

Impact of Construction Projects on Sustainable Landscape: A Systematic Review

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Abstract

Human activities related to land use, such as the transformation of natural landscapes into urban areas and agricultural fields, as well as changes in land management practices, have caused substantial modifications to the Earth's surface. These alterations have had significant consequences for climate, soil, hydrology, biodiversity, and ecosystem processes. The research presented in this study provides a comprehensive summary of previous investigations in the field of landscape research. The main aim of this paper is to make a comprehensive review of the effect of the construction projects on the sustainable landscape, the results found that the projects effect adversely on the landscape and the free re should be increased.

Keywords: construction, landscape, sustainable, smart.

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1. Introduction

The construction industry, as stated by the International Organization for Standardization, is among the largest sectors in terms of size. While it contributes to economic growth and employment opportunities, it also has a substantial impact on the environment and socioeconomic factors due to its resource consumption. Construction calls for particular consideration because it's a customized, non-repetitive activity. [1]. One of the major conundrums facing developing nations is how to balance the demand for faster economic expansion with sustainability According to research conducted by Hosseini et al. [2], construction projects in developing countries face significant challenges in terms of sustainability.

Hosseini et al. [2] also highlight the importance of reducing material and energy consumption, promoting recycling and reuse, and enhancing human well-being to address these issues. Sinha et al., [3] further emphasize the need for sustainable initiatives to mitigate the environmental impacts of the construction sector. ISO 15392 (2008) recognizes the

potential of the construction industry to positively influence the economy, environment, and society, and suggests that implementing sustainable practices can offer a new approach to minimizing these effects [4].

The significance of landscapes in promoting sustainability at both local and global levels, the adoption of a multi-scale viewpoint, the utilization of a spatially explicit methodology, and the incorporation of transdisciplinary practices have all been acknowledged as key factors that contribute to the strong association between landscapes and sustainability. These aspects highlight the critical role that landscapes play and emphasize the valuable expertise that landscape scientists possess, making them important contributors to the field of sustainability [5], [6]. However, some people continue to question the value of even the notions of landscape sustainability (LS) and sustainable landscapes (SL), mostly because these ideas are still developing and because they raise questions about whether landscapes can be sustained in a changing global environment [7], [8].

In this research, we aim to address the following inquiries: (1) Is there a convergence of landscape sustainability studies leading to the development of a distinct scientific discipline? Specifically, have there been an increased number of publications and citations in this field over the years? (2) What are the key subjects and themes explored in these studies, and how has the focus of research evolved? (3) How can integrative landscape science be advanced to enhance sustainability, and what are the main obstacles that need to be overcome? A comprehensive analysis of the relevant literature is necessary to provide insights into these three questions. However, because there are many ways to interpret a landscape, such an assessment is not a simple task. [7], [9] and sustainability [10] and also the consequent challenges of communicating and operationalizing SL and LS [7, 11].

Both model-based simulation and observation-based analysis can be used to study the modification of land surfaces and its impact on the atmosphere. Local information is obtained by in situ measurements, while a wider spatial extent can be analyzed through satellite observations. Several studies [12] have highlighted the significance of analyzing the atmospheric response to land surface alterations. However, a major challenge in empirical data analysis is accounting for long-term climate variations, which can be addressed through the observation minus reanalysis approach [13].

Observational studies have underscored the importance of land use and land cover change (LUCC) in driving climate change, while landscape ecology has facilitated the development of model-based methods to understand spatiotemporal patterns and underlying physical factors. Numerical models, such as the Weather Research and Forecasting Model, have been increasingly employed in LUCC-climate change research to simulate the effects of land surface changes on local and regional climates. Sensitivity tests are conducted to examine potential climate impacts resulting from landscape changes. The growing number of publications in this field over the past decade indicates the increased utilization of numerical models and the benefits they offer in

improving our understanding of the underlying processes involved [14].

2. Materials and Methods

The initial step in our literature review process was to formulate research questions, which played a crucial role in defining the scope of the study and guiding the review process. Our systematic review aimed to examine the status of smart cities, encompassing various aspects such as their definition, financial allocation, applications, quantitative methods, metrics, benefits, advantages, and disadvantages, as well as the challenges encountered during implementation and the strategies employed by cities to address them. By conducting this review, we aimed to gain a comprehensive understanding of the subject matter and provide insights into the state of smart cities. Our inquiries for the study are What is the definition of sustainability?

