



Article

The Green Mirror: Reflecting on Sustainability Reporting Practices of Indian and Australian Real Estate Stakeholders

Raghu Dharmapuri Tirumala^{1,*}  and Kruti Upadhyay² ¹ Faculty of Architecture, Building and Planning, The University of Melbourne, Melbourne, VIC 3010, Australia² Independent Researcher, Ahmedabad 380001, India; kruti.jani@gmail.com

* Correspondence: dtvrghu@unimelb.edu.au

Abstract: Within the real estate sector, the concept of sustainability has traditionally been associated with green building initiatives. This study broadens the scope by examining environmental disclosure practices across a spectrum of stakeholders, including developers, financiers, suppliers, and advisors, within the real estate sectors of Australia and India. Utilizing the Global Reporting Initiative (GRI) standards to evaluate environmental reporting, this research scrutinizes publicly disclosed company data to assess the sector's engagement with sustainability. The findings reveal a pronounced focus on emissions and energy, with less attention to other critical factors like biodiversity, materials, and supplier environmental assessment. This selective disclosure suggests a need for a more holistic approach to sustainability reporting. This study also investigates the influence of regional nuances and the integration of international reporting standards, shedding light on the varied practices of sustainability reporting within the industry. Furthermore, this paper examines the relationship between environmental disclosures and financial performance, measured by the economic value added (EVA). It was observed that environmental disclosures do not show a significant correlation with EVA for companies in either country, indicating that current reporting practices do not directly impact financial outcomes as captured by this metric. These findings offer actionable insights for enhancing reporting practices, encouraging a collective approach to address the environmental impacts of real estate, and contributing to the discourse on responsible environmental stewardship.

Keywords: Australia; economic value added; emissions; energy; environmental disclosure; global reporting initiative; India; real estate; stakeholder transparency



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1. Introduction

The global real estate market, valued at USD 3.88 trillion in 2022, is projected to expand to USD 6.13 trillion by 2030, advancing at a compound annual growth rate (CAGR) of 5.2% during the forecast period from 2023 to 2030 [1]. Dominating the global asset landscape, real estate exceeds the aggregate value of global equities and debt securities and is valued at nearly four times the global gross domestic product (GDP). Real estate, serving as the paramount reservoir of wealth, surpasses the combined value of worldwide equities and debt securities. Its valuation is nearly fourfold that of the global gross domestic product (GDP) [2]. (With the sector accountable for 40% of the world's CO₂ emissions, its role is significant in the collective pursuit of adhering to the Paris Climate Agreement, particularly in limiting the average global temperature increase from pre-industrial levels to below 2 °C. Building operations produce 70% of these emissions, and the remaining 30% is generated from construction [3].

The real estate industry has come under significant scrutiny for its central role in environmental and social challenges, particularly in light of its contribution to carbon emissions. In 2021, the industry reached an all-time high, emitting approximately 10 gigatons of CO₂ equivalent (CO₂e), a trend that raises concerns regarding the fulfillment of the climate goals outlined in the Paris Agreement. According to the UNFCCC, EU, and 193 countries

(excluding Yemen, Iran, and Libya), their nationally determined contributions (NDCs) have been submitted. Notably, the report highlights that 80% of these countries have indirectly referenced buildings, and thus real estate, as an action point within their NDCs. Furthermore, while 40% of the 193 countries have implemented building energy codes, only 26% have made adherence to these codes mandatory. To align the real estate industry with global carbon reduction targets, stakeholders across the sector must take responsibility for understanding the environmental impact of their decisions. This includes considering material choices throughout the entire lifespan of buildings, as emphasized by the United Nations Environment Programme (UNEP) in 2022 [4].

In CBRE's 2021 Global Investor Intentions Survey, a significant shift towards sustainability was observed, with 60% of respondents indicating that they had integrated environmental, social, and governance (ESG) criteria into their investment strategies. This trend was especially prominent in the Americas, EMEA, and Asia-Pacific regions, reflecting a growing emphasis on ESG factors compared to earlier survey periods [5]. As the real estate industry continues to evolve, it is anticipated to face an increase in regulatory measures and the implementation of innovative policies. These may encompass more rigorous construction standards, the establishment of carbon pricing mechanisms, and the introduction of additional reporting benchmarks, all aimed at aligning the sector with global sustainability goals [6]. Such developments underscore the industry's critical role in environmental stewardship and signal a broader shift towards responsible investment and development practices.

Stakeholders within the real estate sector possess a diverse spectrum of pathways to consider in their course of action. These encompass endeavors such as environmentally conscious development and construction, the revitalization of structures to enhance energy efficiency, enhancements to heating, cooling, and lighting systems, as well as the integration of technological solutions for demand and consumption management [7]. As per the Global Alliance for Buildings and Construction, to reach the worldwide decarbonization goal, the predominant approach to new building construction in all economies by 2050 should involve net-zero energy and carbon-neutral buildings [8]. It is further stated that such steps also require a collaborative effort involving all stakeholders along the real estate industry value chain. This effort should focus on diminishing material demand, reducing embodied carbon, and embracing nature-based solutions that bolster building resilience [8].

Historically, the discourse surrounding real estate and sustainability has been largely confined to the realms of green buildings, green building ratings, and reductions in embodied carbon. These initiatives, while valuable, have been limited to individual building levels. A more comprehensive approach is needed—one that engages the entire spectrum of stakeholders to collectively realize the sector's environmental, sustainability, and net-zero targets [9]. The challenge of decarbonization extends beyond mere technical obstacles. It requires stakeholders within the real estate industry to explore and comprehend various strategies for reducing carbon emissions across all parties involved. This includes understanding not only the financial implications but also the strategic benefits and costs associated with these choices [7]. To align the real estate sector with the ambitious goal of achieving net-zero carbon emissions by 2050, a concerted effort is required. Stakeholders across the buildings' value chain must intensify their commitment to decarbonization, increasing their impact by a factor of five [8]. This collective endeavor underscores the industry's pivotal role in global sustainability efforts and the necessity for a unified approach to meet the pressing challenges of our time.

Recognizing the critical interplay between stakeholders and mounting environmental challenges, this paper embarks on an in-depth exploration of how the entire real estate ecosystem is responding to issues related to climate change and emission reductions. While much of the existing literature has focused on specific subsets of stakeholders, such as real estate firms or REITs, there is a notable gap in research that encompasses the full spectrum of the stakeholder ecosystem. This includes developers, suppliers, financing partners, institutional investors, facility management companies, international property consultants,

and REITs. Furthermore, this study also aims to find out the impact of environmental disclosures on firms' financial performances based on economic value added. Thus, this paper seeks to fill this void by delving into the specific issue of transparency within the real estate sector as it pertains to addressing climate change, other environmental concerns, and the financial performance of the real estate stakeholder companies.

By utilizing the Global Reporting Initiative (GRI) standards, this research assesses publicly disclosed data from developers, financiers, suppliers, and advisors. The findings illuminate a noticeable concentration on emissions and energy, while other vital aspects like biodiversity, materials, and supplier environmental assessment receive less attention. This selective disclosure underscores the necessity for a more holistic approach to sustainability reporting, emphasizing the interconnected nature of environmental considerations within the industry.

The subsequent sections are methodically structured to provide a comprehensive analysis. The next section offers a review of existing literature, followed by a detailed explanation of the methods and data collection. The fourth section presents the results and discussions, the fifth section explores policy implications, and the concluding section summarizes the findings and outlines directions for future research. By casting a wide net over the multifaceted landscape of real estate stakeholders, this paper contributes valuable insights to the ongoing dialogue on sustainability and responsible industry practices.

2. Literature Review

The intersection of real estate and climate change has garnered increasing scholarly attention, with a focus that has evolved from energy efficiency and decarbonization to a broader consideration of real estate market dynamics under changing environmental conditions. While existing literature predominantly focuses on residential buildings and private homeowners, there is a growing body of work exploring the impacts of sea-level rise and extreme weather events on real estate pricing and insurance [10–17]. Studies have extended to examine the efficacy of policy instruments within the energy sector [18–21], encompassing financial incentives [22], energy performance certificates (EPC) [23–25], voluntary labels [26,27], mandatory energy audits [28], and the dynamics of large-scale investors' decision-making processes regarding retrofitting and its associated policies [29,30].

In the real estate industry, terms such as green real estate, sustainability, eco, energy-efficient, and footprint have become emblematic of a growing commitment to environmental considerations by developers and investors. The concept of 'green buildings' has emerged as a specific reference to environmentally friendly structures, setting them apart from conventional constructions [31]. The 'green buildings' paradigm, symbolic of environmental consciousness in development, has spurred research into the long-term benefits of sustainable construction, despite a higher initial cost [32].

The research domain of green buildings has seen a proliferation of scoping reviews, encompassing diverse aspects such as green building materials, barriers to adoption, drivers, environmental performance, rating systems, assessment techniques, life cycle evaluation, post-occupancy evaluation, external stakeholders, life cycle assessment models, incentives, decision support tools, cost-benefit analysis, and evaluation standards [33].

