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Original Research Article

From Greenwashing to Sustainable Architecture*

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Abstract

Problem statement: Over the past four decades, the philosophy of sustainability has shaped architectural discourse—initially through an environmental lens and later through economic and socio-cultural perspectives. While the knowledge base and technological capacities for sustainable architecture have grown significantly, built outcomes often fail to meet the normative goals set by theory. This persistent gap between conceptual ambition and real-world implementation has limited architecture's contribution to sustainable development. Superficial or reductive interpretations of sustainability have enabled the rise of greenwashing, where symbolic design gestures are misrepresented as genuine environmental or social commitment. A critical reassessment of greenwashing is necessary to reframe sustainable architecture as a more pragmatic, contextually grounded, and operationally meaningful paradigm.

Research objective: This study aims to critically analyze the aspects of greenwashing in architecture to identify key parameters contributing to the development of an efficient and comprehensive approach to sustainable architecture. These parameters may provide the foundation for redefining sustainable architecture as a holistic, integrative, and practice-driven approach.

Research methodology: This study adopted a critical-analytical methodology to examine greenwashing within architectural discourse. Using discourse analysis and logical-critical reasoning, it identified key parameters for advancing a more pragmatic and context-responsive model of sustainable architecture. Data collection involved documentary and library-based sources, including academic literature and theoretical texts in the fields of sustainability and critical architecture.

Conclusion: The results indicate that redefining technology within a socio-cultural system, adopting process-oriented thinking, embracing contextualism and regionalism, fostering citizen participation and green behavior, and integrating cultural awareness, realism, and holistic approaches are among the most significant components of an effective sustainable architecture and proper responses to greenwashing. Indeed, these parameters lay the foundation for reimagining sustainable architecture as a pragmatic and contextually grounded design paradigm, rather than a merely symbolic or fetishistic construct.

Keywords: *Sustainable Architecture, Greenwashing, Technology, Process, Regionalism, Holism.*

Introduction and Problem Statement

In recent decades, global challenges such as climate change, pollution, the depletion of natural resources, and the energy crisis have placed sustainability at the heart of policymaking and development discourses. In response to these environmental crises, a growing "green wave" has emerged, prompting stakeholders—ranging from investors and consumers to governments and corporate clients—to pay increasing attention to environmental issues. As a result, terms like green packaging, green

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vehicles, green technology, and green architecture have become the embodiment of the prevailing sustainability discourse. Based on ecological issues, organizations are adopting environmentally friendly strategies and technologies. However, in many cases, these approaches remain at the level of claims and have not led to the actual outcome of sustainability goals. The Climate Change Report (2022) reveals limited progress in achieving environmental objectives. Furthermore, in 2021, the European Commission reported that 42% of green claims were exaggerated, misleading, or false. In addition, a global Google survey (2022) of 1,500 executives in the United States indicated that 68% of them believed their organizations were engaging in greenwashing—that is, conveying a false impression or providing misleading information to present a company, its products, or practices as more environmentally friendly than they truly are. Within this context, greenwashing has emerged as one of the key challenges to sustainable development. It refers to the act of promoting environmentally friendly initiatives to divert attention from an organization's actual environmental shortcomings, or to present misleading and unfounded claims to shape a public perception of environmental responsibility. Greenwashing, in essence, reflects the discrepancy between an organization's green claims and its actual environmental and social performance. The construction industry has also been faced with greenwashing. Sustainability approaches in architecture often result in the creation of false impressions and misleading information about environmental compatibility, leading to the production of superficial, false, and deceptive sustainability claims. In such a way that many so-called green buildings perform poorly not only in environmental indicators, but also in social and economic aspects, compared to what designers claim. Thus, the gap between theory and practice in sustainable architecture has turned into a serious obstacle in achieving real sustainability. The main issue of this research is to identify the conceptual and practical gap between the discourse of sustainable architecture and its manifestation in practice. The aim is to explain the latent aspects of greenwashing in architecture and to critically examine its components, aiming to outline key parameters for achieving a more comprehensive, coherent, and practical framework for sustainable architecture. This paper, through an analytical-critical approach, seeks to clarify the conceptual boundaries between sustainability and greenwashing. Revisiting current trends in contemporary architecture provides a foundation for theoretical and practical reconsideration of sustainable architecture—as a multidimensional paradigm, not merely a technical agenda—defined through cultural, social, ethical, and technological components.

Research Questions

•How are greenwashing approaches represented in contemporary architecture?

•Which aspects of greenwashing, as revealed through critical reinterpretation, most significantly contribute to the gap between theory and practice in sustainable architecture?

•Which parameters can contribute to redefining sustainable architecture in response to superficial narratives, towards achieving a more pragmatic and contextually relevant form of sustainability?

Literature Review

This study reviews literature in three levels: descriptive, critical, and prescriptive. It begins by discussing scholarly works that define and describe sustainable architecture and its fundamental principles. Then, it analyzes sources that critically examine the inefficiency of mainstream sustainability concepts in practice and explore the barriers to achieving sustainable architecture. Finally, it considers studies that introduce new perspectives and models to improve architectural performance and promote sustainability.

At the descriptive level, this study considers sustainable architecture as a comprehensive design approach that reduces negative environmental impacts while promoting health, well-being, and social sustainability (Agboola et al., 2024). Its core principles cover sustainable site planning, water conservation and quality, responsiveness to energy and environmental concerns, indoor environmental

quality, and responsible use of materials and resources (Ragheb et al., 2016; Merenkov et al., 2019).

