

Sustainability Indicators for Real Estate Investment Assessment: A Systematic Review of MCDM-Based Studies

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Abstract

The real estate sector is responsible for about 40 percent of global energy use and has increasing pressure to show that investments into the industry are sustainable by way of using multi-dimensional assessment frameworks. As part of mandatory ESG (environmental, social, and governance) disclosure regulations for corporate entities, specifically the Corporate Sustainability Reporting Directive (CSRD, 2024) and European Sustainability Reporting Standards (ESRS), companies are being required to provide a structured set of evidence-based sustainability indicator sets to meet regulatory obligations. MCDM (multi-criteria decision-making) methodologies are the predominant analytical methodology used to apply these criteria to appraisals of real estate investment opportunities. However, there does not exist at present a systemically developed, protocol-based compilation of the indicators reported in the existing literature as it relates to real estate investment. This article reports on a systematic review of 128 peer-reviewed articles published from January 2017 to December 2025, retrieved from Scopus, Web of Science, and Google Scholar. All extracted data was subject to a process of standardization and harmonization, which resulted in the identification of 46 key sustainability indicators across four dimensions: Environmental (n = 15; 32.6%); Economic (n = 13; 28.3%); Social (n = 11; 23.9%); and Technological (n = 7; 15.2%). In addition, three additional indicators were identified that correspond to mandatory CSRD and ESRS reporting requirements. In relation to environmental considerations, Greenhouse Gas emissions were found to be referenced in 95.3% of studies while Employment Creation was mentioned in 92.2% of studies. Analytical Hierarchy Process (AHP) was noted to be the most frequently utilized methodology (27.3%), while Stepwise Weight Assessment Ratio Analysis (SWARA) grew to become the second-most utilized methodology (21.1%) from 2024 onwards. There were no studies focused on Western Balkan or equivalent transitional economy regions. The above-identified 49-indicator framework will serve as a basis for providing an up-to-date evidence-based framework for assessing sustainability within the context of real estate investment.

Keywords: sustainable investment; sustainability indicators; real estate; MCDM; PRISMA 2020; ESG; transition economies

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1. Introduction

The real estate sector consumes roughly 40% of global energy and produces around 30% of all carbon dioxide emissions (UNEP, 2022). As such, it represents one of the key sectors included in international sustainable development agenda initiatives. Real estate investment sustainability was previously considered an optional and voluntary initiative, but is now mandatory due to the convergence of mandatory disclosure regulations. Mandatory disclosure regulations include the EU Taxonomy for Sustainable Activities (Regulation 2020/852), the Corporate Sustainability Reporting Directive (CSRD, Directive 2022/2464/EU, which applies from January 2024) and the European Sustainability Reporting Standards (ESRS), which provide the largest scale of mandatory sustainability reporting structure ever developed (European Commission, 2022). Also, IFRS Sustainability Disclosure Standards (IFRS S1 and S2, ISSB, 2023) are creating a worldwide standard for climate-related financial disclosures. All these developments create the first time there is common mandatory regulatory pressure to evaluate and disclose sustainability performance in terms of multiple sustainability aspects for real estate investors and developers.

There have been several types of analytical frameworks proposed for integrating various sustainability criteria

when conducting multi-dimensional sustainability assessments of real estate investments. In particular, Multi-Criteria Decision-Making (MCDM) methods have become widely accepted as a suitable analytical framework for translating multi-dimensionality into a single dimension sustainability assessment score. MCDM methods allow financial, environmental, social and technological objectives to be integrated into a coherent ranking system. Furthermore, they also enable transparent audit trails, enabling users to track how each objective contributes to the overall ranking. Therefore, MCDM methods act as decision support systems that enable users to meet future ESG disclosure obligations.

Although MCDM methods have become popular over recent years, selecting the appropriate set of sustainability indicators to use within MCDM models remains an ad-hoc process. Researchers draw upon different discipline-based literature reviews and/or regional legal and regulatory requirements to select their sustainability indicators. A consequence of this is that the literature contains a large number of disjointed indicator sets. These disjointed indicator sets prevent the ability to compare results of research conducted in different locations or regions and therefore reduce the applicability of findings obtained in one location to other locations. It is also critical for transition economies. Transition economies rely heavily on the validation of governance frameworks and localised indicator sets. However, this is currently absent.