Particularly at the individual property level, numerous pivotal studies have demonstrated a correlation between green office buildings and their financial performance, as assessed through various real estate performance metrics. This substantiates the significance of environmental, social, and governance considerations in real estate financial outcomes. Many researchers have extensively evaluated the performance of green office buildings in the United States and Australia [34–37].

While earlier academic inquiries have validated the relationship between environmental sustainability and real estate performance at a broad level, they lacked in-depth assessments of critical real estate issues. Recent research has significantly enhanced this depth, delving into crucial issues such as climate change risks in real estate valuation [38–40],

energy efficiency [41–43], decarbonization frameworks/strategies [44], distinct asset class considerations [45], and environmental sustainability strategies employed by major real estate entities [46].

A real estate study focused on the EU (2016–2018) assessed SDG alignment and stakeholder responsiveness via a content analysis. Despite expressed interest, the findings revealed a gap between intentions and actions. The study noted a qualitative focus in sustainability reporting, with SDGs 11, 13, and 8 lacking robust quantitative indicators. The results underscore the need for more comprehensive metrics and strategic approaches to achieving sustainable development goals within the real estate sector [47]. Another paper evaluated sustainability reporting in the UK's real estate market, emphasizing the incorporation and prioritization of the United Nations' Sustainable Development Goals (SDGs). Through a content analysis and scoring, the research found that the companies acknowledged the sustainability agenda but concentrated on specific SDGs (11, 12, 13) relevant to the real estate sector. Other SDGs received less attention, but SDG 13 (climate action) stood out. However, the study notes that few companies discussed specific targets, indicating room for enhanced sector performance assessment and addressing concerns of greenwashing through goal-specific targets [48].

A study focusing on the construction sector explored the voluntary nature of sustainability reporting (SR) and its potential impact on transparency, reputation, and competitive advantage for companies. The study reviewed literature, reports, and standards, scrutinizing disclosure standards, content vehicles, transparency, assurance, and the debate on voluntary versus mandatory reporting. Emphasizing the contested academic landscape, the paper critically assessed the construction sector's challenges, proposing a novel framework and research questions to guide future research, contributing to a deeper understanding of SR in construction and its development [49]. An event study undertaken by Ansari and colleagues explored the impact of sustainability reporting on real estate companies' stock prices, recognizing the industry's substantial role in climate change. Utilizing the Global Reporting Initiative (GRI) framework, the research employed event study methodology on a global scale (Europe, USA, and Australia). The findings revealed a clear positive impact, indicating that sustainability reporting influences corporate valuation. This underscores the significance of sustainability in decision-making for shareholders and investors, positioning it as a success factor for companies [50].

A study undertaken by Ionaşcu and Anghel explored the perception of real estate entities regarding transparency in stakeholder relationships and the integration of information and communication technology (ICT) in their business models. Analyzing sustainability reports from EU real estate companies, the research revealed transparency, particularly in corporate governance, as a key focus [51]. Another paper examined the environmental sustainability transparency of 99 global real estate markets using the JLL GRETI sustainability sub-index from 2016 to 2020. The study highlights considerable variation in ESG practices, with emerging markets trailing behind. Environmental sustainability lagged behind other transparency dimensions in real estate markets. While progress was noted, the study underscored the necessity for global efforts to enhance environmental sustainability, particularly given the increasing focus on ESG and climate-related considerations in real estate investment [52].

Existing literature on environmental transparency specific to the real estate sector is scarce. However, many studies have focused on sustainability reporting transparency over different geographies, but they are often multi-sectorial instead of real estate sector-specific. Many researchers have considered all three environmental, social, and governance aspects and have evaluated the impact of transparency levels on the financial performance of companies. Sebrina and colleagues examined the incremental value of non-financial sustainability information on the value relevance of financial data for 80 listed companies from Indonesia. Their investigation revealed that sustainability reporting quality, as determined by the disclosure index and reliability, is notably low. However, the study indicates that sustainability reporting quality and information on economic, environmental,

and social topics (excluding governance) are relevant to stakeholders, aligning with the shared value concept. Despite this, sustainability reporting does not exhibit a positive incremental value on the value relevance of financial information for listed companies. Another study by Yu and colleagues examined the impact of environmental, social, and governance (ESG) transparency, measured based on Bloomberg ESG disclosure scores, on firm value across 1996 large-cap companies in 47 developed and emerging countries. The research explored the mechanisms by which improved ESG transparency influences firm value, focusing on reducing information asymmetry and agency costs for investors. Empirical analyses revealed that, on average, enhanced ESG disclosure positively affects firm valuation measures, including Tobin's Q. The study identified key determinants of ESG transparency, indicating that larger asset size, better liquidity, higher R&D intensity, fewer insider holdings, and favorable past financial performance contribute to greater ESG disclosure [53]. Rashidfarokhi et al. [54] provided a poignant examination of sustainability reporting practices within the Finnish real estate sector, revealing challenges in reporting practices. Examining stakeholder influence on sustainability report transparency, Fernandez-Feijoo et al. found positive effects from groups like customers, clients, employees, and the environment. They expanded on prior research by scrutinizing various stakeholder groups' impact on transparency in sustainability reporting. These insights offer a nuanced understanding of how diverse stakeholders influence corporate social responsibility communication dynamics [55].

The closest research to the current study scrutinizes sustainability reporting in the real estate sector, utilizing a content analysis to evaluate the strengths and weaknesses of sustainability information among sample companies. The analysis considers both quantity and quality, revealing inconsistencies in the form, extent, and quality of sustainability reports. The findings highlight a lack of clarity in approaching materiality, external assurance, and stakeholder engagement. Many companies issue reports for compliance with legislative requirements and risk mitigation, exposing common weaknesses. The study contributes insights into the current state of sustainability reporting, aiding in mitigating financial and legal risks while enhancing corporate reputational capital [54]. Another paper (that focuses only on environmental transparency) employing the varieties of the capitalism approach investigates the influence of national governance characteristics on environmental disclosure in coordinated economies. Analyzing 1815 companies across 13 countries from 2009 to 2018, the study creates an environmental disclosure index and employs United Nations governance indicators. The findings indicate that countries with higher transparency, democracy, citizen participation, and government effectiveness tend to have companies exhibiting a heightened environmental concern. The research suggests that corporate responsibility reflects the governance environment of the country [56].

Recent studies have further enriched this field. For example, Lee et al. evaluated the impact of mandatory disclosure of building energy efficiency on the premium associated with environmentally conscious features in Australia, finding that green buildings consistently outperform non-green counterparts [57]. Ofek and Portnov explored consumer familiarity with green building concepts, demonstrating that enhanced awareness leads to a willingness to pay higher premiums and suggesting the need for customized strategies to engage various stakeholders [58].

The broader context of environmental sustainability in construction has also been examined. Ali et al. provided a comprehensive analysis of concerns, repercussions, and strategies for CO₂ emissions reduction and management, emphasizing the continued reliance on unsustainable fossil fuel energy in the construction and operation phases [59]. Research on the influence of GRESB ratings on real estate investment trusts (REITs) across North America, Asia, and Europe from 2011 to 2014 revealed a positive correlation between commendable sustainability scores, operational efficiency, and reduced stock market risks [60]. In contrast, a study by Brounen et al. on European publicly traded real estate markets, using LEED and related certifications, disclosed an adverse impact on performance

metrics such as return on assets (ROA), return on equity (ROE), and stock alphas, attributed to the additional expenses of renovations for BREEAM and LEED certification [61].

This study contributes to the field by evaluating the environmental aspects of the real estate industry through an examination of disclosure transparency. Unlike prior studies that considered environmental, social, and governance collectively [62], this research disaggregates these components to assess specific disclosure reporting levels for climate change and other environmental aspects among various stakeholder groups. Also, most of the existing studies have limited themselves to the transparency evaluation of the environment, social, or governance indicator levels. However, this research goes more in-depth by presenting an analysis at the sub-indicator level and investigating the relationship between environmental disclosure transparency and the financial performance of the companies. In advocating for a collective approach, this research acknowledges the influence of regional nuances and the integration of international reporting standards. This insight sheds light on the diverse practices of sustainability reporting within the real estate sector, emphasizing the need for a unified and standardized approach. This study can serve as a catalyst for industry-wide collaboration, urging stakeholders to collectively address the environmental impacts of real estate.

This research encourages responsible environmental stewardship by highlighting the gaps in current reporting practices, advocating for a more holistic approach, and promoting a collective effort within the real estate industry. This inclusive perspective is crucial for fostering sustainable practices, driving positive environmental outcomes, and contributing meaningfully to the ongoing discourse on responsible environmental stewardship in the realm of real estate. Recognizing a significant research gap in the comprehensive evaluation of real estate sector disclosure transparency, this research aims to illuminate the current state of disclosure transparency and identify stakeholder groups requiring further efforts to enhance green practices related to climate change and other environmental aspects.