Over the past fifty years, sustainability in architecture has evolved under the influence of technological, economic, environmental, and political factors, giving rise to various approaches and schools of thought within the field. Although these approaches differ in certain details and perspectives, they all share a common goal: preserving energy and resources, reducing carbon emissions and the impacts of climate change, and enhancing human comfort and well-being. For example, the historical progression of sustainable architecture over the past decades can be outlined as follows: 1950s: Tropical Architecture/1960s: Environmental Architecture /1970s: Low-Energy Architecture / 1980s: Passive Architecture / 1990s: Sustainable Architecture / 2000s: Low-Carbon Architecture / 2010s: Net-Zero Energy (Bassas et al., 2020). In recent years, due to the limited realization of sustainable architecture goals in practice, new approaches have emerged under concepts such as smart architecture, biophilic architecture, and blue-green architecture (Well & Ludwig, 2020; Zare et al., 2021; Zhong et al., 2022; Ding et al., 2024).

At the second level, from a critical perspective, although sustainability has gained significant attention in architecture over recent decades, and both theoretical knowledge and related technologies have advanced shows that sustainable architecture has not fully achieved its stated goals in practice. There remains a fundamental gap between theoretical discourse and practical implementation. Many studies suggest that many projects identified as sustainable have not fully met the intended goals of sustainability in practice (Vefago & Avellaneda, 2012; Mehaffy & Salingaros, 2013; Mahdavinejad et al., 2014; Yilmaz et al., 2020; Khoshbakht et al., 2022). Scholars have identified multiple structural barriers in achieving sustainable architecture, including complex technologies, economic constraints, lack of proper education, and the shortage of skilled and efficient labor (Esa et al., 2011; Assylbekov et al., 2021; Fattah Ammar, 2024). Other studies, through deeper investigations into sustainable architecture, have revealed that the disconnect between knowledge-based theory and practice is rooted in more complex and multidimensional issues. These include the complexity of contemporary societies, technological challenges, economic system structures, resource scarcity, waste generation, energy storage, and the absence of effective standards for recycling and reuse (Vefago & Avellaneda, 2012). Mehaffy and Salingaros (2013) point to the neglect of sustainability philosophy in infrastructure and foundational design, along with the dominance of modern architecture's technological regime. Several scholars have critically addressed the oversimplified interpretation of sustainability in architectural practice, along with the prescriptive and performance-score orientation of certification systems such as LEED, which tend to reduce sustainability to quantifiable checklists rather than holistic integration (Mahdavinejad et al., 2014; Onyeizu, 2014). Other scholars have underscored the insufficient integration of critical contextual parameters—including local environmental characteristics, vernacular and cultural identity, climatic responsiveness, socioeconomic dynamics, and energy-related consequences—as significant deficiencies in prevailing sustainability frameworks (Onyeizu, 2014; Zhong et al., 2023). Furthermore, the tendency to reduce sustainability to a mere matter of energy efficiency—while disregarding the pivotal role of human agency and participation in its evolution—has been recognized as a fundamental conceptual limitation (Yilmaz et al., 2020). Moreover, the prevailing emphasis on emerging technologies—without sufficient attention to the cultural context, individual values, and religious beliefs that shape their acceptance—has been identified as a critical challenge in the pursuit of sustainable architecture (Debrah et al., 2022). These studies indicate that although many architectural projects incorporate visible signs of sustainability, they often perpetuate consumerist values and rely on the aestheticization of "green" elements, rather than advancing authentic and integrated sustainable practices.

At the third level, from a prescriptive approach, a group of recent studies has emphasized the need to redefine the concept of sustainability in architecture, particularly considering the intensifying environmental crises on the one hand, and the ongoing superficial engagement with

the philosophy of sustainability on the other. These studies propose new approaches that integrate cultural, ethical, social, and technological dimensions into sustainability discourse. For example, several scholars underscore the significance of cultural frameworks, behavioral dynamics, and user-centered needs as foundational variables in the formation of sustainable architectural practices (Rezapour et al., 2012; Mustika et al., 2021). Others have explored how cultural embeddedness and local sociocultural contexts serve as catalysts for advancing practice-based sustainability models (Soini & Dessein, 2016; Bakri, 2018; Zhong et al., 2022). Within this emerging body of research, concepts such as the "Art of Sustainable Design" (Ayman et al., 2017), "Cultural Sustainability" (Rokosni, 2019), "Environmental Ethics" (Ahmed et al., 2020; Úbeda-García et al., 2021), "Anthropocentric Paradigm" (Bibri, 2021; Rane, 2023), "Society 5.0" —which advocates for a more pragmatic, integrated, and anthropocentric approach to sustainable design (Rane, 2023)—have been proposed as alternative frameworks that challenge purely technocratic interpretations of sustainability. These emergent perspectives reflect a paradigmatic transition in the discourse of sustainable architecture—from a primarily technocentric and performance-driven orientation to a more integrative, multidimensional, and human-centered paradigm grounded in cultural, ethical, and social considerations.The review of the literature indicates that despite the growing discourse on sustainable architecture, a significant gap persists between theoretical claims and practical realities. Among the manifestations of this disconnect, the concept of "greenwashing" remains underexplored, particularly in terms of direct and critical analysis. Accordingly, this study adopts a critical-analytical approach grounded in a rereading of existing literature to examine and identify the disjunction between the conceptual and practical dimensions of sustainable architecture through the lens of greenwashing. In doing so, the research aims to provide a foundation for rethinking and redefining the notion of sustainability.

Research Methodology

This study defines its objective within the scope of fundamental research and adopts a qualitative approach regarding its nature and methodology. The research method combines qualitative content analysis, logical-critical reasoning, and a structured review of the literature. The study gathered data through the review of documents and library-based sources, including academic articles, credible international references, and theoretical texts in the field of sustainable architecture and its associated critical discourses.

