REVIEW OF KEY CRITERIA FOR SUSTAINABLE BUILDING MATERIALS

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Abstract

Over the past decade, sustainable building materials (SBM) have increasingly been gained the interests from construction industries, leading to numerous studies that have been conducted to find out the criteria for evaluating the effectiveness and sustainability of such kinds of materials. Despite this growing interest, a systematic review of the key sustainability criteria used to select building materials, which is crucial for guiding future research and practical applications, is possibly still lacking. Thus, this article presents a literature review on sustainability criteria for building material selections for engineering designs and practices. This study employed a systematic literature review (SLR) method, following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Data were extracted from the Scopus database, comprising 27 impactful peer-reviewed publications related to the selection of SBM criteria from 2015 to 2024. The review identified and synthesized four key criteria: environmental, economic, social, and technical. A model framework was also developed to understand these sustainability criteria better. The findings could enhance the understanding of critical sustainability considerations, assisting industry practitioners, policymakers, and sustainability-focused institutions in formulating more informed guidelines and strategies for sustainable material selection. Furthermore, the checklist and model framework presented in this article may offer valuable resources for researchers conducting further empirical studies in sustainable construction.

Keywords: *Sustainable building materials; selection criteria; PRISMA; sustainable construction; literature review.*

1. Introduction

The global construction industries are undergoing a significant transformation as it seeks to address the pressing challenges posed by climate change, environmental degradation, and rapid urbanization. In the construction industries, a wide variety of materials are employed, each demanding substantial energy during manufacturing and contributing to carbon dioxide (CO_2) emissions. The United Nations Environment Programme reported that the building and construction sector is responsible for over 36% of global energy consumption and around 40% of energy-related CO_2 emissions [1], [2].

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The adoption of SBM has become a central strategy in promoting environmentally responsible construction practices.

SBM is defined as materials that could reduce environmental impact while supporting economic and social performance throughout their lifespan. Their rise is driven by growing awareness of how the construction industry contributes to environmental issues, accounting for up to 40% of global energy consumption and greenhouse gas emissions [1], [2]. Since the early 1990s, certification systems such as BREEAM and LEED have encouraged the use of SBM by promoting materials that are durable, recyclable, locally sourced, and low in embodied energy and toxicity [3], [4]. Over time, sustainability principles have expanded to include broader considerations such as social equity, health, and affordability [5]. Today, the adoption of SBM is also linked to larger sustainable development goals, integrating economic factors such as life-cycle costs and resource efficiency, as well as social aspects such as worker safety and community health. This research highlights the importance of value-based and multi-criteria decision-making approaches to effectively evaluate and select SBM in various regional contexts.

Material selection is crucial for sustainable construction because it greatly affects the environmental performance of buildings and structures throughout their entire life cycle, from raw material extraction and manufacturing to use, maintenance, and disposal at the end of their life [6]. Early choices about materials can have an effect on the environment of a building by up to 80%. This shows how important it is to include sustainability concepts in the design phase [3]. Choosing materials with low embodied carbon, high recyclability, and durability not only helps to reduce the carbon footprint of buildings but also to support broader goals such as achieving net-zero emissions and moving toward a circular economy [4]. Consequently, informed material selection is vital for ensuring long-term environmental, economic, and social sustainability in the construction industry.

Although research into SBM selection has evolved dramatically, some significant gaps still remain. Most current models focus solely on three pillars of sustainability: environmental, economic, and social, ignoring the technical side, which is crucial for ensuring material performance and constructability [7]. This oversight results in a lack of comprehensive frameworks that incorporate all four pillars [8]. Furthermore, the methodologies for weighting and prioritization employed in research, which are frequently reliant on subjective expert judgments, have introduced uncertainty and constrained the capacity to replicate outcomes in sustainable material selection [3], [4], [9], [10]. These limitations underscore the necessity for a comprehensive, contextsensitive, and empirically validated paradigm to facilitate more consistent and inclusive decision-making in sustainable construction.

This study aims to systematically review and synthesize the key sustainability criteria influencing the selection of SBM. Given the fragmented nature of current research, which often emphasizes isolated criteria or focuses on specific case studies, this review seeks to provide a comprehensive categorization of sustainability criteria across four pillars: environmental, economic, social, and technical [8], [11]. While earlier frameworks have primarily addressed environmental and economic factors, recent studies underscore the importance of integrating social equity and technical performance to support holistic decision-making in construction projects [12]. Building on this, the study also aims to develop a model framework that consolidates and organizes these multidimensional criteria, serving as a practical guide for stakeholders and a foundation for future empirical research. This framework will facilitate transparent and informed material selection, aligning with broader sustainability goals in policy and industry practices.

2. Research method

A SLR enables the rigorous identification, evaluation, and integration of peer-reviewed studies, reducing bias and enhancing the reliability of the findings [13]. This study adopted an SLR approach to ensure a comprehensive, transparent, and replicable synthesis of existing knowledge on the key criteria for sustainable building material selection. By applying the PRISMA protocol, this method allows for a structured analysis that not only identifies the most frequently used sustainability criteria but also supports the development of a conceptual framework to guide future research and industry practices [14], [15].

