porcelain tiles with a marble pattern, wood, and quality upholstery. These materials reduce the maintenance and repair costs of the house while also prolonging the lifespan of the furnishings (Kibert, 2022). Moreover, the plants in the room add to the beauty of the room, as well as to the air quality and mental well-being of the occupants (U.S. Environmental Protection Agency [EPA], 2023).

In conclusion, the example of the contemporary living room showcases how the best aspects of a sustainable and smart home can be combined to create a residence that is both environmentally responsible and comfortable for its occupants. The case highlights a selection of sustainable features and materials that have become more popular in recent years due to growing demands for environmental responsibility and energy efficiency (Kibert, 2022; International Energy Agency [IEA], 2023; UNEP, 2023).

Figure 4.2. Home Office of the Sustainable Smart Residence in DHA Lahore

Source: Author's photograph (2026).

Figure 4.2 illustrates a modern home office that utilizes sustainable interior design to meet contemporary home-office requirements while conserving natural resources through a combination of efficient lighting and modern technology, helping to create a highly functional and energy-efficient working environment.

The large window allows plenty of natural daylight to enter the room, thus reducing



the need for artificial lighting during the day and creating a comfortable environment for the occupants. Providing access to daylight has been shown to reduce energy use, as well as improve health, comfort, and overall productivity among building occupants (International Energy Agency [IEA], 2023; United Nations Environment Programme [UNEP], 2023). The window has blinds that enable occupants to adjust the amount of daylight entering the room in terms of privacy, brightness, and glare.

The room has energy-efficient recessed lighting and display shelves. The lighting provides sufficient illumination for various tasks while using less electricity than other lighting systems, while the shelves hold items needed in the room. The use of light-emitting diodes (LEDs) in recessed lighting reduces the amount of electricity used for illumination and ensures that the lighting system lasts longer (Kibert, 2022).

The room has a ceiling fan that facilitates improved air circulation throughout the house. Improved air circulation in a house reduces the need for artificial air-conditioning systems, thus saving energy. The reduced need for artificial cooling also helps reduce greenhouse gas emissions in the atmosphere, thereby countering global warming (IEA, 2023).

In addition to ceiling fans, the house has durable interior finishes and high-quality furniture. Durable wood finishes, including paneling and shelving, have been used throughout the house. High-quality fittings and finishes ensure that the furniture and fittings in the house are long-lasting, thereby reducing the need for constant furniture replacement. Using durable materials is one of the principles of designing sustainable interiors because it reduces waste generated from furniture disposal and ensures effective utilization of the materials used for the house's interior finishing (Kibert, 2022).

Finally, the home office shows how a variety of sustainable design features could be utilized to create a homely yet productive working environment that is fit for the future. The home office has been designed to provide ample working space while maintaining its ability to serve multiple purposes, such as hosting meetings, working out, and studying. The office has been furnished with comfortable seating and storage solutions to accommodate the occupants' needs while providing a conducive working environment. The home office can also be fitted with a range of smart home technologies, including voice-activated switches and sensors, occupancy sensors, smart thermostats, and alarm systems. Smart home technologies could enhance household sustainability by improving energy efficiency, reducing energy expenses, and ensuring convenience for occupants (IEA, 2023).

Figure 4.3. Smart Staircase Design with Motion Sensor Lighting in the Sustainable Smart Residence, DHA Lahore

Source: Author's photograph (2026).

Figure 4.3 illustrates a modern staircase with integrated sustainable design and home-system technologies. The staircase has motion-sensor LED lights that turn on as one steps onto the stairs and turn off after a certain period when one reaches the end. This ensures energy-efficient use of the staircase because electricity is used only when people are using the stairs. The use of occupancy and

motion sensors to control lighting in homes is a proven energy-saving strategy in residential lighting because the lights are switched on only when needed in each room (International Energy Agency [IEA], 2023).

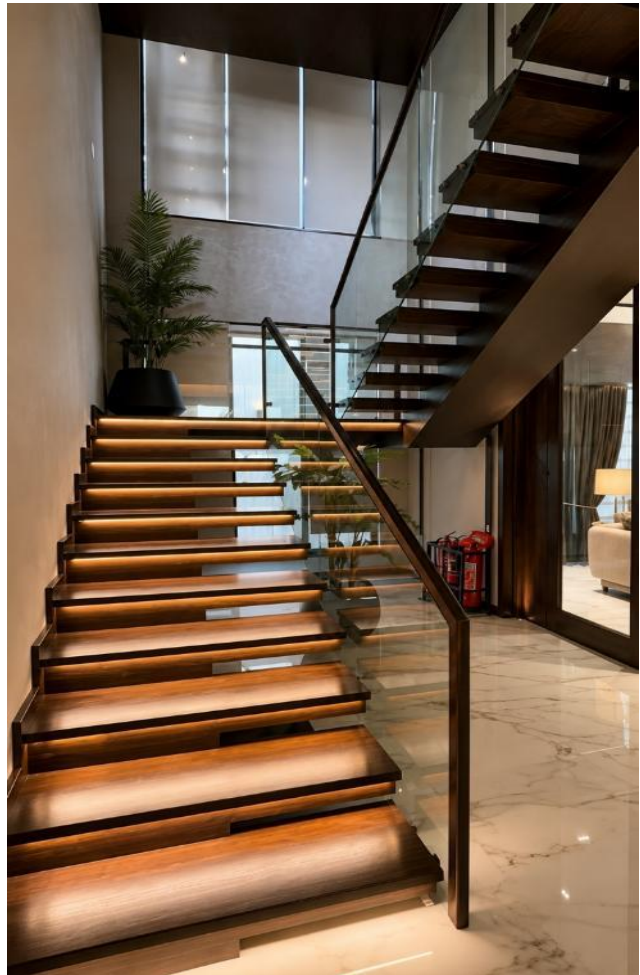
The stairs have been fitted with energy-efficient LED strip lighting, which is integrated into each step. LED-lit stairs are more energy-efficient than standard lighting, last longer, and require less maintenance while still providing the required amount of light (Kibert, 2022). The LED strip integrated into the stairs also allows for safe navigation at night while adding an attractive feature to the home.