The data analysis in this study was carried out in three interrelated and complementary stages. First, through descriptive-conceptual analysis, key concepts such as "Sustainability," "Sustainable Development" "Sustainable Architecture," and "Greenwashing" were identified and interpreted. Next, by adopting a discourse-oriented critical approach, the gap between theory and practice in sustainable architecture was examined, along with a critical evaluation of prevailing green discourses. Finally, analytical-inferential reasoning was employed to extract foundational parameters and propose conceptual components for redefining sustainable architecture, beyond symbolic and superficial claims. This stage places particular emphasis on the roles of culture, the design process of technological systems, and ethical-social imperatives in shaping authentic and effective sustainability. This study adopts a theoretical framework that analyzes the foundational concepts of sustainable architecture in the contextual, cultural, human, technological, and behavioral dimensions. The framework draws on contemporary critical discourses as well as both theoretical and practical approaches to sustainability, aiming to systematically expose the disconnect between abstract theories and the actual performance of sustainable architecture. It further emphasizes the conceptual roots of sustainability while critically examining how sustainability is represented in practice, particularly through green claims and superficial expressions within the architectural field. Ultimately, this study, through a conceptual-analytical method grounded in qualitative data and supported by logical reasoning, seeks to develop a more realistic and pragmatic understanding of the essence of sustainable architecture by critically revisiting key texts and foundational concepts.

Theoretical Foundations

This research outlines its theoretical foundations across three key concepts: the multidimensional nature of sustainability; the interpretation of sustainable architecture as a manifestation of this philosophy within the architectural context; and the concept of greenwashing as a contemporary challenge to the achievement of sustainability goals. This section establishes the conceptual groundwork for the study's critical analysis.

- **Sustainability and sustainable development**

This research approaches the concepts of "Sustainability" and "Sustainable Development" as key yet ambiguously defined terms within recent scientific, philosophical, and policy-related literature. The word sustainability, derived from the Latin root sustinere—meaning to hold, support, or maintain—has historically referred to the "Continuation of Life" and the "Preservation of Desirable Conditions" (Caradonna, 2018).In general terms, sustainability implies the ethical, equitable, and efficient use of natural resources in a manner that meets the needs of the present generation while safeguarding the livability of the planet for future generations (Sakalasooriya, 2021).

Several theorists have explored sustainability through a range of conceptual frameworks, including socio-ecological systems, systemic sustainability, systems theory perspectives, networked sustainability, trans-spatial sustainability, strong and weak sustainability, urban metabolism, circular economy, and cultural sustainability (Ruggerio, 2021; Sakalasooriya, 2021). This diversity of perspectives suggests that sustainability is not merely an environmental concept, but rather a multilayered discourse that encompasses philosophical, cultural, economic, and political dimensions. From a historical perspective, the concept of sustainability has deep roots in ancient civilizations such as Rome, and it is not merely a modern response to contemporary environmental crises. However, since the 1980s—particularly following the publication of the Brundtland Report in 1987—sustainability, under the framework of sustainable development, has gained a central position in global policy and public discourse. This report famously defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Allaei et al., 2020). While sustainability reflects a fundamental and ontological concept, sustainable development provides the operational and policy-oriented pathways for implementing it in practice.

- **Sustainable architecture**

The philosophy of sustainability in architecture originated in the 1960s, a period characterized by increasing environmental concerns, resource depletion, and energy shortages that challenged the long-term sustainability of human life. In this context, sustainable architecture emerged as a multidimensional response to ecological degradation, economic instability, and the erosion of social cohesion, aiming to redefine the role of architecture in its relationship with both nature and society. Theoretical perspectives define sustainable architecture as an approach that emphasizes the interrelationship between humans, nature, and the built environment. Within this framework, two overarching perspectives have emerged regarding the position of humans in the natural system. The first is the "Anthropocentric Ethics", which places the environment in the service of human needs; the second is the "Ecocentrism"—which has gained increasing prominence in recent years—that emphasizes the intrinsic value of nature and advocates for the equal rights of all living beings, including humans (Syam et al., 2023).

Sustainable architecture fundamentally aims to create environments that respond to human needs and behaviors while being rooted in cultural and social context, and aligned with nature (Lami & Mecca, 2021). Building on this perspective, McLennan has proposed seven guiding principles for sustainable architecture including "respect for the wisdom of natural systems", "respect for people – the human vitality principle", "respect for place – [the] ecosystem principle", "respect for the cycle of life", "respect for energy and natural resources – the conservation principle", "respect for process – the holistic thinking principle" and " respect for the future" (Babcock, 2016). These principles establish the foundation for a holistic, ethical, and ecologically responsive approach—one that defines sustainable architecture beyond physical form and technological considerations.

Despite this, an excessive focus on energy and technology

in some mainstream approaches has overshadowed other critical aspects of sustainability, including cultural context, ethical values, and user behavior. This one-dimensional approach has contributed to the emergence of phenomena such as greenwashing in architecture, where projects may appear environmentally responsible but ultimately fail to address the core principles of sustainability in practice.

- **Greenwashing**

As environmental awareness increases and sustainability becomes more mainstream, greenwashing has emerged as a critical concern in the context of contemporary sustainability practices. Greenwashing refers to a marketing strategy aimed at presenting a company or organization as environmentally responsible—often through selective promotion—despite the absence of genuine efforts to reduce its environmental footprint.