Therefore, this research aims to address this issue through a systematic review of MCDM-based sustainability assessment of real estate investments published since January 2017. The review includes all relevant publications up until the end of December 2025. This review timeframe covers all the changes in regulation associated with ESG disclosure, i.e. from voluntary adoption of ESG frameworks to mandatory adoption under CSRD and ESRS. Moreover, this timeframe also encompasses significant growth in the volume of original research outputs documented following entry into force of the CSRD in January 2024. The review has four objectives: (i) document and categorize all sustainability indicators used in reviewed papers during the entire review timeframe; (ii) describe the methodological landscape throughout the entire review timeframe; (iii) examine the extent to which sectoral areas and geographical regions are covered and evidence gaps exist; and (iv) investigate the relevance of reviewed research outputs for assessing sustainable property investments in transition economy settings.

2. Literature Review

There is now a considerable body of evidence indicating that the financial significance of sustainability within real estate investment has been empirically established. Friede et al. (2015) provided an overview of more than 2,000 empirical studies, finding that around 90 percent reported a non-negative association between ESG-performance and financial performance. Furthermore, Bolton and Kacperczyk (2021) demonstrated that investors impose a statistically significant price discount on properties with higher levels of carbon risk exposure, thereby demonstrating a direct link between sustainability performance and the cost of capital within investment portfolios. In addition, Berg et al. (2022) found a substantial level of variation among the main ESG-rating agencies, illustrating the need for transparency, consistency and standardized indicator frameworks in order to enable comparative assessments of sustainability performance. Within real estate finance itself, Flammer (2021) demonstrated that companies issuing corporate green bonds are able to achieve reductions in their carbon footprint and demonstrate improved environmental performance, thereby providing further evidence of the mechanisms through which sustainability criteria can impact upon investment results.

MCDM techniques provide formalized methodologies for structuring the integration of diverse sustainability criteria when assessing and selecting investments. AHP (Analytic Hierarchy Process) (Saaty, 1980) is currently the most popular methodology for assigning weights to various sustainability criteria during assessments and decision-making processes due to its ability to break down complex decision-making processes into simple pairwise comparisons of criteria based on relative importance. Consistency checks are also included in the pairwise comparison process to ensure that the input data provided during the analysis reflects logical decision-making processes. SWARA (Stepwise Weight Assessment Ratio Analysis) (Kersuliene et al., 2010) provides an alternative methodology to AHP and requires significantly fewer sequential pairwise comparisons for each criterion compared to AHP. Therefore, SWARA is particularly useful for larger indicator sets. TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) (Hwang and Yoon, 1981) is currently the most commonly applied methodology for determining rankings using multiple-criteria decision analysis models. However, the primary limitation of TOPSIS is that it does not provide explicit investment appraisal scores. Finally, Stevic et al. (2020) developed MARCOS (Multi-attribute Ranking-based Composite Index Method) as a methodology for evaluating and comparing alternative solutions within a complex multi-stakeholder context, and as such, MARCOS has gained increasing acceptance in applications focused on sustainability. Although there is

considerable methodological sophistication in many of these individual studies, there is currently no published PRISMA-compliant meta-analysis or systematic review of sustainability indicators applied in real estate MCDM studies. This lack of aggregation of research findings prevents the accumulation of knowledge regarding best practices and commonalities in the application of sustainability indicators in real estate MCDM studies (Zavadskas et al., 2014).

Regulatory changes were made between 2023 and 2025, which will have measurable implications for sustainability indicator practice. One such implication was the CSRD's double-materiality requirement, whereby organizations will be required to consider the financial materiality of sustainability risks impacting an organization's operations, and additionally to assess how those same risks may affect individuals and environments outside of an organization's direct operations. Both of these elements will be operationalized via ESRS 1 and ESRS S2. As a result, two additional types of sustainability indicators will be demanded from organizations beyond those typically assessed at the project level. Consequently, an expanded time frame is being utilized in this study to account for these additional indicators.

3. Methodology

3.1 Research Design and Search Strategy

The systematic review was developed and documented according to the PRISMA 2020 Guidelines (Page et al., 2021). The review protocol was finalized before collecting data. Systematic searches were performed over Scopus, Web of Science Core Collection, and Google Scholar by utilizing Boolean strings that combined sustainability terms (sustainability assessment, sustainability indicators, ESG), MCDM terms (MCDM, MCDA, AHP, TOPSIS, SWARA, multi-criteria), and real estate terms (real estate, property investments, green buildings, sustainable developments). The unified search period spanned January 2017 to December 2025, covering all nine full years of publication output throughout the entire transformation from voluntary to required ESG reporting.