The use of open wooden steps allows natural and artificial light to illuminate the staircase, resulting in a brighter interior space. The glass balustrades allow even more daylight to flow throughout the house, brightening it. Maximizing the amount of daylight that flows through a building is an important passive design strategy that promotes sustainability while ensuring excellent indoor environmental quality (United Nations Environment Programme [UNEP], 2023).

The staircase is also located next to large glazed openings that allow natural daylight to illuminate the circulation space during daylight hours. This passive design strategy reduces reliance on artificial lighting, thus improving occupants' visual comfort and reducing overall household energy consumption (IEA, 2023; UNEP, 2023).

The use of durable wood finishes, glass railings, and LED motion-sensor lighting in this project is a creative example of how sustainability-focused materials and cutting-edge technologies can be incorporated into home circulation areas. The motion-sensor lighting not only allows for improved energy efficiency but also increases the overall comfort, accessibility, and safety of the staircase by activating only when needed.

In general, this staircase is a good reminder of how passive design, energy-efficient LED lighting, and innovative automated systems can be utilized in a residential setting to create a safe, eco-friendly, and technologically advanced environment. The case highlights the significance of



designing with smart building technologies in mind in order to improve the sustainability and livability of residential buildings (Kibert, 2022; International Energy Agency [IEA], 2023; United Nations Environment Programme [UNEP], 2023).

Figure 4.4. Indoor Swimming Pool Area of the Sustainable Smart Residence, DHA Lahore

Source: Author's photograph (2026).

Figure 4.4 shows the indoor swimming pool area of the selected sustainable smart residence. It demonstrates the use of different sustainable technologies and features to ensure that people using the facility have a beneficial and comfortable experience.

The large glazed window allows maximum daylight utilization in the room, thus minimizing the need for artificial lighting sources. Daylight maximization is a key passive design strategy that improves visual comfort and reduces electricity consumption in the building (International Energy Agency [IEA], 2023; United Nations Environment Programme [UNEP], 2023). The window is equipped with motorized curtains, which can be remote-controlled or connected to the smart home system to manage daylight, privacy, and solar heat gain.



The pool area makes use of energy-efficient recessed LED lighting and hidden linear LED strip lighting, which provide even illumination while minimizing electricity consumption compared with traditional lighting sources. LED lighting has a longer lifetime, thus being a more sustainable option for residential buildings (Kibert, 2022). The lighting system can be connected to the smart home system to manage its operation and optimize electricity consumption.

The extensive use of wood-finish wall paneling and flooring with a natural appearance creates a cozy atmosphere while utilizing durable materials that require minimal maintenance. The use of indoor plants contributes to residents' well-being by connecting them to the outdoors, thus improving indoor environmental quality (U.S. Environmental Protection Agency [EPA], 2023).

The indoor swimming pool itself contributes to residents' health and well-being by providing them with an opportunity to engage in physical activity and relax in the comfort of their own home. Connecting the equipment in the pool area to the smart home system ensures optimization of

energy and water consumption, thus improving the operational efficiency of the facility (International Energy Agency [IEA], 2023).

In general, the pool area is a good example of the use of passive daylight, energy-efficient lighting, and smart home systems, as well as durable and natural materials, to create a healthy and sustainable recreational area. The case study demonstrates that the use of sustainable materials and smart home technologies can improve the environmental performance of the building while contributing to residents' comfort, well-being, and overall quality of life (Kibert, 2022; IEA, 2023; United Nations Environment Programme [UNEP], 2023).

Conclusion

This study aimed to explore future trends in home interiors by examining the impact of sustainability on residential interiors. The research method consisted of a qualitative review of academic literature on the topic and a case study of a smart, sustainable residence in DHA Lahore. The research findings suggest that sustainability trends represent a major force impacting the transformation of residential interiors into smart and eco-friendly concepts that benefit the well-being of their occupants.