Environmental activist Jay Westervelt first introduced the term greenwashing in 1986 through an essay that criticized the hotel industry's promotion of towel reuse programs (Freitas Netto et al., 2020; Yang et al., 2020). For several years, writers and researchers rarely used the term. Finally, in 1996, Burno and Greer redefined and popularized the concept in their book "Greenwash: The Reality Behind Corporate Environmentalism", which brought the term into broader academic and public use (Yang et al., 2020).

Several dictionaries have defined and discussed the concept of greenwashing. The Oxford Dictionary (2023), for instance, interprets greenwashing as "misleading information disseminated by an organization to present a public image of environmental responsibility, which is either unfounded or intentionally deceptive" (Freitas Netto et al., 2020). In addition to these lexicographic definitions, various scholars have contributed their interpretations of the term. TerraChoice (2010), in its report "Sins of Greenwashing", defines greenwashing as "the act of misleading consumers regarding environmental practices or environmental benefits, to build a positive perception". Lyon & Maxwell (2011) describe it as the selective disclosure of positive information about a company's environmental or social practices, without full transparency about its negative impacts, ultimately creating an overly favorable public image. Tateishi (2017) further defines greenwashing as "a form of communication that misleads people about the environmental performance or benefits of an organization, service, or product by hiding negative information and highlighting positive aspects". Some scholars consider greenwashing to be exclusively related to environmental issues and address social concerns under distinct concepts such as "CSR-Washing" (Pope & Wæraas, 2016) or "Bluewashing" (Berliner & Prakash, 2014). However, other researchers—such as Lyon and Maxwell—argue that greenwashing also encompasses social dimensions, and that environmental and socio-economic deception should not be treated as entirely separate domains. This study adopts the latter view, aligning with the integrative perspective proposed by Lyon and Maxwell.

Due to inadequate oversight in the enforcement of environmental regulations, numerous companies—and even architectural projects—invoke green terminology and certifications without genuinely adhering to the principles of sustainability. Such a disconnection between symbolic adherence and practical outcomes necessitates a critical reevaluation of both the conceptual definitions and applied strategies of sustainable architecture (Furlow, 2010; Yang et al., 2020).

Theoretical Framework

This study's theoretical framework focuses on analyzing the dimensions of greenwashing in architecture—a phenomenon that stems from the gap between theoretical ideals and practical implementation, and has led to the emergence of superficial and symbolic forms of sustainability.

- **Greenwashing in architecture**

The phenomenon of greenwashing is not limited to consumer products or services; it also affects broader domains such as architecture and urban design, both of which are increasingly subject to "green illusions" (Sigrist, 2023). In the architectural context, greenwashing manifests as a superficial engagement with sustainability, where visual or formal indicators suggest environmental responsibility, yet the underlying design strategies lack substantive alignment with sustainable principles.

When keywords such as "sustainable development,"

"sustainable architecture," or "green architecture" are searched online, the results often consist of images showcasing buildings with green roofs, green façades, and international certifications.

However, upon closer inspection, it becomes evident that many of these projects have destroyed natural habitats, the disruption of ecosystems, and the overconsumption of resources during their construction. In many instances, the application of green technologies or native plants is considered sufficient proof of sustainability, while deeper evaluations of the project's social, cultural, and economic dimensions are disregarded. In the contemporary context, sustainable architecture is increasingly entangled with commercial interests and the marketing of "being green" under the broader phenomenon of greenwashing.

Greenwashing in architecture takes multiple forms:

Greenwashing in architecture is often reinforced through the uncritical reliance on green certification systems and standards. Certification frameworks such as LEED and BREEAM tend to prioritize selected environmental indicators and generalized holistic perspectives, while often neglecting key elements of the local construction context, including economic, social, and cultural dimensions. Moreover, these certification systems often overlook the contextual mismatch that arises when country-specific rating tools are imposed on regions with distinct environmental and socio-cultural conditions, thereby compromising the core objectives of sustainability. Certification-based sustainable architecture is widely criticized as a form of "Pseudo Green" practice. Many certification systems are structured around programmatic criteria rather than actual performance, resulting in buildings that merely convey a green façade without delivering substantive sustainability outcomes (Mahdavinejad et al., 2014).In such pseudo-green practices, the marketing dimension of greenwashing tends to dominate. For some investors, the brand value of possessing a certified green building system outweighs the real sustainability performance of their projects.

Consequently, technologies that are more visually prominent receive greater emphasis, while social, cultural, and economic dimensions are frequently disregarded (Donovan, 2015). As a consequence, many certified architectural projects fail to fulfill the declarations and commitments made during the certification process. According to Fabiano Sobreira, green certification systems perpetuate greenwashing in two fundamental ways: first, by placing minimal emphasis on the intrinsic qualities and contextual specificity of the individual project; and second, by lacking a localized framework that accounts for critical factors such as community engagement, cultural context, and social dynamics.

Another prevalent form of greenwashing in sustainable architecture pertains to projects that, despite being categorized as "sustainable," contribute—either directly or indirectly—to environmental degradation throughout their development and operational phases (Belitardo, 2023). Such buildings are frequently promoted as examples of sustainable design solely based on the integration of green technologies, such as photovoltaic panels, green roofs, or green façades, without adequate consideration of their broader ecological footprint or contextual appropriateness (Ghisleni, 2022). Although sustainable technologies offer substantial environmental advantages, their isolated application cannot be regarded as a reliable indicator of genuine sustainability.

Another significant dimension of greenwashing is reflected in the use of imprecise language and marketing-driven terms, such as "eco", "green", or "environmentally friendly", without providing any verifiable evidence to support such claims. In many cases, references to recycled materials appear solely in promotional narratives, while the actual construction practices remain environmentally detrimental (ibid.).