3. Methods and Data Collection

The foundation of this study is a quantitative exploration of sustainability reporting practices in the real estate sectors of India and Australia, guided by the Global Reporting Initiative (GRI) standards. The GRI functions as an independent global standards entity, assisting various organizations in understanding and communicating their impacts on environmental, social, and governance (ESG) concerns. Established in 2000 by the Global Sustainability Standards Board, GRI standards are recognized as the prevailing global benchmarks for ESG reporting [63]. Unlike prior frameworks, GRI standards are organized modularly, allowing for convenient updates and adjustments. These standards promote standardization in content, format, and other reporting requirements, enhancing the quality and credibility of sustainability reports [64]. They are the preferred method for ESG communication [65]. The GRI standards have become an essential tool for organizations within the real estate sector. To effectively communicate sustainability strategies and initiatives, companies often rely on sustainability reports or dedicated sections in annual reports, which are predominantly based on the international regulatory framework provided by the GRI. This widespread adoption underscores the relevance of the GRI standards in assessing disclosure transparency related to environmental, social, and governance (ESG) concerns. For this study, indicators focusing on climate change and other environmental aspects were selected. Table 1 lists all the indicators and sub-indicators considered.

The dataset targets major publicly listed real estate companies from Australia (38) and India (34), known for their significant ESG reporting. Each stakeholder group was represented by five companies, with provisions for fewer representatives in cases where limited numbers were available (e.g., three Indian REITs). The selection was strategic to ensure a representation of diverse yet critical stakeholder groups, including developers, raw material suppliers, REITs, facility management companies, international property consultants, and financial institutions. The rationale for company inclusion was based on their market capitalization and reported ESG activities, ensuring a focus on firms where

sustainability reporting is likely to have a substantial impact and interest. Table 2 lists the companies considered for all the stakeholder groups.

Table 1. GRI indicators and sub-indicators list.

Indicator Name	Sub-Indicator Name
GRI 301: Materials 2016	301-1 Materials used by weight or volume
	301-2 Recycled input materials used
	301-3 Reclaimed products and their packaging materials
GRI 302: Energy 2016	302-1 Energy consumption within the organization
	302-2 Energy consumption outside of the organization
	302-3 Energy intensity
	302-4 Reduction of energy consumption
	302-5 Reductions in energy requirements of products and services
GRI 303: Water and Effluents 2018	303-1 Interactions with water as a shared resource
	303-2 Management of water discharge-related impacts
	303-3 Water withdrawal
	303-4 Water discharge
	303-5 Water consumption
GRI 304: Biodiversity 2016	304-1 Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas
	304-2 Significant impacts of activities, products and services on biodiversity
	304-3 Habitats protected or restored
	304-4 IUCN Red List species and national conservation list species with habitats in areas affected by operations
GRI 305: Emissions 2016	305-1 Direct (Scope 1) GHG emissions
	305-2 Energy indirect (Scope 2) GHG emissions
	305-3 Other indirect (Scope 3) GHG emissions
	305-4 GHG emissions intensity
	305-5 Reduction of GHG emissions
	305-6 Emissions of ozone-depleting substances (ODS)
	305-7 Nitrogen oxides (NO _x), sulfur oxides (SO _x), and other significant air emissions
GRI 306: Waste 2020	306-1 Waste generation and significant waste-related impacts
	306-2 Management of significant waste-related impacts
	306-3 Waste generated
	306-4 Waste diverted from disposal
	306-5 Waste directed to disposal
GRI 308: Supplier Environmental Assessment 2016	308-1 New suppliers that were screened using environmental criteria
	308-2 Negative environmental impacts in the supply chain and actions taken

Source: (GRI, 2023).

To assess the environmental disclosure transparency of real estate companies in India and Australia, this study adopted a dual analytical approach. Initially, a binary scoring system was applied to the GRI sub-indicators, as outlined in Table 1, with ‘1’ indicating disclosure and ‘0’ indicating non-disclosure. This scoring method facilitated the calculation of disclosure percentages for each sub-indicator, enabling a detailed assessment of environmental reporting practices.

Table 2. Companies considered for the study.

Stakeholder Group	Australia	India
Developers	Goodman Group	DLF Limited
	Scentre Group	Godrej Properties Ltd.
	Vicinity Centres	Sobha Ltd.
	Stockland Corporation Ltd.	Omaxe Ltd.
	Mirvac Group	Mahindra Lifespace Developers Ltd.
Raw Material Suppliers	James Hardie Industries plc	UltraTech Cement Ltd.
	Boral Limited	Visa Steel Ltd.
	Brickworks Limited	RDC Concrete (India) Pvt Ltd.
	CSR Limited	Volvo Construction Equipment
	Adbri Limited	Asahi India Glass Ltd.
Financial Institutions	Commonwealth Bank of Australia	HDFC Bank Ltd.
	Westpac Banking Corp	State Bank of India
	National Australia Bank Ltd.	PNB Housing Finance Ltd.
	Australia and New Zealand Banking Group Limited (ANZ)	LIC Housing Finance Ltd.
	Bank of Queensland Ltd.	ICICI Bank Ltd.
	AMP Capital Investors	ICICI Venture Funds Management Company
	Macquarie Infrastructure and Real Asset	Kotak Private Equity Group
	Blackstone	Blackstone
	KKR & Co. Inc.	KKR & Co. Inc.
	TPG Capital	Motilal Oswal Alternates
	Future Fund Australia	New York Life Insurance Company
	Bain Capital	The Canada Pension Plan Investment Board
	IFM Investors	Temasek's Mapletree
		Caisse de dépôt et placement du Québec
		Ontario Teachers' Pension Plan Board
REITs	Goodman Group	Brookfield India Real Estate Trust REIT
	Scentre Group	Mindspace Business Parks REIT
	Vicinity Centres	Embassy Office Parks REIT
	Stockland Corporation Ltd.	
	Mirvac Group	
International property consultants	CBRE	Cushman & Wakefield
	Jones Lang Lasalle	CBRE
	Colliers	Jones Lang LaSalle
	Cushman & Wakefield	Colliers
	Knight Frank	Knight Frank
Facility management companies	CBRE	Cushman & Wakefield
	ISS Australia	
	Jones Lang LaSalle	

Source: Authors' compilation from various sources.

The data for this analysis were sourced from publicly available corporate documents, including sustainability and annual reports, found on the companies' official websites. This ensured that the analysis was based on data that were both accessible and representative of the companies' public disclosure practices. The detailed results of this scoring and percentage calculation are compiled in Appendix A.

To ensure the reliability of the assessment tool, the internal consistency of the GRI sub-indicators was verified using Cronbach's Alpha coefficient. This statistical measure provided an estimate of the reliability of the psychometric test used for this study. Furthermore, the normality of the data distribution was assessed using the Kolmogorov–Smirnov Test. Ensuring a normal distribution is crucial for the selection of appropriate statistical tests for hypothesis testing. This study then utilized a Mann–Whitney U test to compare the environmental disclosure transparency levels between the Australian and Indian companies. This non-parametric test was chosen due to its suitability for comparing two independent samples that may not follow a normal distribution. Subsequently, a Kruskal–Wallis test was employed to examine the differences in disclosure practices across the seven categories of GRI sub-indicators. This test is particularly useful for analyzing data with one independent variable but more than two groups or levels.

Finally, to establish the relationship between environmental disclosure and financial performance, a correlation analysis was carried out. The dependent variable, economic value added (EVA), was correlated with the environmental disclosure scores to determine the impact of transparency on financial outcomes. EVA, representing a firm's economic profit after accounting for the cost of capital, was selected based on prior research suggesting its effectiveness in explaining the efficiency of business assets [66].

The independent variable, termed the "E" transparency score, was computed based on the dichotomous presence or absence of the 31 environment-related sub-indicators. This binary scoring approach was integral in measuring the extent of environmental transparency in reporting practices.

Through this comprehensive methodological framework, this study aims to provide a multi-dimensional analysis of environmental disclosure transparency and its correlation with economic performance in the real estate sector.

For the financial performance evaluation, 29 and 24 companies were considered for Australia and India, respectively. The remaining companies are private and thus their financial performance-related data are not available in the public domain.

Descriptive Statistics

The following analysis presents a descriptive statistical comparison between the environmental disclosure transparency and financial performance of real estate companies in Australia and India, as measured based on the EVA.

Table 3 summarizes the environmental disclosure transparency scores, revealing that, on average, both Australian and Indian companies disclosed information on approximately 11 out of the 31 indicators. In Australia, the mean environmental disclosure score was 11.59, with a standard deviation (SD) of 4.26, while India had a mean score of 11.08 and a higher variability, with an SD of 7.28. The minimum and maximum reported scores for Australia ranged from 1 to 18, compared to 0 to 24 for India, indicating a broader range of reporting practices among Indian companies. Financially, the Australian companies showed a significantly higher average EVA of AUD 161,393,240, in stark contrast to the Indian average of AUD 10,702,300, suggesting a disparity in financial performance, as reflected in these values.