The PRISMA was employed for this SLR analysis in the current study because it is a widely recognized framework designed to improve the reporting quality of systematic reviews and meta-analyses [16], [17]. The primary goal of PRISMA is to enhance transparency, consistency, and replicability in how reviews are conducted and reported, enabling readers to critically assess the validity of the findings [18], [19]. Moreover, the PRISMA protocol provides a structured checklist of 27 essential items along with a flow diagram that guides researchers through each stage of the review process, from identifying and screening sources to determining eligibility and final inclusion [20]. Fig. 1 depicts the literature search scheme following PRISMA guidelines, outlining the four phases discussed in the subsequent paragraphs.

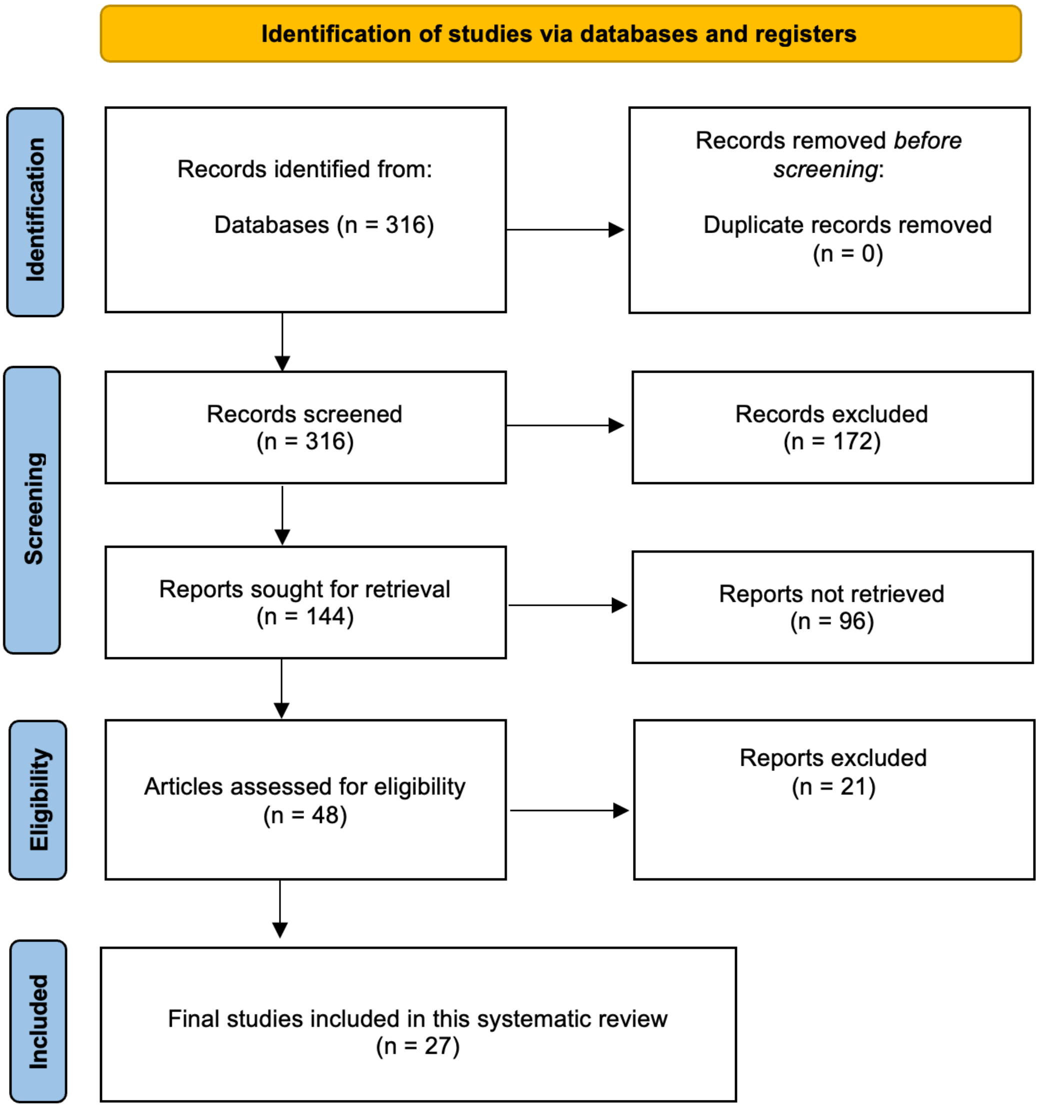

Fig. 1. Stages of PRISMA flowchart.

2.1. Phase 1: Identification

The Scopus database was chosen to identify academic journals instead of other databases such as PubMed, Google Scholar, and Web of Science for four significant reasons [21], [22]. First, it covers most of the research publications in various research areas such as business, accounting, engineering, and construction. Second, the Scopus dataset has gained a precise and accurate performance compared to other search engines. Third, it has been adopted to conduct similar review studies in the construction management domain. Last, it was recognized as the best and most effective search engine for conducting a literature review. The entire search code was listed as follows:

- Keywords: "criteria" AND "sustainability" AND "building material".
- From 2015 to 2025.
- English only
- Elimination book chapters.
- Engineering field.