Operational greenwashing represents another dimension of greenwashing in architecture. In this approach, sustainability is often equated with the inclusion of green roofs and façades. While these features are frequently promoted as strategies for reintegrating nature into urban environments—intended to improve air quality and enhance human well-being—they typically demand significant inputs of energy and resources, including irrigation, fertilization, and pest management, to remain functional. Moreover, the lifecycle management of plant materials involves energy-intensive disposal processes

at the end of their useful life. Across a range of climatic and geographic contexts, green roof systems often fail to deliver measurable environmental benefits or long-term sustainability. Although trees provide various ecological benefits—such as shading, carbon sequestration, and biodiversity support—their incorporation into built surfaces entails considerable expenditures of energy, spatial resources, and maintenance inputs (Sigrist, 2023). Another critical issue concerns the temporal dynamics of green infrastructure elements and their capacity to achieve sustainability goals over the long term. Plant species used in green roofs or façades often require several years to reach maturity and begin sequestering ecologically significant amounts of carbon dioxide. In addition, the transportation of vegetation to construction sites entails considerable energy expenditure, particularly over long distances, a factor that is rarely accounted for in sustainability assessments. When greenery is incorporated merely as a visual or symbolic gesture, without addressing factors such as climatic suitability, irrigation requirements, transport-related energy use, and long-term maintenance, sustainability is reduced to a superficial display, thus reinforcing operational greenwashing.

Contemporary architecture increasingly confronts the illusion of sustainability—a condition that emerges either from the marginalization of socio-cultural and economic dimensions, or a technocentric and formalist reduction of sustainability to energy performance and physical form. In many cases, claims of "green" design are made in the absence of a comprehensive integration of sustainability's multidimensional nature. Table 1 outlines the most common modes of greenwashing in sustainable architecture. The theoretical framework of this study engages in a critical discourse analysis of sustainable architecture to interrogate the discursive, political, instrumental, and performative dimensions through which greenwashing is enacted. It seeks to explore the complex interdependencies among form, process, technology, and culture, thereby constructing a conceptual foundation for a more integrative and situated understanding of sustainability in architectural praxis.

Discussion: From the Image to the Reality of Sustainability

Sustainable architecture in the contemporary context is increasingly confronted with the phenomenon of greenwashing. The various dimensions of greenwashing reveal that current architectural practice tends to address sustainability at a micro-level — while neglecting the necessary interplay between the micro, meso, and macro scales, which is essential for realizing authentic sustainability. This narrow and reductionist approach has significantly contributed to the growing gap between the core values of sustainable architecture and its actual implementation in practice. By critically analyzing greenwashing strategies, it becomes possible to identify the latent structural factors that have diverted sustainability from its original purpose—allowing for a renewed and more context-aware understanding of sustainability in architectural design.

- **From product to systematic approaches**

One of the prevalent mechanisms contributing to greenwashing in architecture is the use of technology without aligning it with a broader sustainability-oriented design process. The overemphasis on technology—often applied in a narrow and simplified way—has marginalized other key aspects that are equally important for advancing truly sustainable architectural practices.

Sustainable architecture today is increasingly based on digital and data-driven technologies. Big data, the Internet of Things (IoT), machine learning (ML), cloud computing, and artificial intelligence (AI) all play a significant role in the advancement of sustainable design and construction. While the overreliance on technology has contributed to greenwashing, its importance in realizing sustainability goals cannot be denied. The development of sustainable architecture undoubtedly requires technological support—yet not in the form it is currently being applied. This highlights the urgency of developing a more reflective and integrative approach to technology in sustainable design practice.

Various philosophical perspectives have been proposed regarding the nature of technology. Some philosophers define technology primarily as a tool, assigning it a hardware-based function that, in their

Table 1. Greenwashing in Architecture. Source: Authors.

Types of Greenwashing	Key Characteristics
Market-Driven Greenwashing	Program-based sustainability Label-oriented sustainability prioritizes image and certification over substantive integration into design and implementation Branding and marketing-oriented sustainability
Tech-Centric Greenwashing	Technological framing of sustainability, with the assumption that green systems ensure sustainable outcomes Lack of integration of sustainability into the architectural design process
Aesthetic Greenwashing/ Formal Greenwashing	Sustainability reduced to superficial design elements, such as green walls and roofs Lack of attention to water systems, climate responsiveness, and long-term performance

view, fails to fully express the essence of technology (Dusek, 2013, 53). Within this instrumentalist view, technology is simply a means to achieve specific ends (Moghadam Heidari & Monajemi, 2019, 23). Others contend that technology operates more like a rule or logic of behavior rather than a mere tool—where physical devices or machines are not central in themselves, but rather embedded in patterns of goal–means relationships. A third group conceptualizes technology as a system: if a hardware object is to be considered technology, it must be maintained, repaired, and operated within a human and social context. This view introduces the notion of a technological system that integrates both material devices and human competencies (Dusek, 2013, 53–55). A fourth perspective claims technology as a form of applied science, which closely aligns with the first (instrumental) view—framing technology as the practical extension or application of scientific knowledge (Moghadam Heidari & Monajemi 2019, 23–30).