1. What are the sustainable construction projects?
2. What are sustainable landscapes?
3. What are the challenges of the sustainable landscape?

We developed criteria to determine which research articles to include or exclude after determining the research themes. Fig. 1 depicts the search procedure, which includes using specific keywords to search Google Scholar and the Web of Science (WoS) Core Collection. A single keyword provided far too many results to sort through, therefore utilizing multiple keywords was required to minimize the number of articles discovered. The review proposes two phases for selecting and analyzing the research papers.

- Phase I: Locating, Evaluating, and Screening Studies

We looked through the Web of Science (WoS) and Scopus databases for potential publications for evaluation. We developed several keyword lists to help find and search research. The terms "Sustainability AND Construction Project," "Sustainability AND landscape," "Sustainability AND Project," "Sustainable* AND environment Project," "Sustainable* AND Construction Industry," and "Sustainable* AND Project" were the search parameters.

We used the exclusion criteria to select and screen articles to find the desired papers. Published in the Procedia, editorial remarks and conference papers were dropped, and the publishing date was pushed back from July 2013 to July 2023.

- Phase II: Data Extraction and Co-Occurrence Analysis

To do bibliometric analysis, we utilized BibExcel. Data analysis and administration were made possible by this application. BibExcel does statistical analysis and generates data files from several publications. This program transforms data into formats that other programs, like Pajek and Gephi, may utilize for network visualization and additional analysis.

BibExcel was used to extract the article title, authors, journal, publication year, and other bibliometric information from the publications. We standardized the terms "construction," "construction industry," "civil construction," and "industrial construction" because they all essentially imply the same thing even if they are expressed differently. This allowed us to map the relationships between the articles. In more detail as follows:

2.1 Filtering relevant papers and extracting data

In line with the objective of our study, we adhered to the guidelines proposed to select relevant research articles for our systematic literature review and extract relevant data from them. The procedure consisted of multiple steps, including the development of a protocol, filtering research papers based on keywords, titles, and abstracts, and extracting necessary data from the identified publications. This systematic approach employed in selecting appropriate papers and gathering data is discussed in detail in this section.

2.2 Development of Protocol

The outline of the protocol specifies the criteria for searching and reviewing research publications. The protocol that was created included the following tasks: We used the Google Scholar database's search function to locate the study publications. Only peer-reviewed research publications released in the

previous ten years (2013 to 2023) were included in the search parameters. The search phrases "sustainability," "landscape," and "sustainability assessment" were chosen since other researchers had already used them. By taking this action, we made sure that any research paper that has the term "sustainable landscape" in its title, keywords, or abstract was extracted. We took into account only the theses and published, peer-reviewed articles.

According to [15], it is important to consider limiting the review to published research to enhance quality control. Similarly, Light et al., in [16] suggested that restricting the review to published studies can help improve the overall quality of the review process. Because most peer-reviewed journals have stringent publication standards, the procedure often yields better technical results. 150 research papers were found overall thanks to the database search procedure.

2.3 Exclusion Decision Based on the Title and Keywords

Titles and keywords were utilized to further filter the research papers discovered by the search protocol. Research publications with a core focus unrelated to SLS were disqualified at this round of selection. The research publications that did not seem relevant to this investigation were excluded by two researchers. This step assisted in bringing the total number of papers for additional screening down to 148.

2.4 Exclusion Decision Based on Abstract

Two researchers evaluated the paper abstracts independently to weed out the research papers that were not relevant. To settle their differences and justify the deletion of research papers, the two researchers then sought the third researcher's perspective. After this stage, 88 papers were taken into consideration for this study because the removed papers did not specifically focus on SLS.

2.5 Final Selection of Research Papers

Two researchers have read the research articles. in their entirety to further exclude them based on the following criteria: a) SLS should be the paper's main area of investigation. b) The paper's research goal

should be connected to SLD, such as by examining how SLD develops.