Following the completion of the search and the removal of duplicates, a total of 316 articles were retained for screening.

2.2. Phase 2: Screening

In Phase 2 of the systematic literature review, we refined the initially identified studies by applying specific inclusion and exclusion criteria to guarantee relevance and quality. This phase adhered to the PRISMA guidelines, which enhance transparency and reproducibility in systematic reviews. The main screening criteria involved filtering records based on:

- Timeframe: We included only studies published from 2015 to 2025. These 10 years were selected to cover both foundational and contemporary literature pertinent to emerging construction technologies and sustainability issues.
- Language: Only publications in English were considered to ensure consistent interpretation and accessibility for the research team.
- Document Type: Eligible document types included peer-reviewed journal articles, full-length conference papers, and published research articles. In contrast, book chapters, conference reviews, editorials, and other types of literature, such as reports and unpublished theses, were excluded.
- Download: Did not provide access to the full text, even after database or institutional retrieval efforts.

This multi-step filtering reduced the dataset significantly, from 316 to 96 papers in one review. The outcome of this screening ensured that only the most relevant and high-quality studies progressed to the eligibility and data extraction phases.

2.3. Phase 3: Eligibility

The eligibility phase involved a thorough examination of the full-text articles retained after the screening stage to ensure their methodological rigor and thematic relevance to the research objective: identifying and analyzing key sustainability criteria for selecting building materials.

These studies were chosen based on: (1) relevance to the selection and evaluation of SBM, (2) inclusion of at least one of the four key sustainability criteria: environmental, economic, social, or technical, (3) clear methodological design with extractable data or conceptual frameworks, (4) contextual alignment with the construction and built environment sectors. Eligibility decisions were recorded in a shared database, ensuring access to all decisions. As a result of this rigorous assessment, 48 studies were confirmed as eligible for final inclusion in the systematic review.

2.4. Phase 4: Inclusion

The final phase of the PRISMA process involved consolidating and confirming the studies that met all prior stages (identification, screening, and eligibility) for detailed analysis [20]. This step ensured that the final selection of articles was methodologically sound, thematically relevant, and sufficiently comprehensive to support the objectives of this review [15], [18].

Two reviewers independently assessed each full-text article using a standardized eligibility checklist based on the inclusion/exclusion criteria. Discrepancies were resolved through consensus or consultation with a third reviewer. This rigorous inclusion phase ensures that only high-quality, relevant, and analytically rich studies underpin the findings, discussion, and proposed framework in this systematic literature review.

After full-text review to ensure they directly address research objectives, such as identifying sustainability criteria for selecting building materials, a total of 27 studies were included in the systematic literature review (Appendix A). These studies formed the empirical and conceptual basis for developing the sustainability criteria framework presented in the results and discussion sections.

3. Results and discussion

3.1. Publication trend

The data indicate a positive research trend in SBM (Fig. 2), with an increasing number of publications from 2015 to 2024. During the initial period (2015–2018), the number of publications remained relatively limited, fluctuating between zero and two studies per year, indicating an emerging research domain. From 2019 onward, a steady growth in scholarly output can be observed, with the number of publications increasing notably from 3 in 2020 to 4 in 2021. Although a slight decline occurred in 2022, the overall trajectory remained positive, followed by a marked rise in 2023 and reaching a peak of 6 publications in 2024. This sustained growth pattern reflects the increasing academic attention and research maturity in the field, driven by the increasing emphasis on sustainable construction practices and lifecycle assessments [23].

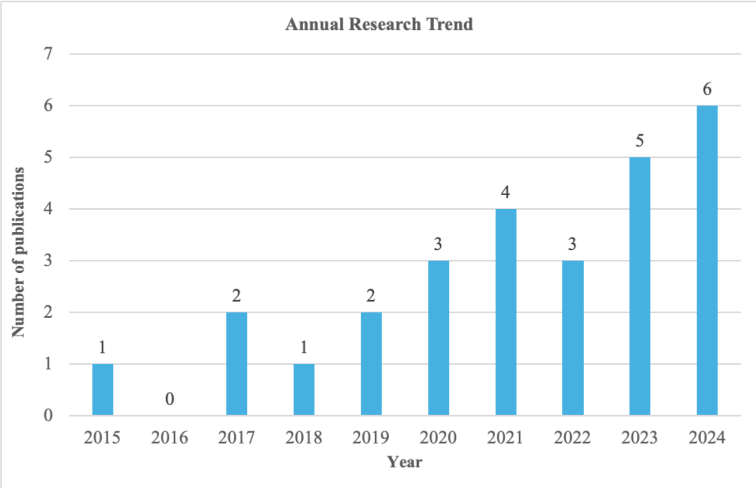

Fig. 2. Yearly research trend in SBM.

3.2. Geographic distribution

The map shows the worldwide distribution of research on sustainable building materials, as shown in Fig. 3. Malaysia leads with five studies, followed by China with three, and India, Pakistan, and Australia with two each. Countries like the United States, Canada, Indonesia, and Iran each contributed one publication. This pattern highlights Asia and Oceania as major regions actively investigating sustainable material choices, indicating their regional focus on green construction and sustainability [24].