The findings of the review demonstrate that sustainability is becoming a critical consideration in modern residential interior design. Eco-friendly materials, energy-efficient appliances, and water-saving devices are staples in modern housing and continue to grow in popularity as carbon footprints and environmental concerns become increasing concerns for homeowners and renters. According to the United Nations Environment Programme (2023), reducing carbon emissions from buildings is a primary objective of the environmental movement, and net-zero buildings are being promoted as a new standard in the architecture and construction industries. Therefore, the findings of this research suggest that sustainability is a critical consideration in residential interior design.

The review also demonstrated that smart home technologies are quickly becoming essential in residential settings. The increasing popularity and accessibility of AI, IoT, and smart devices enabled by technological advancements allow residents and homeowners to benefit from the convenience, security, comfort, and efficiency that smart home technologies bring. The findings of the case study conducted in DHA Lahore support this statement, demonstrating that sustainability-focused improvements can yield positive results in residential settings.

Overall, the study concludes that future home interior design will rely on sustainable technologies that will improve the living environment and address the issue of ecological footprints. In this perspective, sustainable design and smart technologies are two interrelated concepts that contribute to the creation of a resilient and future-proof built environment.

The current research adds value to existing studies on sustainable interior design and smart technologies by summarizing the existing scholarly works on the topic and providing a practical example of the application of such concepts in a local context. The findings can be used in the practical work of interior designers, architects, housing industry specialists, and policymakers to improve the quality of residential buildings in the future. Further research should be conducted to

understand global perspectives and address issues such as the use of smart technologies in residential buildings. For example, additional surveys, interviews, and case studies in Pakistan and other areas can provide more information about people's attitudes and challenges experienced in the use of new technologies and concepts for residential building design.

Recommendations

Based on the findings of this study, the following recommendations are proposed to promote the integration of sustainability and smart home technologies in future residential interior design.

First, interior designers and architects must focus on sustainable design practices by choosing environmentally friendly materials such as recyclable, renewable, and local resources, as well as low-volatile-organic-compound (VOC) paints, adhesives, and finishes. Energy-saving lighting, water fixtures, and passive design strategies such as natural ventilation and daylight utilization must also be considered to reduce adverse environmental effects and improve indoor environmental quality. Additionally, the application of circular design principles that promote durability, reuse, and waste reduction can contribute to sustainable residential development.

Second, homeowners, designers, and housing developers should promote the adoption of smart home technologies to improve residential energy efficiency, comfort, and safety. Intelligent lighting systems, programmable thermostats, occupancy sensors, automated HVAC controls, smart appliances, and digital security systems can optimize resource consumption while enhancing occupants' convenience and quality of life. Integrating smart home technologies with sustainable design strategies can significantly reduce household energy demand and support climate change mitigation efforts.

Third, smart home technologies should be implemented with careful consideration of cybersecurity, data privacy, interoperability, affordability, and ease of use. Designers and technology providers should ensure that smart systems are secure, reliable, and compatible with future technological developments. User education and technical support should also be provided to encourage wider adoption and effective operation of smart home systems.

Furthermore, governments and housing authorities should introduce policies and incentive programs that encourage sustainable construction and the adoption of energy-efficient smart technologies in residential buildings. Financial incentives, green building certification systems, and public awareness campaigns can motivate homeowners and developers to invest in environmentally responsible and intelligent housing solutions. The results of the DHA Lahore survey also demonstrate that it is possible to combine sustainability with smart home technology in Pakistani households. As a result, developers should consider installing smart lighting switches, climate-control systems, energy-efficient devices, water-saving appliances, and other sustainable technologies in residential buildings to ensure long-term cost savings and sustainability.

Finally, future researchers are advised to conduct primary empirical studies involving homeowners, interior designers, architects, and smart technology specialists to verify the findings of this review. Comparative studies in different cities and socioeconomic contexts in Pakistan may provide greater

insight into acceptance, implementation challenges, and the long-term performance of sustainable smart homes. Further research is also needed to explore emerging technologies such as artificial intelligence, renewable energy integration, and intelligent energy management systems to support the continued evolution of future residential interior design.

References

- Alizadeh, F., Randall, D., Tolmie, P., Lee, M., Xu, Y., Mennicken, S., Woźniak, M. P., & Pins, D. (2024). Future of home-living: Designing smart spaces for modern domestic life. arXiv. <http://ecsdev.org/ojs/index.php/ejsd/article/view/908>
- International Energy Agency. (2023). Energy efficiency 2023.
- Kibert, C. J. (2022). Sustainable construction: Green building design and delivery (5th ed.). John Wiley & Sons.
- Lee, J., & Kim, H. (2024). Smart home automation and invisible technology in residential environments. *Automation in Construction*. Advance online publication.
- Seymour, W. (2022). A design philosophy for agents in the smart home.
- United Nations Environment Programme. (2023). 2023 Global Status Report for Buildings and Construction.
- U.S. Environmental Protection Agency. (2023). Indoor Air Quality (IAQ).
- Zhong, W., Schröder, T., & Bekkering, H. (2022). Biophilic design in architecture and its contributions to health, well-being, and sustainability: A critical review. *Frontiers of Architectural Research*, 11(1), 114–141.