Table 4 delves further into the environmental indicators, offering a breakdown of the descriptive statistics for each GRI sub-category. The data indicate that for the Australian companies, the highest mean scores are seen in the emissions category (GRI 305), while the Indian companies had the highest mean scores in the material (GRI 301) and water (GRI 303) categories. This distribution illustrates the specific environmental areas where companies in each country are focusing their reporting efforts.

Table 3. Descriptive statistics for Australia and India.

Australia	N	Min	Max	Mean	SD
Environmental disclosure transparency score	29	1	18	11.59	4.26
EVA (AUD'000)	29	6,100,206.58	5,042,547.97	161,393.24	1,682,220.22
India					
Environmental disclosure transparency score	24	0	24	11.08	7.28
EVA (AUD'000)	24	−11,348,483	8,461,092.5	−107,023	3,237,208.3

Table 4. Descriptive statistics for environmental indicators.

			Australia				India			
		N	Min	Max	Mean	SD	Min	Max	Mean	SD
Material	GRI301	3	0	1	0.14	0.351	0	2	0.509	0.509
Energy	GRI302	5	0	4	2.21	1.264	0	5	1.351	1.351
Water	GRI303	5	0	4	1.38	0.979	0	5	1.503	1.503
Biodiversity	GRI304	4	0	4	0.86	1.217	0	3	1.216	1.216
Emission	GRI305	7	0	5	4.00	1.035	0	6	2.078	2.078
Waste management	GRI306	5	0	5	2.45	1.594	0	5	1.597	1.597
Supply chain	GRI308	2	0	1	0.86	0.506	0	2	0.637	0.637

4. Results and Discussion

4.1. Disclosure Practices

Table 5 provides a summary of the overall results, offering insights into the disclosure practices related to various environmental aspects within the real estate sector.

Table 5. Overall transparency scores.

GRI Indicator	Disclosure Transparency Score	
Emission	224	(44.44%)
Waste management	125	(34.72%)
Energy	129	(35.83%)
Supply chain	33	(22.92%)
Water and effluent	89	(24.72%)
Biodiversity	53	(18.40%)
Material	10	(4.63%)

It is evident that Emissions have garnered the most attention, with a disclosure score of 44.44%, underscoring the sector's prioritization for climate impact mitigation. Energy and waste management follow, with scores of 35.83% and 34.72%, respectively. These figures signify a strategic focus on key environmental challenges, particularly those related to emission reductions.

Conversely, supply chain, water and effluents, and biodiversity received scores of 22.92%, 24.72%, and 18.40%, respectively, pointing to a potential oversight in these critical areas. The particularly low score for materials at 4.63% is a stark indicator of the need for a more comprehensive approach to sustainability.

These findings collectively paint a picture of a sector that is actively engaging with certain key environmental challenges, particularly emissions, but may be neglecting other equally vital areas. The results prompt a consideration of how a more balanced and holistic approach to environmental disclosure might be fostered within the real estate industry, ensuring that all aspects of environmental sustainability are adequately addressed.

Figure 1 presents country-wise reporting disclosure scores for the indicators. For Australian companies, emissions and waste indicators are highly disclosed indicators. Indian companies have the highest disclosures for emissions, followed by energy indicators.

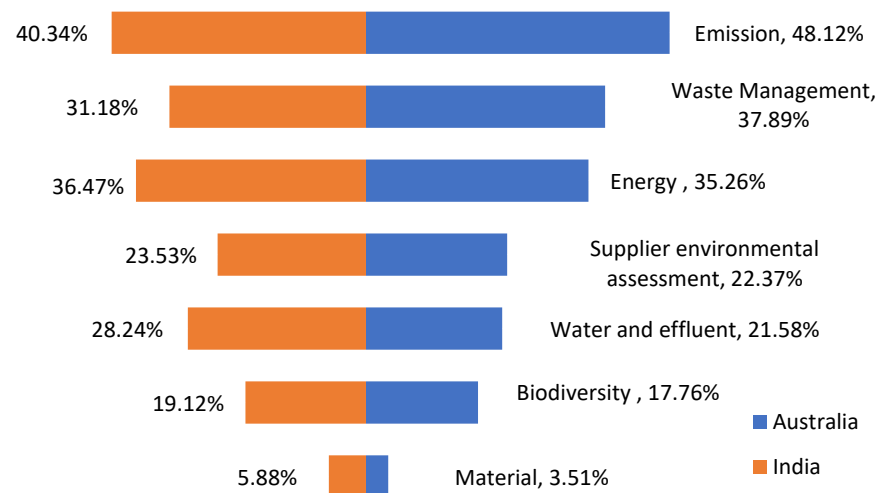


Figure 1. Country-wise disclosure transparency scores.

However, supplier environmental assessment and material are the least-disclosed categories for both countries. For Australia, energy, water and effluents, and biodiversity had a lesser focus compared to the emissions and waste indicators. For India, waste, water and effluents, and biodiversity had a lesser focus compared to emissions and energy.

Table 6 shows the stakeholder groups-wise results for the disclosure transparency scores. Most of the stakeholder groups were highly focused on disclosing emissions-related sub-indicators. All the stakeholder groups were least focused on disclosing materials-related sub-indicators.

Table 6. Stakeholder-wise indicator disclosure scores.

Stakeholder Group	Material	Energy	Water and Effluents	Biodiversity	Emission	Waste	Supplier Environmental Assessment
Developers	6.67%	46.00%	50.00%	35.00%	58.57%	60.00%	35.00%
Suppliers	20.00%	42.00%	30.00%	32.50%	47.14%	34.00%	30.00%
REITs	0.00%	37.50%	32.50%	25.00%	42.86%	52.50%	25.00%
Facility management	0.00%	40.00%	30.00%	12.50%	60.71%	45.00%	37.50%
Financial institutions	2.22%	26.67%	10.67%	10.00%	34.76%	21.33%	11.67%
International property consultants	0.00%	44.00%	28.00%	10.00%	51.43%	32.00%	30.00%

It is crucial to note that for developers and REITs, waste is the most-disclosed indicator, which is in alignment with the quantity of the waste this particular category has to deal with. The suppliers exhibited a subsequent focus on the energy indicator, aligning with

their consumption levels and efforts to reduce them. The financial institutions displayed a secondary focus on energy, consistent with global disclosure trends and frameworks such as the Task Force on Climate-Related Financial Disclosures (TCFD).

Tables 7 and 8 show the disclosure reporting scores for different stakeholder groups for Australia and India, respectively.

Table 7. Australia disclosure reporting scores.

Stakeholder Group	Material	Energy	Water and Effluents	Biodiversity	Emission	Waste	Supplier Environmental Assessment
Developers	0.00%	36.00%	28.00%	30.00%	57.14%	64.00%	20.00%
Suppliers	26.67%	56.00%	44.00%	45.00%	62.86%	40.00%	30.00%
REITs	0.00%	36.00%	28.00%	30.00%	57.14%	64.00%	20.00%
Facility management	0.00%	40.00%	20.00%	16.67%	57.14%	40.00%	33.33%
Financial institutions	0.00%	24.00%	8.00%	3.33%	34.29%	21.33%	16.67%
International property consultants	0.00%	44.00%	28.00%	10.00%	51.43%	32.00%	30.00%

Table 8. India disclosure reporting scores.

Stakeholder Group	Material	Energy	Water and Effluents	Biodiversity	Emission	Waste	Supplier Environmental Assessment
Developers	13.33%	56.00%	72.00%	40.00%	60.00%	56.00%	50.00%
Suppliers	13.33%	28.00%	16.00%	20.00%	31.43%	28.00%	30.00%
REITs	0.00%	40.00%	40.00%	16.67%	19.05%	33.33%	33.33%
Facility management	0.00%	40.00%	60.00%	0.00%	71.43%	60.00%	50.00%
Financial institutions	4.44%	29.33%	13.33%	16.67%	35.24%	21.33%	6.67%
International property consultants	0.00%	44.00%	28.00%	10.00%	51.43%	32.00%	30.00%

The results of Table 7 show that all the Australian stakeholder groups (other than developers and REITs) had maximum disclosure scores for the emission indicator. However, all of them had the least focus on the materials indicator. For the developers and REITs stakeholder groups, waste-related disclosures were prioritized. Table 8 presents similar results for Indian stakeholder groups. Indian stakeholders, while also showing a lower focus on materials, diverged from their Australian counterparts, with developers showing a pronounced focus on water and effluents. Indian REITs equally prioritized energy and water and effluents, reflecting their operational impacts.

4.2. Sub-Indicator Disclosure Transparency Scores

Table 9 delves into the intricacies of the real estate sector's reporting, presenting a comparative analysis of disclosure transparencies for specific sub-indicators across Australia and India.