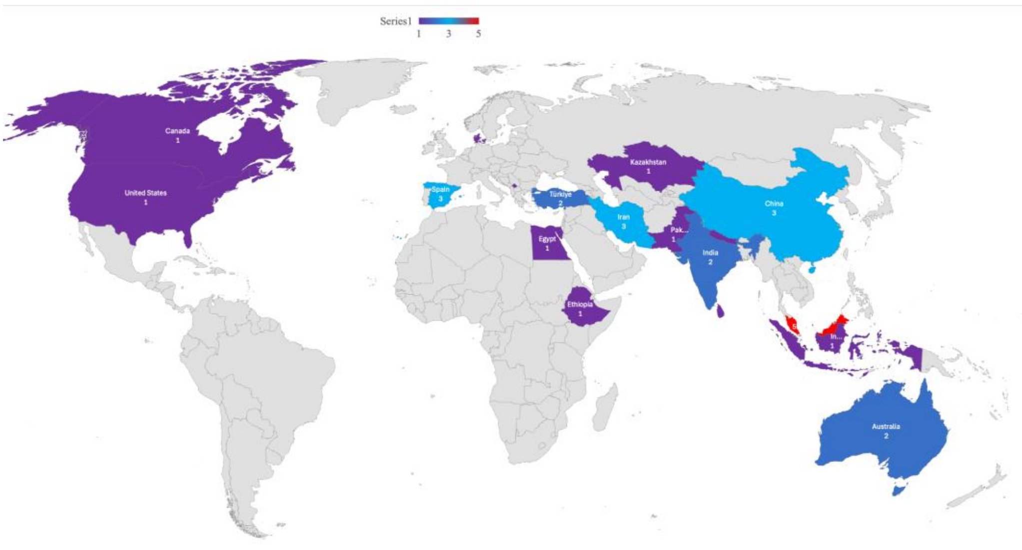

Fig. 3. The worldwide distribution of research on SBM.

3.3. Types of research methods

The research methods (Fig. 4) used in SBM studies varied. Surveys are most common (32%), then secondary data analysis (19%), interviews (17%), focus groups (15%). Less used are case studies (11%) and experiments (6%), respectively. This highlights a focus on empirical and stakeholder-centered methods, especially surveys to gather expert opinions and stakeholder preferences [25]. The prominence of secondary data and interviews indicates reliance on existing models and expert input for decision-making. The limited experiments suggest a research gap in validating SBM models through physical tests [6].

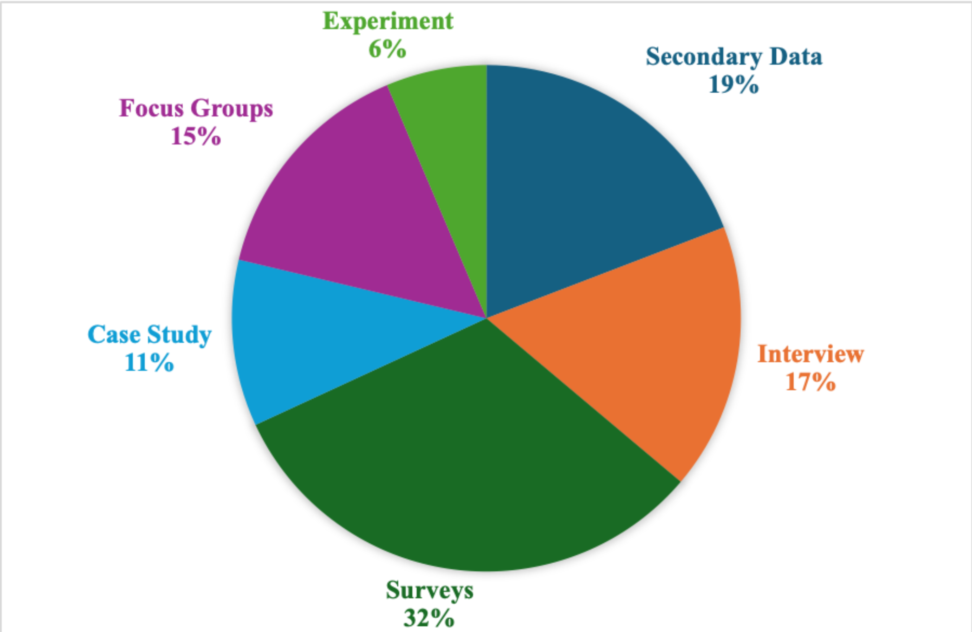

Fig. 4. Types of research methods.

3.4. Identified SBM selection criteria

Table 1 illustrates the proportional distribution of 36 sustainability criteria categorized under four primary criteria: environmental, economic, technical, and social. The analysis reveals that environmental criteria constitute the largest share (12), followed by economic (8), technical (8), and social (8). This distribution provides critical insights into the prevailing focus areas within the literature on SBM selection. Each main criterion included a set of sub-criteria, derived from a thorough review of the literature and aligned with sustainability goals.

• **Technical Criteria** (TE1–TE8) include core performance indicators such as material durability, fire and moisture resistance, thermal and acoustic properties, structural strength, ease of installation, and technological advancement, especially in Vietnam. These aspects are fundamental to ensuring functional longevity and construction feasibility, especially under varying climatic and regulatory contexts [7], [11].