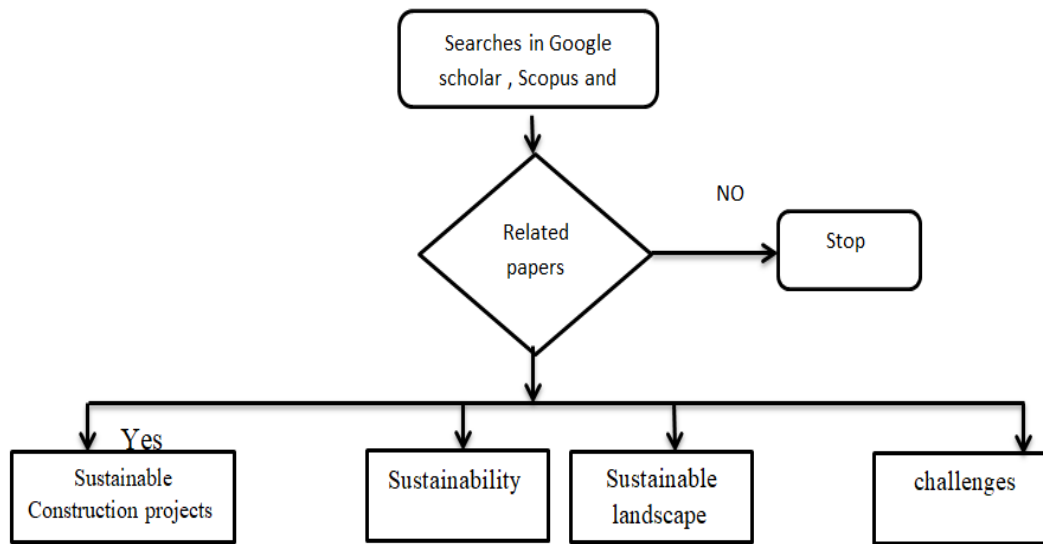


Fig. 1 Literature Review Search Process[16]

3. Results

A) Keyword Retrieval and Standardization 222

keywords were taken out of 50 publications using BibExcel. Keywords were standardized since many of them have meanings that are identical or comparable. First, the singular form of the plural keywords was converted [17]. Next, based on keyword popularity, related phrases like "Construction Project" and "Construction Engineering Project" were standardized to "Construction Project." The same-field keywords were then standardized to a single, widely used term.

For instance, the terms "construction," "construction industry," "industrial construction," and "civil construction" were all standardized to "construction." The 222 keywords were whittled down to 76 distinct keywords after standardization. The top 20 most referenced terms are displayed in Table 1.

Table (1) Top 20 keywords.

Keyword	Frequency
Sustainability	25
Construction	22
Project management	13
Construction project	8
Sustainable construction	8
Environmental sustainability	7
Social sustainability	7

Construction company	5
Sustainable development	5
Information technology	4
Sustainability performance	4
Key performance indicators	4
Design	3
Performance management	3
Waste management	3
Innovation	3
Lean construction	3
Benefits management	3
Construction management	3
Stakeholder management	2

B) Journal Analysis

24 specialized journals published the 50 publications that this report assessed. The way papers are distributed across the top 10 most published journals according to the journal. The top 5 journals published more than 70% of the publications. Although "project management" was not the primary focus of the "Journal of Cleaner Production" or "Sustainability," these and other publications that were especially committed to project management themes did a good job of studying sustainable building projects.

However, a lot of businesses in the public and commercial sectors today use projects to bring about change. A paper on sustainability and project management should be published in these journals rather than solely in a journal for project management because many projects (especially those in the

construction industry) have the potential to have serious implications for sustainability, and because these projects frequently involve multiple stakeholders who must be taken into account when managing sustainability issues.

C) Year Analysis

45 publications that have been assessed and distributed within the previous ten years (January 2013 – July 2023). job in the building industry's sustainable development field. The number of articles discussing sustainability in building projects is trending upward. The global sustainable development report may have contributed to a more than 70% rise in publications between 2018 and 2021 by persuading scholars to examine sustainability more thoroughly and from a variety of perspectives. Therefore, increased environmental deterioration and socioeconomic inequality pose a danger to the sustainability successes of the present. The study also shows that considerable adjustments to development policies, incentives, and practices linked to sustainability might result in a more hopeful and sustainable future [18].

4. Discussion

4.1 Sustainability Definition

In environmental science, the idea of sustainable development has evolved into a development paradigm and a key point of reference. [17], [18]. Its emergence can be traced back to the Brundtland Report [19], and since then, it has gained global prominence, being incorporated into international treaties, national constitutions, and legal frameworks in numerous countries [21]. Agricultural production industry [22], business-related difficulties [23], [24], and urban development [25] are only a few of the fields where sustainable development has been used. It provides a theoretical framework for ideas such as the circular economy [26], [27] and the green economy[28].