Table 9. Sub-indicator disclosure transparency scores.

Indicator Name	Sub-Indicator Name	Australia	India
GRI 301: Materials 2016	301-1 Materials used by weight or volume	0.00%	5.88%
	301-2 Recycled input materials used	7.89%	8.82%
	301-3 Reclaimed products and their packaging materials	2.63%	2.94%
GRI 302: Energy 2016	302-1 Energy consumption within the organization	63.16%	50.00%
	302-2 Energy consumption outside of the organization	0.00%	5.88%
	302-3 Energy intensity	39.47%	50.00%
	302-4 Reduction of energy consumption	44.74%	41.18%
	302-5 Reductions in energy requirements of products and services	28.95%	35.29%
GRI 303: Water and Effluents 2018	303-1 Interactions with water as a shared resource	2.63%	14.71%
	303-2 Management of water discharge-related impacts	44.74%	50.00%
	303-3 Water withdrawal	10.53%	26.47%
	303-4 Water discharge	2.63%	5.88%
	303-5 Water consumption	47.37%	44.12%
GRI 304: Biodiversity 2016	304-1 Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas	18.42%	26.47%
	304-2 Significant impacts of activities, products and services on biodiversity	23.68%	26.47%
	304-3 Habitats protected or restored	23.68%	17.65%
	304-4 IUCN Red List species and national conservation list species with habitats in areas affected by operations	5.26%	5.88%
GRI 305: Emissions 2016	305-1 Direct (Scope 1) GHG emissions	81.58%	58.82%
	305-2 Energy indirect (Scope 2) GHG emissions	81.58%	58.82%
	305-3 Other indirect (Scope 3) GHG emissions	71.05%	41.18%
	305-4 GHG emissions intensity	23.68%	44.12%
	305-5 Reduction of GHG emissions	71.05%	58.82%
	305-6 Emissions of ozone-depleting substances (ODS)	0.00%	0.00%
	305-7 Nitrogen oxides (NOx), sulfur oxides (SOx), and other significant air emissions	7.89%	20.59%
GRI 306: Waste 2020	306-1 Waste generation and significant waste-related impacts	5.26%	2.94%
	306-2 Management of significant waste-related impacts	63.16%	52.94%
	306-3 Waste generated	36.84%	35.29%
	306-4 Waste diverted from disposal	42.11%	41.18%
	306-5 Waste directed to disposal	42.11%	23.53%
GRI 308: Supplier Environmental Assessment 2016	308-1 New suppliers that were screened using environmental criteria	44.74%	41.18%
	308-2 Negative environmental impacts in the supply chain and actions taken	0.00%	5.88%

The Australian companies demonstrated a robust reporting framework for emissions, with Scope 1 and Scope 2 GHG emissions revealing the highest disclosure transparency at 81.58%. This was closely followed by Scope 3 GHG emissions and reductions in GHG

emissions, both at 71.05%. The Indian firms mirror this trend, placing a significant emphasis on Scope 1 and Scope 2 GHG emissions and reductions in GHG emissions, each with a score of 58.82%.

Conversely, sub-indicators such as materials used by weight or volume, energy consumption outside of the organization, emissions of ozone-depleting substances (ODS), and negative environmental impacts in the supply chain and actions taken were the least disclosed, all scoring 0% in Australia. The Indian companies exhibited a similar pattern, with the least disclosed being emissions of ozone-depleting substances (ODS) at 0%, reclaimed products and their packaging materials, and waste generation and significant waste-related impacts, both at 2.94%.

4.3. Discussion on Disclosure Practices

The materials indicator captures data regarding material usage in terms of weight or volume, integration of recycled input materials, and the utilization of reclaimed products along with their accompanying packaging materials. This approach reflects a collective endeavor to promote sustainable resource management across diverse industries. Nevertheless, as highlighted by certain companies during their reporting for this indicator, the company in question is actively engaged in the realm of real estate development, encompassing the entire lifecycle of real estate assets, from construction to operation and maintenance. The company's portfolio comprises the construction of residential properties as well as the establishment, operation, and upkeep of commercial office spaces, retail outlets (shopping malls), and hospitality establishments (hotels and clubs). Despite this focus, findings from the current study indicate an underutilization of reclaimed products, a trend that is consistent with broader industry practices but suggests a missed opportunity for enhanced sustainability. This observation aligns with the discourse on green buildings and eco-friendly construction practices that has become increasingly emblematic within the industry [31,32].

Carbon emissions are assessed through Scope 1, Scope 2, and Scope 3 greenhouse gas emissions. Presently, it has become customary to report these emissions due to the enhanced clarity in calculation methods and the availability of third-party validations. This convergence of factors renders carbon emissions a more convenient metric for measurement. Emissions have consistently held significance and have often been equated with the broader regime of environmental activities [42,43]. This is evident in the disclosure scores, where the emissions indicator attained the highest disclosure scores.

Numerous companies have emphasized the challenges associated with reporting sub-indicators concerning energy and water and effluents. The primary reason is the nature of the property arrangement; as many properties are rented rather than owned, installing proprietary measuring units to accurately record these indicators is often unfeasible. This issue resonates with the findings of Rashidfarokhi et al. [54], who explored the sustainability reporting practices among Finnish real estate companies and reported similar challenges. The current study expands upon this by providing a cross-country analysis, highlighting innovative practices in waste utilization as seen in India, which are not commonly reported in other geographies [10]. Nonetheless, these companies acknowledge their efforts to capture these indicators with the highest possible precision wherever circumstances allow. Consequently, this circumstance could contribute to the relatively lower priority placed on water-related matters or the potential inability to fully disclose information tied to this particular indicator.

Waste generation for developers is an issue, as companies can actually use some of their waste as raw material inputs. This is captured by the materials indicator (interlinkage of 2 different indicators). In India, Godrej Properties Limited used 94.44% of construction waste as "recycled input materials used". DLF Ltd. also incorporated 2.22% fly ash, 0.27% ground granulated blast furnace slag used in RCC and PCC works, and 0.01% steel scrap.

Supplier evaluation is an area that often receives limited emphasis. This can be attributed to the fact that suppliers are external entities. Amongst stakeholders, developers

and providers of raw materials are the groups that are more likely to prioritize this aspect. Many of these companies implement supplier codes of conduct and policies to facilitate supplier screening. On the other hand, stakeholders like financial institutions, international property consultants, and facility management firms do not typically need to procure raw materials on such a significant scale. Hence, their focus on this indicator might not be as pronounced. However, within the real estate sector, particularly among developers and raw material providers, this aspect assumes a significant role, signaling a potential area for policy innovation to enhance supplier sustainability [22].

Through a comprehensive analysis encompassing a diverse array of stakeholders, this study sheds light on the environmental disclosure priorities of different groups within the real estate ecosystem. The emissions indicator emerged as the most disclosed, yet stakeholders are encouraged to place greater emphasis on the materials indicator. Such detailed insights into sub-indicator disclosure levels are scarce in the existing literature, which has traditionally evaluated environmental, social, and governance (ESG) factors in aggregate [34,37].

The findings of this study suggest an evolution in reporting practices, where the disclosure of supplier environmental impacts has increased, potentially due to growing climate change awareness. This represents a deviation from the patterns identified by Rashidfarokhi et al. [54], emphasizing the dynamic nature of sustainability reporting over time.

This research extends the existing body of literature by dissecting environmental disclosures into their constituent sub-indicators. This granular approach uncovers specific areas within the sustainability reporting landscape that warrant further attention. This study's emphasis on a comprehensive, stakeholder-informed approach enriches the dialogue on responsible environmental stewardship within the real estate sector.

4.4. Reliability and Normality Testing

To ascertain the data's consistency, Cronbach's alpha coefficient was computed. As per Sekaran and Bougie, Cronbach's alpha stands as a suitable measure for evaluating internal consistency reliability, and an alpha coefficient falling below 0.6 is deemed inadequate, while coefficients in the range of 0.7 are considered acceptable, and those exceeding 0.80 are regarded as good [67]. Ameer and Othman's research in 2012 posits that enhanced reliability is evidenced when Cronbach's alpha coefficient approaches one. The Cronbach's alpha for this study was found to be 0.83, indicating a reliability level of 83% for the disclosure transparency score items, which suggests a high degree of internal consistency. Consequently, all the items contributing to the disclosure transparency score exhibited a high degree of reliability. The examination of normality in the data was conducted through the application of the Kolmogorov–Smirnov test. Given that the K–S test statistic value is above the predetermined alpha threshold, it was deduced that the data were not normally distributed.

Table 10 details the results of the Mann–Whitney U test conducted to compare the environmental disclosure transparency scores between the companies in Australia and India. This test's null hypothesis assumes no significant differences in environmental disclosure levels between the two countries. The results yielded a *p*-value of 0.341, which did not meet the typical alpha level of 0.05, leading to a conclusion that there was no significant difference in the environmental disclosure levels between the two countries. This finding might reflect a global harmonization in reporting practices, likely influenced by the adoption of standardized frameworks such as the Global Reporting Initiative (GRI).