In contemporary discourse, technology is predominantly conceptualized either as a tool or as a functional logic. This dual perspective—rooted in instrumental and procedural understandings—may in part explain the limited effectiveness of technology in achieving sustainability goals within architecture. A shift toward viewing technology as a system reintroduces the role of human agency and social context, aligning with Heidegger's notion of a "free relationship with technology." According to Heidegger, technology possesses an intrinsic essence—distinct from human manipulation—and any meaningful engagement with it requires a form of understanding that is attuned to its ontological nature. Such an approach enables the possibility of using technology without being dominated by it. This systemic view is echoed in anthropological perspectives, which emphasize the complex and reciprocal relationship between culture and technology as a critical pathway toward realizing the intended aims of technological intervention. Therefore, in the context of sustainable architecture, what proves essential is not product-centered technology per se, but rather a technological system embedded within cultural and human frameworks. This perspective on technology has been introduced by Richard Sennett under the term coordinating technology (Sennett, 2021, 256–263). According to Sennett, cooperative technologies enable users to actively interact with data, rather than passively consuming it. These technologies are relatively low-cost and fundamentally human-centered, aiming not to replace human capabilities but to nurture human intelligence, skill, and sensibility. Technology should be understood neither as a neutral instrument nor as a fixed ideological construct. Rather, it calls for critical socio-cultural agency, complementing individual engagement, to fulfill its foundational purpose: responding to the multidimensional needs of human life—including biological necessities, cultural practices, and socially mediated demands. While technology exhibits universal characteristics, certain dimensions of it must be recontextualized and redefined within specific cultural milieus. Human actors must be able to intervene in technological systems and reshape them in accordance with evolving and context-sensitive needs. From this perspective, technology is conceived as an integrated socio-technical, cultural, and behavioral system—one that must remain open to human influence and capable of sustaining a free and dialogical relationship with human beings. Accordingly, what is required is a mode of technology that transcends prevailing instrumentalist models and reorients

technological development toward greater cultural and ethical responsiveness. A technological system that integrates the interrelationship between humans, culture, and technology is essential for the effective advancement of sustainable architecture.

- **From the result to the process**

One of the fundamental challenges that perpetuates greenwashing in sustainable architecture lies in the reductionist framing of sustainability as a matter of physical form, with limited consideration given to the design process as an integrated and dynamic system. Within prevailing discourse on sustainability, the concept of "sustainable" or "green" buildings is often associated with skyscrapers featuring green roofs and façades, or glass towers certified by environmental rating systems. Yet such buildings frequently embody only a superficial aesthetic of sustainability, projecting visual indicators of "greenness" while failing to achieve substantive ecological, social, or cultural performance. A singular focus on the building envelope cannot generate a truly process-oriented or holistic sustainable design. Moreover, this object-centered paradigm tends to conceptualize buildings in isolation from their broader urban, infrastructural, and social contexts. As a consequence, many so-called green buildings are relocated from dense urban cores to suburban areas—thereby increasing dependence on transportation infrastructure and intensifying the consumption of additional energy and material resources. In practice, the energy demands associated with transportation can outweigh the environmental gains achieved through clean energy systems or the construction of new green buildings. Mehaffy and Salingaros (2013) argue that in this model of sustainability, green components—such as efficient mechanical systems, insulated walls, and green roofs or façades—function as discrete technical add-ons, rather than being integrated into a comprehensive design logic. Although such strategies may produce a superficial appearance of sustainability, they are ultimately limited in impact, as they leave the underlying infrastructural and systemic challenges of contemporary construction largely unaddressed. In contemporary architectural discourse, sustainability has increasingly been framed as an ideology—one that tends to prioritize physical form and visual aesthetics over more integrated and process-oriented approaches. However, the essence of architecture extends beyond material structure; it is a form of cultural expression that reflects the ways of life, values, and collective identities of societies across time. Architecture is not merely the act of constructing buildings or providing shelter, but a design-driven process through which sustainability must be meaningfully addressed throughout all phases of design and implementation. Accordingly, sustainable architecture can only fulfill its objectives when sustainability is not treated as an external layer or symbolic gesture, but as an embedded and continuous dimension of both the design process and everyday lived experience. Architecture is, at its core, a process—informed by systems thinking, holistic philosophy, and integrative worldviews. Within this framework, the behavior of any single element cannot be fully understood in isolation from the system in which it operates; rather, its meaning and performance emerge through its dynamic interactions with other components. Consequently, architectural design cannot rely solely on the isolated performance of individual parts, but must instead be guided by the relational logic that governs the system as a whole. In advancing sustainability within architecture, this requires a comprehensive understanding of energy consumption across all stages of a building's life cycle—including material extraction, manufacturing, transportation, construction, and post-use recycling. Furthermore, buildings must be conceived as embedded within the urban context, not as autonomous or detached objects. As such, the application of green technologies—such as green roofs or vegetated façades—cannot, in itself, constitute a meaningful or sufficient approach to sustainable design. Sustainable architecture becomes more authentic when the philosophy of sustainability is integrated not only into the design process but into the rhythm of everyday life.

- **From fixed standardization to flexible and contextual approach**

Standardization and certification mechanisms represent one of the principal drivers of greenwashing in contemporary architecture. Much of what is labeled as "sustainable architecture" today is predicated on

universalized, product-driven models that disregard the specificities of local contexts and regional conditions. These frameworks operate under the reductive assumption that sustainability constitutes a singular, transferable goal—neglecting the reality that, in one setting, energy conservation may be paramount, while in another, water resource management may define the sustainability agenda. Such paradigms reduce sustainability to abstract metrics and prescriptive outputs, privileging measurable outcomes over the nuanced processes through which sustainability must be cultivated. They reinforce a procedural culture of compliance rather than fostering a context-responsive, culturally attuned, and process-oriented approach to sustainable architectural practice.