Furthermore, it is generally known by a sizable section of the world's population and has influenced political slogans related to environmental protection.

Although in academic and scientific contexts the phrases "sustainability" and "sustainable development" are sometimes used interchangeably [29], [30] different perspectives emphasize the contradictions inherent in the goals of sustainable development.

Critics argue that sustaining unlimited economic growth on a finite planet is fundamentally contradictory [31], highlighting the immense challenge of basing environmental policies on an ill-defined or inconsistent concept. This challenge extends beyond epistemological concerns and encompasses social, political, economic, cultural, and environmental dimensions [32]. Scholars have cautioned that sustainability should be viewed as a distinct idea, relevant to contemporary environmental strategies such as "degrowth" and "buen vivir" [33]. These ongoing debates underscore the need for further scholarly exploration to better understand the meanings and implications of these concepts [34].

Since sustainability is usually considered a subtype of environmental sustainability, which ensures preserving environmental health, it is often viewed as a barrier to financial success in businesses. Businesses regularly produce garbage and exploit natural resources. According to Nidomolu et al. [35], businesses and consumers are becoming more conscious of environmental sustainability, which is encouraging them to utilize less natural resources, correctly manage their waste, and consume mindfully. This enables companies to implement effective business ideas that will pay off overall. Being socially and ecologically responsible ensures a company's longevity, but one cannot overlook a company's economic component because it is what keeps it afloat [35], [36]. As a result, corporations are putting more focus on environmental management and setting social, economic, and environmental goals[14]. Sustainable development goals are essential for guaranteeing environmental sustainability.

Table 2: sustainability definition

Researcher	Definition
Moore, and Mascarenhas [37]	The program, clinical intervention, and/or implementation tactics are presently in progress, with continuous support. Individual behavior change is being maintained, both by patients and clinicians. The program and individual behavior modification

	can evolve and adapt as needed. Furthermore, advantages for persons and systems continue to be created.
Ben-Eli [38]	A dynamic equilibrium occurs when a population interacts with the environment's carrying capacity in a way that allows it to reach its maximum potential without causing a permanent reduction in the carrying capacity of the environment.
Calzada [39]	Technologies, the quality of life, traffic, smart housing, and energy-saving buildings
Zheng, and Kwok [40]	Digital intelligence, information, tools, services, businesses
Bagdasarian Trip [41]	Networks, services, ICT, resource use, emissions
Toli and Murtagh [42]	Data integration, policy, technology, process, capital
Statistics [43]	The concepts primarily revolve around the environment and the anticipated impact of digital technology on specific urban services. These technologies have the potential to reduce emissions and enhance resource efficiency. As a result, there can be improvements in municipal administration services, enhanced safety in public areas, and better accommodation of the needs of the elderly population. Additionally, smarter transportation infrastructure, improved water supply and waste management systems, and more efficient building thermal management can also be achieved.

4.2 Sustainable Construction Projects

Encouraging sustainable construction initiatives has become global in recent times. Other considerations that make individuals consider sustainable construction include rising costs for traditional building materials and energy, particularly in light of government regulatory incentives [44]. Over the last few years, the building sector in the UAE has witnessed significant expansion. This boom peaked in 2007, just before the 2008 financial crisis, and began about 1996 [45]. Environmental activists are pushing for a small-scale transition to a more sustainable way of living, and more lately, the government has started to impose this change since it will soon become a requirement.

The Esti Dama system in Abu Dhabi, launched by the Abu Dhabi Urban Planning Council, is one example of this. This initiative aims to construct more sustainable communities by establishing its own Pearl Rating System, which awards a score based on the number of points received by building projects with each credit representing the achievement of a sustainable goal. By mandating all projects to fulfill a specific number of mandatory credits, they are accelerating the move to sustainable construction techniques [46]. Similarly, the Dubai Municipality is

adopting the green construction initiative, which is a guideline customized to the features of the UAE, to enforce the concept of sustainable development. This scheme has been in effect since 2014 and is necessary for all newly erected structures in Dubai [47]. Furthermore, a poll found that interest in and awareness of green construction and the notion of moving toward sustainability are growing [48].

Researchers studying SC technologies often work to create environmentally friendly technologies that reduce negative effects on neighboring communities and increase the effectiveness with which natural resources are used in building projects. To lower the carbon emissions of building systems, for example, analyzed the key aspects of prefabricated engineered solid wood panels and proposed that this SC technology might be extensively deployed [49]. Wanjiru and Xia [50] investigated the applications of greywater recycled water systems in buildings and suggested these systems might improve the efficiency with which water resources are used [50].