• **Environmental Criteria** (EN1–EN12) consisted of factors such as carbon footprint, embodied energy, resource availability, water usage, waste reduction, biodiversity impact, and resilience to disasters. These factors are vital in minimizing the ecological impacts across a material's life cycle [9], [10].

• **Social Criteria** (SO1–SO8) reflected human-centered concerns such as health and safety, cultural compatibility, educational value, labor practices, and local economic benefits. Despite being historically underemphasized, social aspects are critical for the acceptability, equity, and long-term success of sustainable construction [26]

• **Economic Criteria** (EC1–EC8) included financial feasibility indicators such as initial cost, return on investment (ROI), maintenance and disposal costs, lifecycle cost analysis, and market demand. These elements are central to practical decision-making, especially in contexts where construction budgets and investor expectations are tightly constrained [12].

In summary, the findings indicate that while environmental, economic, and social criteria continue to dominate the discussion on sustainable material selection, technical criteria are becoming more important and need to be more systematically integrated [7]. A comprehensive approach covering all four pillars is crucial to help practitioners and policymakers achieve holistic sustainability outcomes in construction projects.

Tab. 1. The identified criteria

Main Criteria	Code	Sub-Criteria	Short Description	References
Technical	TE1	Material Durability	Long-lasting materials reduce the need for frequent	1,2,4,10,11,12,16,21,22
	TE2	Thermal Performance	High insulation materials improve energy efficiency in buildings	1,2,7,10,12,21
	TE3	Fire Resistance	Materials must comply with fire safety standards to prevent hazards	10,14,18,21
	TE4	Structural Strength	Load-bearing capacity affects material selection for different building types	5,10,14,18,21
	TE5	Moisture Resistance	Materials should prevent mold growth and degradation in humid environments	4,7,10,16,21
	TE6	Acoustic Properties	Soundproofing capabilities may influence material choices for certain projects	1,5,16
	TE7	Ease of Installation	Materials requiring complex techniques may be less favored	1,12,16
	TE8	Technological Advancements	New innovations in green materials, including self-healing concrete influence selection or others	7,8,9,14,15
Environmental	EN1	Climate Stabilization	Materials must be suitable for local temperature, humidity, and extreme weather events	2,6,10,13,15,17,21,24,26,27
	EN2	Availability of Natural Resources	Sustainable material choices depend on locally available resources; e.g., timber, clay, or stone	1,3,4,6,7,10,15,17,18,21,23,25
	EN3	Carbon Footprint	Lower embodied carbon materials are preferred in green building projects	4,6,7,8,10,11,12,14,15,17,20,22,26,27
	EN4	Energy Consumption	Materials with lower manufacturing energy requirements are more sustainable	2,3,4,9,10,11,14,15,16,18,21,22,23,27
	EN5	Water Usage	Water-intensive materials may not be ideal in regions with water scarcity	2,4,6,7,10,11,16,17,23,27
	EN6	Biodiversity Impact	Material extraction should not harm ecosystems or wildlife habitats	2,3,12,16,17,22,25
	EN7	Waste Reduction	Materials should minimize landfill waste through recyclability or biodegradability	9,11,12,14,15,17,19,21,23,27
	EN8	3Rs Materials	Choosing materials with care to reduce, reuse and recycle the amount of waste generated	2,3,4,5,6,7,9,10,15,16,17,19,20,21,22,27
	EN9	Transportation Emissions	Locally sourced materials reduce emissions from long-distance shipping	6,7,15,17,24
	EN10	Land Acquisition	Materials that reduce heat absorption, e.g., reflective roofing, contribute to urban cooling	2,6,7,13,17,21,23
	EN11	Disaster Resilience	Materials must withstand natural disasters like earthquakes, floods, or cyclones	2,13,21,22,24,27
	EN12	Toxic Emissions	The release of harmful or hazardous substances into the environment	3,4,5,7,21,23,27
Social	SO1	Local Availability	Preference for locally sourced materials to support community economies and reduce transportation emissions	3,4,6,7,15,16,17
	SO2	Aesthetic Quality	Selecting materials that enhance visual appeal and community acceptance	5,6,11,16,17,21,23,27
	SO3	Labor Practices	Choosing materials sourced or produced under fair labor conditions and ethical employment standards	10,15,16,17,25,27
	SO4	Educational Value	Materials that offer opportunities to educate on sustainable building and environmental responsibility	13,25
	SO5	Cultural Compatibility	Materials respecting and aligning with the cultural heritage and values of the community	1,3,6,8,10,13,17
	SO6	Health and Safety	Ensuring materials do not negatively affect occupant health through toxins or poor indoor air quality	1,4,6,7,8,9,10,11,16,17,21,23,27
	SO7	Community Acceptance	Materials supported and positively perceived by local communities	6,8,9,10,11,13,17,23,25
	SO8	Local Economic Benefit	Preference for locally sourced materials to boost regional economies and employment	6,10,13,17
Economic	EC1	Initial Cost	Initial cost plays a key role in selection, especially for budget-sensitive project at first step	1,4,7,10,13,16,17,21,23,26
	EC2	Return on Investment (ROI)	Sustainable materials with long-term financial benefits are prioritized	6,9,10,13,17,23
	EC3	Maintenance Cost	The total expenses required to keep a building material or component in good working condition	7,9,10,12,13,16,1721,23,25,26
	EC4	Tax Contribution	Higher taxes on non-sustainable materials may push for greener alternatives	6,17
	EC5	Financial Risk	Some materials affect building insurance premiums due to risk factors	6,17
	EC6	Market Demand	The popularity of sustainable materials can influence their price and availability	5,10,13,14,21
	EC7	Lifecycle Cost Analysis	A cost-effective material should have low maintenance and operational expenses	4,6,9,10,13,17,21,22,23,24,25,26
	EC8	Disposal Cost	The expenses associated with removing, transporting, treating, or landfilling building materials	9,16,21,23,26