Table 10. Mann–Whitney U test results.

	Environment Disclosure Transparency Score		Country	N	Mean Rank	Sum of Ranks
Mann–Whitney U	325	Environment disclosure transparency score	Australia	29	27.79	806
Z	−0.411		India	24	26.04	625
p-value	0.341		Total	53		

4.5. Comparative Analysis of Environmental Disclosure Priorities

Table 11 illustrates the findings of the Kruskal–Wallis test, which was applied to analyze the differences in the disclosure levels for the seven environmental indicators identified in the methodology (referenced in Table 1). The test outcomes for both countries showed a significance value of less than 0.05, which is indicative of a statistically significant difference in the disclosure levels across all seven indicators in both Australia and India.

Table 11. Kruskal–Wallis test results.

		Australia		Asymptotic Significance (2-Tailed)	India		Asymptotic Significance (2-Tailed)
Indicator		N	Mean Rank		N	Mean Rank	
GRI301	Material	29	43.00	0.000000	24	40.52	0.000000
GRI302	Energy	29	123.45		24	107.06	
GRI303	Water and effluents	29	100.05		24	93.65	
GRI304	Biodiversity	29	73.64		24	68.69	
GRI305	Emissions	29	175.19		24	124.06	
GRI306	Waste	29	131.67		24	94.98	
GRI308	Supplier environmental assessment	29	67.00		24	62.54	

According to the mean rank values, the emission indicator received the highest level of reporting in both countries, with the waste and energy indicators also being frequently reported. Conversely, disclosures related to materials, supplier environmental assessment, and biodiversity were less emphasized. These results suggest a commonality in the disclosure priorities for environmental indicators among all the stakeholders in both countries.

The Kruskal–Wallis test delineates the areas where reporting is most robust, as well as those that may require greater attention to elevate the overall standard of environmental accountability. The significant results of this test signal that, while emissions are given due importance, other critical aspects like material sustainability and supply chain assessment could benefit from increased reporting and transparency.

4.6. Impact of Environmental Disclosure on Firm Performance

Tables 12 and 13 present a correlation analysis examining the relationship between environmental disclosure scores across various indicators and the economic value added (EVA) for the companies in Australia and India, respectively. In these matrices, the bolded figures signify significant correlations, indicating either a positive or negative relationship between the environmental indicators and EVA.

Table 12. Correlation matrix—Australia.

	Material	Energy	Water and Effluents	Biodiversity	Emission	Waste	Supplier Environmental Assessment	Overall Disclosure Transparency Score	EVA
Material	1								
Energy	0.213361	1							
Water and effluents	0.291171	0.323886	1						
Biodiversity	0.46823	0.021756	0.43471	1					
Emission	0.097034	0.614878	0.160399	0.165938	1				
Waste	−0.1045	0.290916	0.56046	0.13658	−0.03195	1			
Supplier environmental assessment	−0.0416	0.052494	0.166779	−0.04115	−0.14353	0.183284	1		
Overall disclosure score	0.319142	0.673535	0.717091	0.514598	0.479256	0.694635	0.175358	1	
EVA	0.143551	−0.03208	−0.08904	0.259796	0.130888	−0.15304	−0.33593	0.021983	1

Table 13. Correlation matrix—India.

	Material	Energy	Water and Effluents	Biodiversity	Emission	Waste	Supplier Environmental Assessment	Overall Disclosure Transparency Score	EVA
Material	1								
Energy	0.515121	1							
Water and effluents	0.451501	0.557444	1						
Biodiversity	0.543986	0.643592	0.504232	1					
Emission	0.489166	0.787664	0.680113	0.560117	1				
Waste	0.439103	0.660143	0.681262	0.691192	0.675627	1			
Supplier environmental assessment	0.287403	0.538431	0.595365	0.543081	0.567061	0.794916	1		
Overall disclosure Score	0.582762	0.863448	0.804285	0.768691	0.898499	0.85677	0.703038	1	
EVA	0.048314	−0.03208	−0.208	−0.08405	0.268028	0.040408	0.115467	0.078953	1

For Australia, a noteworthy positive correlation was observed between the biodiversity and materials indicators (0.46823). A similar significant positive relationship was present in India between emissions and materials (0.489166). These correlations suggest that certain aspects of environmental reporting, such as biodiversity efforts and material usage, are linked with the financial performance of firms, potentially due to their impact on firm reputation and operational efficiency.

However, across both countries, no individual environmental indicators or the aggregate overall disclosure transparency score exhibited a significant impact on the firms' EVAs. This could imply that while the firms are becoming increasingly transparent in their environmental reporting, these disclosures are not directly translating into financial performance as measured by EVA.

This study examines the connection between environmental disclosure transparency and financial performance using an EVA estimation. The results indicate no correlation between environmental disclosure transparency and financial performance, specifically the EVA. Evaluation of the impact of environmental disclosure transparency on financial performance with the help of EVA shows that such disclosures are not impacting the fi-

financial performance of the companies positively or negatively. This indicates that while stakeholders are increasingly transparent in their sustainability reporting, this transparency does not directly translate into financial performance metrics. This finding is consistent with existing research suggesting that the benefits of environmental disclosure may manifest in non-financial forms or over a longer period. The absence of an impact on financial performance due to disclosures should be considered a positive sign by the entire stakeholder system. Real estate stakeholders who might be worried about the negative impact of incorporating these best practices can take inspiration from the results of this research and start working towards disclosing such indicators.

Previous empirical studies have consistently substantiated the absence of a significant relationship between the level of corporate responsibility disclosure and firms' performances [68–70]. The results of this paper are also in alignment with previous studies undertaken.

The absence of a significant correlation between the overall disclosure score and EVA in both countries may suggest that other factors, perhaps outside the realm of environmental reporting, hold more sway over financial outcomes. Alternatively, it may reflect a delayed impact of environmental performance on financial results, which could surface over a longer term. It is also possible that investors and stakeholders value the disclosure of certain indicators more than others, affecting the EVA differently.

The implications of these findings indicate that while environmental disclosures are a step toward greater corporate transparency and may fulfill regulatory or ethical expectations, their direct influence on immediate financial performance is less evident. This underscores the complexity of the relationship between environmental sustainability and firm profitability, suggesting that the benefits of environmental disclosure may manifest in non-financial forms or over a longer period.

This study advocates for a collaborative model of environmental stewardship within the real estate sector, premised upon the broadening and enhancement of environmental reporting mechanisms. It enjoins a diverse array of industry participants, encompassing developers, financial entities, and regulatory bodies, to engage in a synergistic endeavor aimed at augmenting the breadth and granularity of sustainability disclosures. In laying bare the inconsistencies inherent in prevailing reporting practices and foregrounding the imperative of exhaustive environmental accountability, the research posits a compelling case for unified action. Such a coalition is instrumental not merely in propelling the sustainability agenda forward but equally in cultivating a paradigm of cooperation and innovation that is capable of precipitating substantive transformation within the real estate domain.

5. Policy Implications

This research has illuminated the need for a more comprehensive environmental disclosure regime in the real estate sector. While emission disclosures have been robust, likely due to regulatory pressure and public scrutiny, the study indicates that other critical environmental aspects, such as materials, biodiversity, and water and effluents have not been disclosed with comparable thoroughness. This imbalance suggests the potential for policy interventions that could encourage a more holistic reporting approach, thereby providing stakeholders with a fuller picture of a firm's environmental impact.

Given the alignment of disclosures with international frameworks like the Task Force on Climate-Related Financial Disclosures (TCFD), it is evident that integrating these global standards into national reporting practices is crucial. Such integration promotes consistency and enables comparability, which is beneficial for investors and stakeholders operating across borders. The data imply that the roles and responsibilities of different stakeholders significantly influence their reporting practices. Therefore, customizing sustainability strategies to these roles can potentially improve both the relevance and efficacy of policies.

The contrast in disclosure practices between Australia and India underscores the necessity of formulating policies that are sensitive to the local context, including environmental

conditions, regulatory landscapes, and cultural factors. Policymakers must consider these nuances to ensure that environmental reporting is both meaningful and actionable within each country's specific framework.

For developers and REITs, who have shown a propensity for waste-related disclosures, policies could encourage or mandate the reporting of sustainable materials usage and waste management practices. Suppliers may benefit from clear energy efficiency benchmarks and supply chain transparency requirements, which could also involve cooperative efforts to establish industry-wide best practices.

Financial institutions, pivotal in driving the sustainability agenda, should further integrate with global disclosure frameworks such as TCFD. Policies could be developed to promote green financing and enhance the assessment of climate-related financial risks, thereby fostering a financial environment that supports broader environmental objectives.