Senaratne et al. [51] used experimental approaches to study the physical properties of innovative building materials derived from recycled construction and demolition waste. They emphasized

that these new materials might be applied in practical situations to lessen the negative effects of trash from buildings and destruction. Present SC technologies typically concentrate on two areas: the preservation of resources [51], and the protection of the environment [49].

Developing sustainable conceptions may be extremely difficult in developing nations, like the Kurdistan region of Iraq; in contrast to industrialized nations, the performance of sustainable structures is still in its infancy. According to Zebari and Ibrahim (2016)[52], countries like Australia (Bond, 2010) and England [53] also face similar challenges in implementing green buildings. In the Kurdistan region, Zebari and Ibrahim (2016) [52] identify several key obstacles to green buildings, including a limited consensus on sustainable concepts, inadequate availability of suitable building materials, a shortage of skilled labor and staff, and a lack of sustainable subjects incorporated into institutional education in Iraq. Moreover, Kurdistan's home construction seldom makes use of any kind of thermal envelope insulation to meet energy demand reduction goals.

4.3 Sustainable landscape

The role of "pivotal" between landscapes and sustainability, as well as the valuable contributions of landscape scientists, can be attributed to several factors. These include the significant role of landscapes in linking local and global sustainability, adopting a multi-scale perspective, employing a globally explicit strategy, and embracing a multidisciplinary tradition. [5], [6]. However, some people continue to question the value of even the notions of landscape sustainability (LS) and sustainable landscapes (SL), mostly because these ideas are still developing and because they raise questions about whether landscapes can be sustained in a changing global environment. [7], [8], There will be several questions raised, including:

(1) Are landscape sustainability studies becoming increasingly of a science? More specifically, in terms of yearly publications and citations, have there been more of these studies?

- (2) What are the primary subjects and themes of their research, and how has the direction of their study changed?
- (3) In what ways may integrative landscape science be developed to improve sustainability, and what are the primary obstacles to be overcome? Prompt analysis of the pertinent literature is required to respond to the three questions. However, because there are many ways to interpret a landscape, such an assessment is not a simple task. [7], [9] and sustainability [10] and the ensuing difficulties in operationalizing and communicating SL and LS [7], [11].

Today's theme is sustainability or sustainable development. But there are plenty of unsustainable towns, cities, and areas in our modern world. Our landscapes and regions need to be properly planned and designed to attain sustainability at local, regional, and global levels [54], [55]. This requires sustainable landscape architecture [56], or environmentally friendly landscape planning. Landscape Sustainability Science (LSS), also known as sustainability science at the landscape and regional levels, is an emerging transdisciplinary field that employs spatially explicit methodologies to examine the dynamic connections between ecosystem services, human well-being, and landscape patterns [55]. One of the fundamental principles of landscape system theory is the belief that certain landscape configurations are preferable to others in terms of enhancing and sustaining ecosystem services and human well-being. One of the main issues in LSS is the identification and creation of ideal landscape configurations. LSS needs to create tools to "find" and create certain setups to do this.

There are several ways to satisfy LSS's requirement for a tool set in landscape design. on the findings of Li and Milburn [57]. The initial era, known as the analog era, spanned from the mid-19th century to the mid-20th century. During this period, hand drawing was the primary skill utilized, and Warren Manning introduced the map overlay method using a light table. The integration of scientific theory with art became more prominent, albeit relatively weak. The subsequent era, referred to as the poor data era, extended from the mid-20th century to the 1970s.

McHarg's map-overlay method was employed for land suitability analysis, driven by an increasing awareness of environmental preservation.

The current age, often known as the "big data era," began in the year 2000 and continues to this day. There has been a steady shift throughout this time from ecological to sustainability thinking. Furthermore, in the field of data collecting and processing, high-resolution remote sensing data, Light Detection and Ranging (LiDAR), Global Positioning System (GPS), and interactive drawing devices have become more well-known [57].

Previous studies have primarily focused on examining the benefits of environmentally friendly urban parks and open spaces, particularly in terms of providing ecosystem services [58]. a comparison between the long-term costs and advantages of employing ecological design and management practices versus standard groomed landscape management, to deliver potential ecosystem services. Such a comparison is essential to elucidate optimal management practices and maximize the contribution of urban parks as a component of the city's green infrastructure toward addressing environmental concerns.