3.5. Model framework development

The traditional sustainability framework, the Triple Bottom Line, has three pillars: environmental, economic, and social [27]. Although widely used in sustainable construction, it has not fully captured the complexities of selecting and implementing SBMs. This research proposes an expanded four-pillar model, adding a technical pillar alongside the original three. Based on the synthesis of findings from the 27 reviewed studies, a model framework (Fig. 5) was developed to guide the sustainable choice of building materials. This framework consolidates the identified sustainability criteria into four main pillars: environmental, economic, social, and technical, with each pillar including specific, frequently cited indicators from the literature [8], [10], [28], [29]. This proposed framework addresses previous limitations in sustainability assessment models by formally recognizing the technical dimension. Consequently, it enhances alignment with industry practices, material science research, and evolving performance standards. It is particularly appropriate for application in both developed and emerging construction markets, where material choices must increasingly balance resilience, affordability, and environmental responsibility.

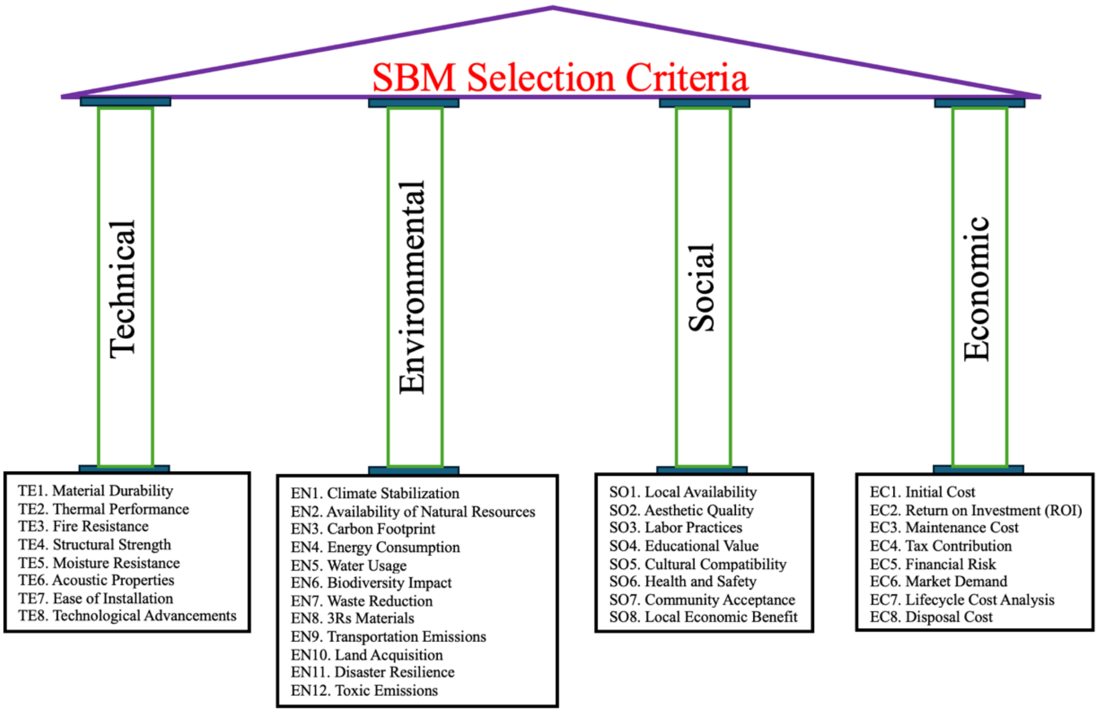

Fig. 5. A framework for SBM selection criteria. Source: Author.

4. Conclusion

This research conducted a systematic review of the literature using the PRISMA methodology to identify and synthesize key sustainability criteria used in selecting SBM. The review examined 27 peer-reviewed articles published between 2015 and 2025, primarily sourced from the Scopus database. Findings were organized into four main sustainability dimensions: environmental, economic, social, and technical, providing a comprehensive and integrated view of material sustainability. The analysis showed a strong focus on environmental criteria, while also highlighting the increasing importance of technical performance alongside economic and social factors. Additionally, the study identified gaps in the existing literature, such as the lack of a unified framework, inconsistent criteria weighting, and limited empirical validation. These insights led to the development of a four-pillar model framework to guide research and practical applications in selecting SBM.