Empirical evidence, including the findings from this study, suggests that the level of corporate responsibility disclosure does not have a significant direct impact on firm performance as measured by EVA. This insight could alleviate concerns among real estate stakeholders regarding the potential adverse financial impacts of increased environmental reporting. Stakeholders should view this as an opportunity to align with best practices without fear of negative repercussions on financial performance.

Regulatory bodies in both Australia and India could spearhead the development of harmonized environmental reporting standards that incentivize balanced disclosures across all environmental aspects. Establishing robust monitoring and enforcement mechanisms will be essential to ensure compliance and to foster a culture of transparency.

In summary, this study's actionable insights for the real estate sector emphasize the need for comprehensive environmental reporting, advocating for balanced disclosures beyond emissions. It calls for the integration of global standards such as the TCFD into national practices to promote uniformity and comparability. Tailoring sustainability strategies to fit the distinct roles of stakeholders, considering local contexts, and encouraging reporting on a wider range of environmental aspects are crucial. Specific recommendations include incentivizing sustainable material and waste management practices, establishing energy efficiency benchmarks for suppliers, and promoting green financing and risk assessment among financial institutions. Finally, the development and enforcement of harmonized reporting standards by regulatory bodies are essential to achieve a culture of transparency and to propel the industry towards sustainable development.

This research underlines the pivotal role of transparent and comprehensive environmental reporting in mitigating the real estate sector's ecological footprint. By illuminating the current disparities in disclosure practices, particularly in the underreported areas of materials, biodiversity, and water and effluents, it lays the groundwork for policy enhancements that ensure that a full spectrum of environmental impacts are considered and reported. This study's alignment with global standards such as the TCFD further promotes consistency in reporting, facilitating accountability and comparability across borders. Importantly, it delineates how specific roles and contextual factors influence reporting, guiding the creation of customized, role-tailored sustainability strategies. These findings collectively advocate for the adoption of a more transparent reporting culture within the real estate industry. Such a cultural shift, supported by the development of context-sensitive and stakeholder-specific policies, could significantly advance the industry's contribution to environmental sustainability.

6. Conclusions

This study highlights the real estate sector's significant engagement with emissions, with disclosures on this indicator exceeding 44% among the examined stakeholders in Australia and India. This engagement aligns with the industry's response to global climate change concerns, which has been substantiated by the emphasis on emissions in recent studies [34,37]. However, these findings also reveal discrepancies in the reporting of other essential sustainability aspects such as materials (4.63%), biodiversity (18.40%), and water

and effluents (24.72%). The sector's narrow focus on emissions, while critical, overlooks these vital areas, suggesting an opportunity for policy interventions that could lead to more diversified environmental reporting.

The absence of a correlation between environmental disclosure transparency and financial performance, as measured by EVA, mirrors the existing body of literature that challenges the direct financial impact of such disclosures [68,69]. However, rather than viewing this lack of correlation negatively, this study proposes a positive interpretation, positing that disclosures may contribute to non-financial benefits that are equally valuable.

Derived policy implications call for the adoption of reporting practices that encompass a broader environmental impact. The need for more comprehensive disclosure standards reflects a movement toward transparency and sustainable development, echoing calls for enhanced corporate environmental accountability in the sector.

This study further recommends developing policies that encourage or mandate a wider spectrum of sustainability reporting, potentially through incentives for stakeholders. Such policies may lead to a more balanced and transparent reporting culture within the industry and are in line with global sustainability trends [31,32].

Moreover, this study underscores the need for increased stakeholder awareness regarding the full range of environmental indicators, fostering a shift in focus that acknowledges the interconnectedness of various sustainability aspects. Policymakers and educational initiatives have a vital role in promoting this holistic understanding.

Future research is encouraged to delve into the motivations behind current disclosure practices, exploring the influence of regulatory frameworks and market dynamics. The impact of emerging technologies on environmental disclosures also presents a fruitful area for inquiry.

In summary, this study adds a critical perspective to the dialogue on responsible industry practices, advocating for an integrated effort to enhance sustainability in the real estate sector. It underscores the need for a comprehensive approach to environmental reporting that aligns with global environmental goals.

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Appendix A

Table A1. Australia Developers and Suppliers Disclosure Transparency Score Matrix.

Sub-Indicators	Developers					Suppliers				
	Goodman Group	Scentre Group	Vicinity Centres	Stockland Corporation Ltd.	Mirvac Group	James Hardie Industries plc	Boral Limited	Brickworks Limited	CSR Limited	Adbri Limited
301-1 Materials used by weight or volume	0	0	0	0	0	0	0	0	0	0
301-2 Recycled input materials used	0	0	0	0	0	1	1	1	0	0
301-3 Reclaimed products and their packaging materials	0	0	0	0	0	0	0	0	1	0
302-1 Energy consumption within the organization	0	0	1	1	1	1	1	1	1	1
302-2 Energy consumption outside of the organization	0	0	0	0	0	0	0	0	0	0
302-3 Energy intensity	0	0	1	1	1	1	0	1	0	0
302-4 Reduction of energy consumption	0	0	1	1	1	1	1	1	0	1
302-5 Reductions in energy requirements of products and services	0	0	0	0	0	0	1	1	0	1
303-1 Interactions with water as a shared resource	0	0	0	0	0	0	0	0	0	0
303-2 Management of water discharge-related impacts	0	1	0	1	1	1	1	1	1	1
303-3 Water withdrawal	0	0	0	0	0	1	0	0	0	0
303-4 Water discharge	0	0	0	0	0	1	0	0	0	0
303-5 Water consumption	0	1	1	1	1	1	0	1	1	1
304-1 Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas	0	1	0	1	0	0	1	0	0	0
304-2 Significant impacts of activities, products and services on biodiversity	1	0	0	1	0	1	1	0	1	0

Table A1. *Cont.*[illegible]

Table A2. Australia REITs, Facility Management and International Property Consultants Disclosure Transparency Score Matrix.

Sub-Indicators	REITs					Facility Management			International Property Consultants				
	Goodman Group	Scentre Group	Vicinity Centres	Stockland Corporation Ltd.	Mirvac Group	CBRE	ISS Australia	Jones Lang LaSalle	CBRE	Jones Lang Lasalle	Colliers	Cushman & Wakefield	Knight Frank
301-1 Materials used by weight or volume	0	0	0	0	0	0	0	0	0	0	0	0	0
301-2 Recycled input materials used	0	0	0	0	0	0	0	0	0	0	0	0	0
301-3 Reclaimed products and their packaging materials	0	0	0	0	0	0	0	0	0	0	0	0	0
302-1 Energy consumption within the organization	0	0	1	1	1	1	0	1	1	1	1	1	0
302-2 Energy consumption outside of the organization	0	0	0	0	0	0	0	0	0	0	0	0	0
302-3 Energy intensity	0	0	1	1	1	1	0	1	1	1	1	1	0
302-4 Reduction of energy consumption	0	0	1	1	1	0	0	1	0	1	0	0	0
302-5 Reductions in energy requirements of products and services	0	0	0	0	0	1	0	0	1	0	1	0	0
303-1 Interactions with water as a shared resource	0	0	0	0	0	0	0	0	0	0	0	1	0
303-2 Management of water discharge-related impacts	0	1	0	1	1	0	0	1	0	1	1	1	0
303-3 Water withdrawal	0	0	0	0	0	1	0	0	1	0	0	1	0
303-4 Water discharge	0	0	0	0	0	0	0	0	0	0	0	0	0
303-5 Water consumption	0	1	1	1	1	0	0	1	0	1	0	0	0
304-1 Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas	0	1	0	1	0	0	0	1	0	1	0	0	0

Table A2. *Cont.*[illegible]

[illegible][illegible]

Table A3. Cont.

Sub-Indicators	Financial Institutions														
	Common Wealth Bank of Australia	Westpac Banking Corp.	National Australia Bank Ltd.	Australia and New Zealand Banking Group Limited (ANZ)	Bank of Queens- land Ltd.	AMP Capital In- vestors	Macquarie Infrastruc- ture and Real Asset	Blackstone	KKR & Co. Inc.	TPG Capital	Future Fund Australia	Bain Capital	IFM In- vestors	Common Wealth Bank of Australia	Westpac Banking Corp
302-3 Energy intensity	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
302-4 Reduction of energy consumption	0	0	1	1	1	0	0	1	0	0	0	1	0	0	0
302-5 Reductions in energy requirements of products and services	0	1	1	1	1	1	0	0	0	0	0	0	0	0	1
303-1 Interactions with water as a shared resource	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
303-2 Management of water discharge-related impacts	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0
303-3 Water withdrawal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
303-4 Water discharge	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
303-5 Water consumption	1	1	1	1	0	0	0	0	0	0	0	0	0	1	1
304-1 Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
304-2 Significant impacts of activities, products and services on biodiversity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
304-3 Habitats protected or restored	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
304-4 IUCN Red List species and national conservation list species with habitats in areas affected by operations	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
305-1 Direct (Scope 1) GHG emissions	1	1	1	1	1	1	0	1	0	1	0	1	0	1	1

Table A3. *Cont.*[illegible]

Table A4. India Developers and Suppliers Disclosure Transparency Score Matrix.