The comparison between ecological landscape management and traditional landscape management was conducted using the four types of ecosystem services outlined in the Millennium Ecosystem Assessment Report (2005): cultural, regulating, supplying, and supporting services. Ecological design, by enabling the landscape to undergo self-regeneration through natural processes like the nutrient cycle, soil formation, and hydrological cycle, aids in supporting services and offers a cost-free support system for the environment and people. In contrast, maintaining a traditional, well-maintained landscape demands greater resources and may result in higher costs [58].

4.4 Challenges of Sustainable Landscape

The problem that modern cities in the global north face is meeting the requirements of people living in urbanized regions while maintaining open, green public spaces. Particularly in Norway, brownfield sites that were once industrial landscapes

are being turned into residential and leisure spaces. There has been a lot of focus on the increase in waterfront developments. [59], The redevelopment of obsolete industrial and brownfield sites has been accompanied by the emergence of smart cities [60], [61]. However, the practical implementation of smart cities faces various challenges throughout the design, implementation, and operation stages. These obstacles include the expensive nature of design and operation, device diversity, the collection and analysis of extensive data, information security concerns, and the need for sustainability. To make sure the sustainability of service supply without adding to the financial load on municipalities, minimal operating expenses are strongly desired. Nonetheless, maintaining cost efficiency over a smart city's lifespan is still a difficult undertaking [62].

The issues are divided into eight categories by Chourabi et al., who also provide challenges within each category and several approaches to addressing them.

1. Challenges related to managers and organizations include project scale, managers' attitudes and behaviors, the variety of users or the organization, a lack of alignment between projects and organizational goals, numerous or competing goals, reluctance to change, turf and disputes, and so on.
2. organizational barriers, including a lack of collaboration across sectors and coordination between departments, an unclear vision of IT management, and concerns related to politics and culture. Additionally, there are technological hurdles such as a shortage of IT skills and a lack of individuals with integration capabilities.
3. Government: cooperation, communication, data sharing, accountability, transparency, leadership and championing, participation and partnership, and integration of services and applications.
4. Policy context: because each has its own goal, there are difficulties when integrating ICT with political and institutional elements.
5. People and communities: this includes accessibility, education, communication, quality of life, participation and partnerships,

information and community gatekeepers, and digital divides.

6. Economy: this includes elements related to economic competitiveness including productivity, entrepreneurship, and innovation, among others.
7. Built infrastructure: This encompasses security and privacy concerns, including threats from viruses, worms, and Trojan horses, as well as issues related to privacy and the protection of personal data. IT infrastructure poses challenges such as internal system limitations, a lack of understanding regarding interoperability, and the availability and compatibility of software systems and applications. Additionally, operational costs, including the high expenses associated with IT, IT professionals, consultancies, and the installation and maintenance of IT systems, are also significant factors to consider.
8. Natural environment: this encompasses all the difficulties associated with the long-term viability of ICT introduction.

5. Conclusion

A comprehensive assessment of studies on sustainable landscapes is presented in this article. It provided an overview of the field's current state of knowledge as well as the gaps in the literature on models that should be created to enhance sustainability in the environmental and landscape domains that have not received enough attention. Three stages went into conducting this analysis: two types of analyses: one quantitative and the other qualitative. It was confirmed that only 2.54% of research employed quantitative approaches to quantify the environmental features produced by landscape activities and goods and that most of these studies focused more on multi-family homes than single-family homes. Furthermore, the outcomes of local infrastructure assessments are not taken into account by quantitative assessment approaches that forecast habitational sustainability. This could occur due to a lack of databases and variations in the kind and placement of infrastructure.

Further research is also necessary due to the divergent views held by academics and practitioners on the characteristics of sustainable building project management. In the absence of this, the construction project manager may remain the subject of academic inquiry when it comes to sustainable construction project management problems, even while they lack the skills, power, or capacity to affect sustainable results. Three main research streams were identified by a thorough analysis and synthesis of the study's shortlisted papers: (a) assessing sustainability, (b) project management for sustainability, and (c) drivers of sustainable building.

Conflict of interest

A conflict-of-interest statement must be placed at the manuscript as below: "The authors declare that there are no conflicts of interest regarding the publication of this manuscript".

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