While this study presents a comprehensive four-pillar framework covering technical, environmental, social, and economic criteria for selecting SBM, several limitations should be acknowledged. First, this review mainly relied on the Scopus database, which, although extensive, might have excluded relevant studies listed elsewhere. Furthermore, grey literature, industry reports, and non-peer-reviewed sources were not included, potentially limiting insights from practical applications or emerging research. Second, this study introduces a model framework supported by prior research and categorizes sustainability criteria. However, it has not yet been validated through empirical field studies or real-world construction projects. Additionally, the weighting and prioritization of criteria may vary among stakeholders, regions, and project types, which this framework does not yet accurately quantify. Third, inconsistencies in the criteria classification and definition were observed across the reviewed studies, with some indicators spanning multiple sustainability dimensions or remaining difficult to quantify. These inconsistencies limited further refinement within this review, but provide a basis for future research to improve criteria consistency and standardization.

Future studies should incorporate more grey literature and industry data to enhance the practical applicability of the framework. Furthermore, the development of a weighted multi-criteria model may facilitate a more refined prioritization of sustainability criteria in practical application contexts. Moreover, future research should empirically validate the proposed four-pillar framework through case studies and stakeholder-driven analyses across diverse geographic and project environments.

Appendix A: List of selected articles

Article	Authors	Title	Year	Journal Source
1	Kanniyapan G.; Mohammad I.S.; Nesan L.J.; Mohammed A.H.; Ganisen S.	Façade material selection criteria for optimising building maintainability	2015	Jurnal Teknologi
2	Hoxha V.; Haugen T.; Bjorberg S.	Measuring perception about sustainability of building materials in Kosovo	2017	Facilities
3	Ishak N.I.; Mustafa Kamal E.; Yusof N.	The Green Manufacturer's Compliance With Green Criteria Throughout the Life Cycle of Building Material	2017	SAGE Open
4	Khoshnava S.M.; Rostami R.; Valipour A.; Ismail M.; Rahmat A.R.	Rank of green building material criteria based on the three pillars of sustainability using the hybrid multi criteria decision making method	2018	Journal of Cleaner Production
5	Chen Z.-S.; Martínez L.; Chang J.-P.; Wang X.-J.; Xionge S.-H.; Chin K.-S.	Sustainable building material selection: A QFD- and ELECTRE III-embedded hybrid MCGDM approach with consensus building	2019	Engineering Applications of Artificial Intelligence
6	Mathiyazhagan K.; Gnanavelbabu A.; Lokesh Prabhuraj B.	A sustainable assessment model for material selection in construction industries perspective using hybrid MCDM approaches	2019	Journal of Advances in Management Research
7	Balali A.; Valipour A.; Zavadskas E.K.; Turskis Z.	Multi-criteria ranking of green materials according to the goals of sustainable development	2020	Sustainability (Switzerland)
8	Putra M.A.; Teh K.C.; Tan J.; Choong T.S.Y.	Sustainability assessment of Indonesian cement manufacturing via integrated life cycle assessment and analytical hierarchy process method	2020	Environmental Science and Pollution Research
9	Zhou G.; Gu Y.; Yuan H.; Gong Y.; Wu Y.	Selecting sustainable technologies for disposal of municipal sewage sludge using a multi-criterion decision-making method: A case study from China	2020	Resources, Conservation and Recycling
10	Hatefi S.M.; Asadi H.; Shams G.; Tamošaitienė J.; Turskis Z.	Model for the sustainable material selection by applying integrated Dempster-Shafer evidence theory and Additive Ratio Assessment (ARAS) method	2021	Sustainability (Switzerland)
11	Remizov A.; Tukaziban A.; Yelzhanova Z.; Junussova T.; Karaca F.	Adoption of green building assessment systems to existing buildings under kazakhstani conditions	2021	Buildings
12	Ruslan A.A.B.; Al-Atesh E.A.; Rahmawati Y.; Utomo C.; Zawawi N.A.W.A.; Jahja M.; Raflis; Elmansoury A.	A Value-Based Decision-Making Model for Selecting Sustainable Materials for Buildings	2021	International Journal on Advanced Science, Engineering and Information Technology
13	Vehbi B.O.; Günçe K.; Iranmanesh A.	Multi-criteria assessment for defining compatible new use: Old administrative hospital, Kyrenia, Cyprus	2021	Sustainability (Switzerland)
14	Abed J.; Rayburg S.; Rodwell J.; Neave M.	A Review of the Performance and Benefits of Mass Timber as an Alternative to Concrete and Steel for Improving the Sustainability of Structures	2022	Sustainability (Switzerland)
15	Altaf M.; Zulfiqar Z.	ASSESSING THE POSSIBILITIES OF USING LOCALLY AVAILABLE SUSTAINABLE MATERIALS FOR CONSTRUCTION PURPOSES	2022	International Journal of Energy, Environment and Economics
16	Meng F.; Dong B.	Linguistic intuitionistic fuzzy PROMETHEE method based on similarity measure for the selection of sustainable building materials	2022	Journal of Ambient Intelligence and Humanized Computing
17	Al-Atesh E.A.; Rahmawati Y.; Zawawi N.A.W.A.; Utomo C.	A decision-making model for supporting selection of green building materials	2023	International Journal of Construction Management
18	Izadinia N.; Ramyar E.; Alzayer M.; Carr S.H.; Cusatis G.; Dwivedi V.; Garcia D.J.; Hettiarachchi M.; Massion T.; Miller W.M.; Wächter A.	A versatile optimization framework for sustainable post-disaster building reconstruction	2023	Optimization and Engineering
19	Kadaei S.; Nezam Z.; González-Lezcano R.A.; Shokrpour S.; Mohammadtaheri A.; Doraj P.; Akar U.	A new approach to determine the reverse logistics-related issues of smart buildings focusing on sustainable architecture	2023	Frontiers in Environmental Science
20	Soust-Verdaguer B.; Gutiérrez Moreno J.A.; Llatas C.	Utilization of an Automatic Tool for Building Material Selection by Integrating Life Cycle Sustainability Assessment in the Early Design Stages in BIM	2023	Sustainability (Switzerland)
21	Tegegne D.; Abera M.; Alemayehu E.	Selection of Sustainable Building Material Using Multicriteria Decision-Making Model: A Case of Masonry Work in Lideta Subcity, Addis Ababa	2023	Advances in Civil Engineering
22	Galila A.; Kaseireldeil S.; Abdalkhaliq N.; Farouk E.; Eichner M.; sarhan Y.	Enhancing sustainability and resource efficiency through upcycling: a comprehensive review and analytical – based framework for evaluating building upcycled products	2024	Innovative Infrastructure Solutions
23	Gurupatham S.V.; Jayasinghe C.; Perera P.; Lepakshi R.	Building material selection framework for tropical climatic conditions: Eco-design-based approach	2024	Green Technologies and Sustainability
24	Rivas Aybar D.M.; John M.; Biswas W.	Enhancing eco-efficiency in hemp-based construction boards: environmental and economic strategies for sustainability	2024	Australasian Journal of Environmental Management
25	Sánchez-Garrido A.J.; Navarro I.J.; Yepes V.	Sustainable preventive maintenance of MMC-based concrete building structures in a harsh environment	2024	Journal of Building Engineering
26	Soust-Verdaguer B.; Gutiérrez Moreno J.A.; Cagigas D.; Hoxha E.; Llatas C.	Supporting sustainability assessment of building element materials using a BIM-plug-in for multi-criteria decision-making	2024	Journal of Building Engineering
27	Yildiz S.; Güneş G.Ş.	Determining the importance levels of criteria in selection of sustainable building materials and obstacles in their use	2024	Journal of Sustainable Construction Materials and Technologies