Four inclusion criteria defined eligible studies: (i) English-language peer-reviewed journal articles published between January 2017 and December 2025; (ii) at least one MCDM or MCDA method applied for assessing sustainability, weighting criteria, or evaluating investments; (iii) real estate or built-environment domains, i.e. residential, commercial, tourism-related and mixed-use developments; and (iv) explicitly stated quantitative sets of sustainability indicators described or measured. Excluded were non-peer-reviewed studies, qualitative-only studies, systematic reviews, and studies solely focused on building energy modelling lacking multi-dimensional sustainability scope. All phases of this study's selection are outlined in Table 1.

3.2 Study Data Extraction and Indicator Standardization

A structured extraction template captured year of publication, name of the journal in which it appeared, country of origin, type of project evaluated, types of MCDM used to evaluate the project, and an exhaustive list of each indicator used along with its description and units. Indicators used in each study were standardized through two processes. Terminological standardization occurred when authors used synonymous terminology to describe similar concepts. For example, "carbon emissions," "GHG emissions," and "CO2 equivalent output" were collapsed into the categories "GHG" or "Carbon Balance." Conceptual de-duplication occurred when authors utilized multiple proxy measures to measure identical constructs. The post-standardized indicators were categorized based upon their construct classification into four categories: Environmental, Economic, Social, and Technological. Indicators identified in at least five separate studies published in 2024 or 2025 and not present in studies published between 2017 and 2023 were designated as CSRD and ESRS-driven additions, reflecting new mandatory reporting requirements introduced during that period.

4. Analysis and Results

4.1 Study Selection and Temporal Trends

Table 1. PRISMA 2020 Study Selection Summary (January 2017 - December 2025).

Stage	Records (n)	Notes
Database identification	6,385	Scopus: 2,121; WoS: 1,626; Google Scholar: 2,638
After duplicate removal	4,901	1,484 duplicates removed
Excluded at title/abstract screening	4,378	Irrelevant domain; no MCDM; no quantitative indicators
Full-text assessed	523	Eligible for full-text review
Excluded at full-text	395	Non-peer-reviewed (72); qualitative only (108); out-of-scope (142); language (73)
Included in synthesis	128	Covering January 2017 to December 2025

Source: Author's PRISMA 2020 documentation. WoS = Web of Science Core Collection.

The 128 studies examined in this paper fall within six types of real estate: tourism and hospitality (27 studies; 21.1%); residential and mixed-use development (25; 19.5%); commercial real estate (22; 17.2%); energy-based infrastructures that support real estate (20; 15.6%); environmental and green developments (17; 13.3%); and agricultural tourism and rural real estate (17; 13.3%). The number of studies increased from four in 2017 to fifteen in 2023. In the next two years there was an extremely sharp increase to twenty-nine studies in 2024 and thirty-two studies in 2025. This extreme jump is due entirely to the start of application of the EU Commission's Corporate Sustainability Reporting Directive (CSRD) in January 2024. This directive immediately caused a huge need for empirically based research on how sustainable investment criteria can be used when evaluating investments in real property, as illustrated in Table 2.

Table 2. Annual Distribution of Included Studies (2017 - 2025).

Year	Studies (n)	Cumulative (n)	Key Regulatory Context
2017	4	4	Voluntary ESG frameworks dominate
2018	6	10	EU Sustainable Finance Action Plan published
2019	8	18	EU Green Deal announced
2020	9	27	EU Taxonomy Regulation (2020/852) adopted
2021	11	38	SFDR Level 1 applicable; COP26 Glasgow
2022	14	52	CSRD adopted; ISSB standards in development
2023	15	67	IFRS S1 and S2 issued; CSRD transposition deadline
2024	29	96	CSRD enters application (Jan 2024); ESRS adopted
2025	32	128	ESRS sector-specific standards; green bond market expansion
Total	128	—	January 2017 to December 2025

SFDR = Sustainable Finance Disclosure Regulation. Source: Author's extraction from 128 included studies.

In addition to the geographic differences among high income countries there are also other differences that exist between those countries. The majority of these studies were conducted in Asia which accounts for 27 studies (21.1%) followed by Europe accounting for 30 studies (23.4%). The next largest group consisted of multi-

regional frameworks accounting for 32 studies (25.0%). The remainder of the studies consist of 17 studies (13.3%) conducted in the Middle East, 13 studies (10.2%) conducted in Africa, and 9 studies (7.0%) conducted in Latin America. All three groups, Western Balkans, Central and Eastern Europe, and other similar transitional economy regions have no representation within all 128 studies and therefore present the most significant knowledge void in this research area.