The philosophical foundations of sustainability in architecture are neither temporally fixed nor universally applicable across geographic contexts. In other words, sustainability cannot be meaningfully pursued through standardized frameworks or globalized design templates that overlook local particularities. Each society is shaped by its socio-cultural evolution, climate realities, and economic and political priorities—factors that significantly influence how sustainability is conceptualized, practiced, and experienced within architectural settings. Accordingly, it is both necessary and expected that interpretations of sustainability vary across regions, cultures, and historical periods, each responding to distinct contextual imperatives. Sustainable architecture is fundamentally holistic in nature, and the frameworks and certification systems associated with it ought to be conceptually aligned with this integrative foundation. Yet, in practice, these systems often foster reductionist logics and prescriptive design structures—an orientation that runs counter to the ontological and ethical premises of sustainability itself. In holistic philosophy, no element is regarded as autonomous or self-contained. Each part derives its meaning through its relationship with the whole, while simultaneously contributing to the constitution of that whole. This approach conceptualizes the world not as a collection of discrete, static entities, but as an unfolding system composed of mutually constitutive relations—a continuous process in which being is defined through interaction, interdependence, and becoming. Material forms, spatial structures, and even socio-cultural conditions are thus viewed as abstract expressions of this dynamic process of becoming (Barati, 2004). Reductionism isolates components and views causality as linear and mechanical; holism, by contrast, centers on relationality, mutual influence, and the co-constitution of meaning within an integrated system.

From a holistic philosophical perspective, no element exists in isolation; every part derives its meaning through its connection to the whole, while also contributing to the integrity of that whole. An environment shaped by a specific culture functions as a coherent system, in which each architectural component acquires its full significance only within that cultural and spatial context. In this view, a single architectural form may convey entirely different meanings depending on where and how it is situated. Cultural, social, and environmental diversity fundamentally shapes human perception and interpretation, giving rise to multiple situated understandings of space, form, and meaning—each rooted in a distinct structure of knowledge and experience (ibid., 2004). Accordingly, the reality of holistic sustainable architecture must be grounded in a constellation of interrelated factors: geographical location, topography, climate, spatial typology, and cultural values—including social, economic, political, historical, and aesthetic dimensions—as well as technological conditions shaped by context-specific scientific and technical capacities.

Humans, their environments, and their modes of perception cannot be conceptualized as separate or self-contained domains. Rather, environmental understanding emerges through a dynamic interplay between mind, form, meaning, and spatial context—each shaping and being shaped by the others (ibid., 2004). Architecture, within this framework, is not an autonomous discipline but a constitutive part of broader ecological, cultural, social, and economic systems. Therefore, advancing sustainable architectural practice requires a shift away from abstract, context-detached models toward more situated and culturally responsive frameworks—approaches that promote a multifaceted and context-aware understanding, grounded in the socio-cultural and environmental

particularities of place. This shift underscores the importance of embracing regionalist and context-sensitive design paradigms as viable alternatives to the dominant universalizing logic that continues to shape mainstream sustainability models.

Focusing on regionally and contextually specific characteristics—grounded in a holistic philosophical perspective—can help align sustainable architecture more closely with its practical objectives in real-world implementation.

• From one-dimensional energy-oriented to a holistic sustainability

One of the underlying causes of greenwashing in architecture is the marginalization of economic and socio-cultural parameters. Sustainable design is often reduced to issues of energy efficiency and environmental performance, thereby neglecting the multidimensional character of sustainability. Yet sustainability, in its fullest sense, can only be achieved through the dynamic integration and equilibrium of its environmental, economic, and socio-cultural components. The failure to address even one of these dimensions compromises the integrity of sustainable architecture and contributes to the perpetuation of superficial or misleading practices.

Architecture functions as a cultural artifact that materializes the values, worldviews, behaviors, and belief systems of a society within a given historical and spatial context. Rather than being purely functional, architecture emerges from specific cultural contexts and, in turn, helps to express and sustain them. Culture, as a foundational construct of both social and individual identity, plays a critical role in shaping spatial practices and architectural expression. There exists an inherently reciprocal relationship between architecture and the socio-cultural context it inhabits—where built form, behavioral norms, and collective values are dynamically intertwined. Accordingly, sustainable architecture must place social and cultural dimensions at the core of its design logic to achieve meaningful and lasting impact.

While culture is often associated with history and tradition, the conception of culture relevant to sustainability aligns more closely with an anthropological perspective. British anthropologist Edward Tylor famously defined culture as "that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society" (Jalali Moghaddam, 1997). For Tylor, culture is a comprehensive expression of human social life, whose defining characteristics are best understood through its collective dimensions (Cuche, 2018). Culture constitutes the operational logic of a society. The social relevance of culture within sustainability is therefore embedded in behavioral norms and modes of community involvement.

From another perspective, the inclusion of the economic dimension brings into focus a realist approach to sustainability—one that assumes the existence of a material world independent of human perception or intent. In architectural discourse, realism invites a reconsideration of how we understand the relationship between form, material, space, and use. Rather than treating buildings merely as passive containers for human activity, this approach frames them as active material presences that exist within, and respond to, broader environmental and social systems. Given the accelerating environmental crises and the deepening awareness of our entanglement with natural systems, this epistemological shift becomes not only relevant but essential—calling for design practices that acknowledge complexity, interdependence, and the agency of both human and non-human forces within the built environment. This approach stems from a long-standing architectural tradition rooted in anthropocentric thought—one that primarily sees the built environment as a backdrop for human activity and experience. Within this framework, realism introduces a critical shift in perspective. It offers an alternative lens through which architecture is not merely a passive container, but an active force that shapes how space is experienced by both humans and non-human elements. This shift promotes design approaches that pay closer attention to materials, their behavior in space, and how different elements interact within the built environment. It encourages a broader understanding of architecture as something embedded in complex ecological and material systems—systems that include human presence but are not solely defined by it. By aligning design thinking with these wider environmental and material dynamics,