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TỔNG QUAN VỀ CÁC TIÊU CHÍ QUAN TRỌNG ĐỐI VỚI VẬT LIỆU XÂY DỰNG BỀN VỮNG

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Tóm tắt: Trong thập kỷ qua, vật liệu xây dựng bền vững (*Sustainable Building Materials* – SBM) đã nhận được sự quan tâm ngày càng lớn trong ngành xây dựng, dẫn đến nhiều nghiên cứu nhằm khám phá các tiêu chí đánh giá hiệu quả và tính bền vững của chúng. Mặc dù mối quan tâm này không ngừng gia tăng, song vẫn còn thiếu một nghiên cứu tổng quan có hệ thống về các tiêu chí bền vững chủ chốt được sử dụng trong việc lựa chọn vật liệu xây dựng, điều có ý nghĩa quan trọng trong việc định hướng nghiên cứu tương lai và ứng dụng thực tiễn. Do đó, bài báo này tiến hành rà soát có hệ thống các tài liệu hiện có liên quan đến tiêu chí bền vững trong lựa chọn vật liệu xây dựng, thông qua phân tích các bài báo khoa học được bình duyệt. Nghiên cứu áp dụng phương pháp Tổng quan tài liệu có hệ thống (*Systematic Literature Review* – SLR), tuân thủ hướng dẫn PRISMA (*Preferred Reporting Items for Systematic Reviews and Meta-Analyses*). Dữ liệu được trích xuất từ cơ sở dữ liệu Scopus, bao gồm 27 công trình khoa học có ảnh hưởng liên quan đến tiêu chí lựa chọn SBM trong giai đoạn 2015–2024. Kết quả tổng hợp và phân tích xác định bốn nhóm tiêu chí chính: môi trường, kinh tế, xã hội và kỹ thuật. Đồng thời, một mô hình khung được xây dựng nhằm giúp hiểu rõ hơn về các tiêu chí bền vững này. Các phát hiện của nghiên cứu góp phần nâng cao nhận thức về các yếu tố bền vững cốt lõi, hỗ trợ các chuyên gia trong ngành, nhà hoạch định chính sách và các tổ chức định hướng bền vững trong việc xây dựng hướng dẫn và chiến lược lựa chọn vật liệu hiệu quả hơn. Ngoài ra, bảng kiểm (*checklist*) và mô hình khung được trình bày trong bài báo này là tài liệu hữu ích cho các nhà nghiên cứu trong việc thực hiện các nghiên cứu thực nghiệm tiếp theo về xây dựng bền vững.

Từ khóa: *Vật liệu xây dựng bền vững; tiêu chí lựa chọn; PRISMA; xây dựng bền vững; tổng quan tài liệu.*

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