4.2 MCDM Methods

AHP/Fuzzy AHP was found to be utilized in approximately 27.3% (35) of the studies examined, indicating AHP/Fuzzy AHP has become an accepted tool in real estate appraisal practices. TOPSIS accounted for the second greatest number of applications at 23.4% (30) of the studies, due to the transparency of its ranking methodology. SWARA represented the third greatest number of applications at 21.1% (27). This was demonstrated through an increase in usage from 14.9% in the 2017 to 2023 period to 28.1% in 2024 and 2025, primarily as a result of expanded use of CSRD-aligned indicator sets that surpass the capabilities of AHP's pairwise comparisons. Following SWARA were COPRAS (8.6%), WASPAS (7.8%), BWM (6.3%), and MARCOS (4.7%; Stevic et al., 2020). BWM and MARCOS demonstrate an increased application rate in 2024 and 2025 with respect to materiality assessments. Twenty-six studies (20.3%) used hybrid approaches; however, this difference may reflect the varying nature of ESG rating methodologies identified by Berg et al. (2022), thus providing further rationale for the use of transparent and protocol-driven weighting schemes versus proprietary scoring mechanisms in real estate sustainability assessments.

4.3 The 49-Indicator Sustainability Framework

From extraction and harmonization of indicators from all 128 studies identified during the review process, a total of 46 core sustainability indicators were found to be consistently used across the full 2017 to 2025 review period, along with three additional indicators driven by CSRD and ESRS regulatory requirements, resulting in a confirmed 49-indicator framework. Table 3 illustrates the dimensional structure of the framework. With regard to the structural composition of the framework, the environmental dimension represents the greatest percentage at 32.7%, based upon the regulatory focus on carbon and resource performance in global real estate markets. The economic dimension (28.6%) relates to financial feasibility and territorial value creation, while the social (24.5%) and technological (14.3%) dimensions complete the framework.

Table 3. Dimensional Distribution of Sustainability Indicators (2017-2025).

Dimension	Core Indicators	CSRD/ESRS-Driven Additions	Total	% of Framework
Environmental	15	1	16	32.7%
Economic	13	1	14	28.6%
Social	11	1	12	24.5%
Technological	7	0	7	14.3%
Total	46	3	49	100.0%

Source: Author's extraction from 128 included studies (January 2017 - December 2025).

The environmental dimension is shown in full detail in Table 4. It appears that there were GHG or Carbon Balance indicators reported in 95.3% of studies, which make up the most ubiquitous sustainability indicator for real estate assessments. The next most common was renewable energy share at 74.2%, followed by water consumption at 73.4% and biodiversity impact at 63.3%. In addition, the increasing presence of climate resilience (at 57.8%) and embodied carbon (at 38.3%) indicate an increasing recognition of physical climate risk within the investment appraisal process through post-2020 studies. Finally, the EN-16 Double Materiality Assessment Score, developed as part of ESRS 1 (General Requirements) for sustainability reporting and identified in 17 studies from 2024 and 2025, reflects the requirement of double materiality assessment mandated by the EU Corporate Sustainability Reporting Directive (CSRD) from 2023 onwards.

Table 4. Environmental Dimension: 16 Sustainability Indicators (2017-2025).

Code	Indicator	Unit	n	(%)
EN-01	GHG Emissions or Carbon Balance	tCO ₂ eq/year	122	95.3%
EN-02	Total Energy Consumption	MWh/year	102	79.7%
EN-03	Renewable Energy Share	%	95	74.2%
EN-04	Water Resource Consumption	m ³ /year	94	73.4%
EN-05	Solid Waste Generation	tonnes/year	85	66.4%
EN-06	Recycling and Circularity Rate	%	82	64.1%
EN-07	Land Use and Soil Sealing	Hectares	76	59.4%
EN-08	Biodiversity Impact	Composite index	81	63.3%
EN-09	Ambient Air Quality	microg/m ³	74	57.8%
EN-10	Climate Resilience and Adaptive Capacity	Score 1-5	74	57.8%
EN-11	Surface and Ground Water Quality	Composite index	68	53.1%
EN-12	Sustainable and Low-Carbon Materials	%	64	50.0%
EN-13	Ecosystem Restoration	Hectares rehabilitated	56	43.8%
EN-14	Embodied Carbon in Construction	kgCO ₂ eq/m ²	49	38.3%
EN-15	Ecological Footprint	Global hectares	41	32.0%
EN-16 *	Double Materiality Assessment Score	Composite (ESRS 1)	17	13.3%

* CSRD/ESRS-driven addition identified in 2024-2025 studies (5+ independent studies). Source: Author's extraction.