realism paves the way for more context-sensitive and ethically grounded architectural strategies. From a realist perspective, sustainable architecture must also account for the economic and regional conditions that shape the feasibility and relevance of green technologies. Rather than promoting universal technological solutions, realism advocates for a situated application of sustainability tools—those that respond to the material, cultural, and ecological realities of a given context. Within this framework, factors traditionally regarded as external to architectural form—such as culture, economy, society, local context, and natural systems—are reconfigured not as peripheral concerns, but as integral to the very logic of design. Realism, in this sense, challenges abstract idealism by grounding architectural practice in the concrete conditions that define its performance and meaning.

More comprehensively, when addressing the parameters of economy, society, and culture within sustainable architecture, two interrelated dimensions emerge. On one side, the cultural dimension foregrounds the centrality of human agency and meaning-making. On the other hand, realism calls for the recognition of non-human experiences and material agencies that actively shape spatial and environmental outcomes. Rather than opposing forces, these dimensions operate as conceptual complements—together offering a deeper and more generative framework for rethinking the philosophical foundations of sustainability. This approach contends that anthropocentrism remains a necessary—but partial—perspective within design thinking, and must be situated within a broader ecological and material ontology that accounts for the entangled relationships between humans, environments, and systems of matter. Both culture and realism function as critical epistemological dimensions in the ongoing development of sustainability as a design philosophy. The essential parameters contributing to the advancement of sustainable architecture are demonstrated in Table 2.

It is important to note that the principles and criteria shaping sustainable architecture often overlap. For instance, holistic philosophy can be examined through the lenses of process orientation, contextual sensitivity, and integrative thinking; while cultural considerations intersect with technology, contextualism, and comprehensive sustainability. Ultimately, it is the interplay among these parameters that constitutes the foundation for advancing an authentic model of sustainable architecture.

Conclusion

Sustainability can no longer be regarded as a conceptual ideal or optional framework; it has become a critical global imperative. As a response to contemporary ecological, social, and economic challenges, it seeks to improve the quality of life while ensuring the long-

Table 2. Key Parameters in Achieving Pragmatic Sustainable Architecture. Source: Authors.

Parameter	Description	Significance
System-Oriented Technology	Technology as a broad domain, but certain domains require redefinition within cultural and contextual frameworks Technological systems framed through cultural and behavioral dimensions	Reconceptualizing technology as an integrated system oriented toward human and societal needs, rather than as an isolated instrument or end in itself
Process-Centered Design	Embedding sustainability philosophy within the design process Interaction across micro, meso, and macro levels of design and decision-making	Prioritizing sustainability as a dynamic process, not a static result or final product
Contextualism	Emphasis on contextual factors such as history, culture, tradition, geography, climate, and socio-economic priorities Grounding design in the interrelation of humans, environment, culture, and perception within a holistic framework	A systemic and integrated perspective on sustainability is shaped by contextual specificity, not by universalized models
Holistic Sustainability	Inclusion of economic, socio-cultural, and environmental dimensions of sustainability Emphasis on behavioral patterns and civic participation as part of social sustainability Realism grounded in socio-cultural, economic, and regional-contextual conditions within economic sustainability	Sustainability as a socio-cultural and economic construct—not merely an energy-centered perspective Inability to realize substantive sustainability without addressing its socio-cultural and economic foundations

term viability of the planet and its resources for future generations. Within this broader agenda, sustainable architecture is positioned as a key instrument for advancing sustainable development. Yet, a long-term critical assessment of the past four decades reveals that many architectural approaches labeled as "sustainable"—despite their reliance on green technologies—have largely failed to deliver measurable environmental benefits or meaningful reductions in carbon emissions. This enduring disjunction between theoretical aspirations and built outcomes signals a deeper epistemological crisis in the discourse of sustainable architecture, increasingly shaped by the rise of greenwashing. The superficial framing of sustainability—reduced to technological signifiers or symbolic gestures—has distanced sustainable architecture from its foundational ethical, humanistic, and cultural commitments. Within this context, greenwashing has enabled the production of architectural forms that are often shallow, performative, and at times misleading—undermining not only the integrity of sustainable design but also eroding public trust in policy frameworks and weakening prospects for meaningful civic engagement. These conditions underscore the urgent need to reconceptualize sustainable architecture—not as a rhetorical construct or visual motif, but as an integrated, contextually responsive, and ethically grounded design paradigm. This study demonstrates that confronting the pervasive condition of greenwashing and advancing toward authentic sustainability necessitates a paradigmatic shift—one grounded in integrative, systemic, and critically reflexive thinking. It highlights key parameters, including the reframing of technology within socio-cultural and behavioral contexts, process-oriented thinking, contextual and regional sensitivity, civic engagement, and the integration of holistic and realist perspectives. These elements challenge reductive, technocentric, and image-driven practices by grounding sustainability in lived experience and architectural process—ultimately bridging the gap between knowledge and action and enabling a more pragmatic, context-responsive model of sustainable architecture.Accordingly, sustainable architecture should not be conceived as a predefined technological object, a static formal outcome, or a completed architectural form, but rather as an ethically informed, socially embedded, and contextually grounded process. When sustainability is interwoven with the rhythms of everyday life, it becomes not only a viable framework but also a substantively lived experience.

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The authors declare that they have no conflict of interest in conducting this research.

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