Table 5 provides the economic dimension. Investment costs (total investment costs: 95.3% of studies; total number of studies where this indicator is used = 122) and job generation (employment creation: 92.2% of studies) have been shown to be the most universally applicable indicators across all sub-sectors and geographically. Investor-centric financial metrics, such as IRR (87.5% of studies) and NPV (82.8% of studies), demonstrate how these metrics were viewed from an investor's perspective. The emerging addition EC-14 Sustainability-Linked Financial Cost, in terms of the interest rate difference between standard and sustainability-linked debt instruments, is seen in 14 studies from 2024 and 2025. This demonstrates how rapidly the use of green bonds and sustainability-linked loans has grown since the publication of Flammer (2021).

Table 5. Economic Dimension: 14 Sustainability Indicators (2017-2025).

Code	Indicator	Unit	n	(%)
EC-01	Total Investment Cost (CAPEX)	Million EUR	122	95.3%
EC-02	Employment Created (direct and indirect)	Number of jobs	118	92.2%
EC-03	Internal Rate of Return (IRR)	%	112	87.5%
EC-04	Net Present Value (NPV)	Million EUR	106	82.8%
EC-05	Payback Period	Years	100	78.1%
EC-06	GDP Contribution	% of GDP	91	71.1%
EC-07	Annual Operating Costs (OPEX)	EUR/year	85	66.4%
EC-08	Local Supply Chain Integration	%	82	64.1%
EC-09	Fiscal Contribution	% of public deficit	80	62.5%
EC-10	Economic Multiplier Effect	Coefficient	72	56.3%
EC-11	Financial and Investment Risk	Score 1-5	67	52.3%
EC-12	Export Potential	EUR/year	54	42.2%
EC-13	Financing Source Diversification	% per source	44	34.4%
EC-14 *	Sustainability-Linked Financial Cost	Interest differential (bps)	14	10.9%

* CSRD/ESRS-driven addition identified in 2024-2025 studies. bps = basis points. Source: Author's extraction.

Table 6 illustrates the Social Dimension of sustainability reporting. Basic Services (Access) has been reported at a high rate (90.6%), as well as Occupational Health and Safety (85.9%). With respect to transparency and anti-corruption, SO-06 is positively trending temporally, from 67.2% in studies conducted between 2017 and 2023 to 84.4% in those conducted in 2024 and 2025, which reflects the growing requirement for corporate governance disclosure under ESRS G1 (Business Conduct) and the differences in ESG rating that have been documented by Berg et al. (2022). SO-12 Workforce Value Chain Sustainability has also emerged as an additional item in 11 studies conducted in 2024 and 2025; this is due to the fact that there are now mandatory assessments required by companies regarding their workforce within their supply chains under ESRS S2.

Table 6. Social Dimension: 12 Sustainability Indicators (2017-2025).

Code	Indicator	Unit	n	(%)
SO-01	Access to Basic Services (communities)	Number of beneficiaries	116	90.6%
SO-02	Occupational Health and Safety	LTIFR	110	85.9%
SO-03	Gender Equality in Employment	%	97	75.8%
SO-04	Capacity Development and Vocational Training	Number of trainees	91	71.1%
SO-05	Community Engagement and Consultation	Number of consultations	89	69.5%
SO-06	Transparency, Accountability, Anti-Corruption	Composite index	100	78.1%
SO-07	Benefits to Vulnerable and Marginalised Groups	Number of beneficiaries	83	64.8%
SO-08	Cultural Heritage and Site Protection	Number of sites	71	55.5%
SO-09	Social Cohesion	Composite index	66	51.6%
SO-10	Quality of Life Improvement	Composite index	62	48.4%
SO-11	Displacement and Involuntary Resettlement	Number of families	55	43.0%
SO-12 *	Workforce Value Chain Sustainability	Composite (ESRS S2)	11	8.6%

* CSRD/ESRS-driven addition identified in 2024-2025 studies. LTIFR = Lost-Time Injury Frequency Rate. Source: Author's extraction.

The technological dimension is presented in Table 7. No CSRD or ESRS-driven additions met the five-study threshold within this dimension during the 2017 to 2025 review period, confirming the seven core indicators as the complete set.

Table 7. Technological Dimension: 7 Sustainability Indicators (2017-2025).

Code	Indicator	Unit	n	(%)
TE-01	Technology Readiness Level (TRL)	Scale 1-9	97	75.8%
TE-02	Process Digitisation Rate	% automated	89	69.5%
TE-03	Technology Transfer	Number of technologies	82	64.1%
TE-04	Operational Efficiency Index	Composite index	76	59.4%
TE-05	Smart Management Systems (IoT and AI)	Number of systems	79	61.7%
TE-06	Interoperability with Existing Systems	Score 1-5	60	46.9%
TE-07	Cybersecurity and Digital Resilience	Level 1-5	44	34.4%

Source: Author's extraction from 128 included studies. IoT = Internet of Things; AI = Artificial Intelligence.

5. Discussion and Conclusion

The overwhelming prevalence (32.7%) of environmental indicators in the literature assessed is consistent with the regulatory environment in developed economies which drove the majority of the original research, with the influence of carbon pricing, EU Taxonomy alignment criteria and mandatory environmental disclosure obligations under the Corporate Sustainability Reporting Directive (CSRD), all creating substantial incentive for environmental indicators. The ubiquity of GHG emissions being reported on in 95.3% of studies, and the renewable energy share being reported on in 74.2%, confirms that environmental performance remains the main vehicle for sustainability signalled by property developers in international property markets. The increasing variability in ESG ratings, identified by Berg et al. (2022), highlights an imperative to develop a systematic evidence-based indicator framework, such as one provided by this review. When there are multiple rating agencies producing significantly different assessments of the sustainability of the same asset, without a common set of indicators against which to assess them, this represents a material risk for investors and regulators alike.

Sustainability-linked finance (documented through the EC-14 indicator in 14 studies from 2024 and 2025) is the clearest relationship between the results of sustainability assessments and the cost of capital. Flammer (2021) demonstrates through evidence from financial markets that green bonds have reduced carbon emissions, thus demonstrating that the performance of selected sustainability indicators can result in positive capital allocations. The increased use of this type of indicator indicates that real estate sustainability assessments will be used to support project finance structures and not just remain a separate reporting obligation.

The predominant environmental focus of the indicators available for use in sustainability assessments creates a direct transferability challenge for transition economy real estate markets. The Environmental Kuznets Curve Framework (Grossman and Krueger, 1991) has theoretical foundations supporting why low-income economies may prioritize environmental investments only at certain levels of gross domestic product (GDP) per capita, i.e., income thresholds not yet reached by Western Balkan economies whose average GDP per capita ranges from 35% to 45% of the European Union average (OECD, 2024). In these contexts, the economic dimension indicators, including employment generation (92.2%), fiscal contributions (62.5%), and local supply chain development (64.1%), represent the primary sources of financial materiality for investment decision-makers. The total absence of Western Balkan countries from 128 primary publications over nine years is identified as the most severe evidence gap this review found.

The increase from 14.9% to 28.1% in the proportion of studies using SWARA as their preferred methodology, from those conducted between 2017 and 2023 to those conducted in 2024 and 2025, is the greatest trend in methodology observed throughout this review period. This is primarily due to the growing number of indicators included within CSRD-compliant frameworks that require expanded sets of indicators. The larger numbers of indicators involved within sustainability frameworks approaching 49 or more indicators make AHP's $n(n-1)/2$ pairwise comparison processes unmanageable for institutional expert panels. Because SWARA requires only n minus one sequential comparisons, for example 48 for a 49-indicator set versus 1,176 for AHP, SWARA is identified as the preferable methodology for conducting comprehensive sustainability assessments involving large numbers of indicators.

Four conclusions were drawn from this study. First, the 49-indicator framework represents the most up-to-date and comprehensive evidence-based indicator set for performing MCDM-based real estate sustainability assessments. It includes data collected over nine consecutive full calendar years including the period subsequent to implementation of CSRD requirements, and replaces reliance upon unstructured choice by establishing a systemically valid base for selecting indicators. Second, SWARA is identified as the preferred methodology for assigning weights to large numbers of sustainability indicators; this conclusion is supported by both theoretical rationale and empirical demonstration of greater adoption rates in 2024 and 2025. Third, transition economy stakeholders must adapt and validate the 49-indicator framework to meet contextual needs, i.e., validate via expert input, identify measurable components and modify dimensions relative to developmental priorities so that economic performance takes precedence over environmental optimization. Finally, future research must address the Western Balkans evidence gap by providing context-specific, validated sustainability assessment tools to assist in assessing rapidly growing but currently under-researched areas of international real estate activity.

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