Sub-Indicators	Developers						Suppliers			
	DLF Limited	Godrej Properties Ltd.	Sobha Ltd.	Omaxe Ltd.	Mahindra Lifespace Developers Ltd.	UltraTech Cement Ltd.	Visa Steel Ltd.	RDC Concrete (India) Pvt Ltd.	Volve Construction Equipment	Asahi India Glass Ltd.
301-1 Materials used by weight or volume	0	0	0	0	0	1	0	0	0	0
301-2 Recycled input materials used	1	1	0	0	0	1	0	0	0	0
301-3 Reclaimed products and their packaging materials	0	0	0	0	0	0	0	0	0	0
302-1 Energy consumption within the organization	0	1	0	0	1	1	0	0	1	0
302-2 Energy consumption outside of the organization	0	1	0	1	0	0	0	0	0	0
302-3 Energy intensity	1	1	0	0	1	1	0	0	0	0
302-4 Reduction of energy consumption	1	1	1	0	1	1	0	0	1	0
302-5 Reductions in energy requirements of products and services	1	1	0	0	1	1	0	0	1	0
303-1 Interactions with water as a shared resource	1	1	0	0	1	0	0	0	0	0
303-2 Management of water discharge-related impacts	1	1	1	1	1	1	0	0	0	0
303-3 Water withdrawal	1	1	0	1	1	1	0	0	0	0
303-4 Water discharge	0	0	0	1	1	0	0	0	0	0
303-5 Water consumption	1	1	0	1	1	1	0	0	1	0

Table A4. Cont.

Sub-Indicators	Developers						Suppliers			
	DLF Limited	Godrej Properties Ltd.	Sobha Ltd.	Omaxe Ltd.	Mahindra Lifespace Developers Ltd.	UltraTech Cement Ltd.	Visa Steel Ltd.	RDC Concrete (India) Pvt Ltd.	Volve Construction Equipment	Asahi India Glass Ltd.
304-1 Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas	0	1	1	0	1	1	0	0	0	0
304-2 Significant impacts of activities, products and services on biodiversity	1	1	0	0	0	1	0	0	1	0
304-3 Habitats protected or restored	0	0	0	0	1	1	0	0	0	0
304-4 IUCN Red List species and national conservation list species with habitats in areas affected by operations	0	1	0	0	1	0	0	0	0	0
305-1 Direct (Scope 1) GHG emissions	1	1	0	1	1	1	0	0	1	0
305-2 Energy indirect (Scope 2) GHG emissions	1	1	0	1	1	1	0	0	1	0
305-3 Other indirect (Scope 3) GHG emissions	0	1	0	1	1	1	0	0	1	0
305-4 GHG emissions intensity	1	1	0	1	1	1	0	0	1	0
305-5 Reduction of GHG emissions	1	1	1	0	1	1	0	0	0	0
305-6 Emissions of ozone-depleting substances (ODS)	0	0	0	0	0	0	0	0	0	0
305-7 Nitrogen oxides (NOx), sulfur oxides (SOx), and other significant air emissions	1	0	0	0	1	1	0	0	1	0

Table A4. *Cont.*

Sub-Indicators	Developers						Suppliers			
	DLF Limited	Godrej Properties Ltd.	Sobha Ltd.	Omaxe Ltd.	Mahindra Lifespace Developers Ltd.	UltraTech Cement Ltd.	Visa Steel Ltd.	RDC Concrete (India) Pvt Ltd.	Volve Construction Equipment	Asahi India Glass Ltd.
306-1 Waste generation and significant waste-related impacts	0	1	0	0	0	0	0	0	0	0
306-2 Management of significant waste-related impacts	1	1	1	0	1	1	0	0	1	0
306-3 Waste generated	1	1	0	0	1	1	0	0	1	0
306-4 Waste diverted from disposal	1	1	0	0	1	1	0	0	1	0
306-5 Waste directed to disposal	1	1	0	0	1	0	0	0	1	0
308-1 New suppliers that were screened using environmental criteria	1	1	1	0	1	1	0	0	1	0
308-2 Negative environmental impacts in the supply chain and actions taken	0	0	0	0	1	0	0	0	1	0

Table A5. India REITs, Facility Management and International Property Consultants Disclosure Transparency Score Matrix.

[illegible]

Table A5. Cont.

Sub-Indicators	REITs			Facility Management		International Property Consultants			
	Brookfield India Real Estate Trust REIT	Mindspace Business Parks REIT	Embassy Office Parks REIT	Cushman & Wakefield—Commercial Real Estate Services	Cushman & Wakefield—Commercial Real Estate Services	CBRE	Jones Lang LaSalle	Colliers	Knight Frank
302-1 Energy consumption within the organization	1	0	0	1	1	1	1	1	0
302-2 Energy consumption outside of the organization	0	0	0	0	0	0	0	0	0
302-3 Energy intensity	1	0	0	1	1	1	1	1	0
302-4 Reduction of energy consumption	1	1	0	0	0	0	1	0	0
302-5 Reductions in energy requirements of products and services	0	1	1	0	0	1	0	1	0
303-1 Interactions with water as a shared resource	0	0	0	1	1	0	0	0	0
303-2 Management of water discharge-related impacts	1	1	1	1	1	0	1	1	0
303-3 Water withdrawal	0	0	1	1	1	1	0	0	0
303-4 Water discharge	0	0	0	0	0	0	0	0	0
303-5 Water consumption	1	1	0	0	0	0	1	0	0
304-1 Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas	0	0	0	0	0	0	1	0	0
304-2 Significant impacts of activities, products and services on biodiversity	0	0	0	0	0	0	1	0	0
304-3 Habitats protected or restored	1	0	1	0	0	0	0	0	0
304-4 IUCN Red List species and national conservation list species with habitats in areas affected by operations	0	0	0	0	0	0	0	0	0
305-1 Direct (Scope 1) GHG emissions	1	0	0	1	1	1	1	1	0

Table A6. India Financial Institutions Disclosure Transparency Score Matrix.

Sub-Indicators	Financial Institutions														
	HDFC Bank Ltd.	State Bank of India	PNB Housing Finance Ltd.	LIC Housing Finance Ltd.	ICICI Bank Ltd.	ICICI Venture Funds Management Company	Kotak Private Equity Group	Blackstone	KKR & Co. Inc.	Motilal Oswal Alternates	New York Life Insurance Company	The Canada Pension Plan Investment Board	Temasek's Mapletree	CDPQ(Caisse de Dépôt et Placement du Québec)	Ontario Teachers' Pension Plan Board
301-1 Materials used by weight or volume	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
301-2 Recycled input materials used	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
301-3 Reclaimed products and their packaging materials	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
302-1 Energy consumption within the organization	1	1	1	0	1	0	0	0	0	1	1	0	1	0	0
302-2 Energy consumption outside of the organization	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
302-3 Energy intensity	1	1	1	0	1	0	0	0	0	1	1	0	1	0	0
302-4 Reduction of energy consumption	1	1	0	0	1	0	0	1	0	0	0	0	1	0	0
302-5 Reductions in energy requirements of products and services	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1
303-1 Interactions with water as a shared resource	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
303-2 Management of water discharge-related impacts	1	1	0	0	0	0	0	0	0	1	0	0	1	0	0
303-3 Water withdrawal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
303-4 Water discharge	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
303-5 Water consumption	1	1	1	0	0	0	0	0	0	1	1	0	1	0	0
304-1 Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0

Table A6. Cont.

Sub-Indicators	Financial Institutions														
	HDFC Bank Ltd.	State Bank of India	PNB Housing Finance Ltd.	LIC Housing Finance Ltd.	ICICI Bank Ltd.	ICICI Venture Funds Management Company	Kotak Private Equity Group	Blackstone	KKR & Co. Inc.	Motilal Oswal Alternates	New York Life Insurance Company	The Canada Pension Plan Investment Board	Temasek's Mapletree	CDPQ(Caisse de Dépôt et Placement du Québec)	Ontario Teachers' Pension Plan Board
304-2 Significant impacts of activities, products and services on biodiversity	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0
304-3 Habitats protected or restored	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
304-4 IUCN Red List species and national conservation list species with habitats in areas affected by operations	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
305-1 Direct (Scope 1) GHG emissions	1	1	1	0	1	0	0	1	0	0	1	1	1	0	0
305-2 Energy indirect (Scope 2) GHG emissions	1	1	1	0	1	0	0	1	0	0	1	1	1	0	0
305-3 Other indirect (Scope 3) GHG emissions	1	1	0	0	0	0	0	1	0	0	1	1	0	0	0
305-4 GHG emissions intensity	1	1	1	0	1	0	0	0	0	0	0	0	1	1	0
305-5 Reduction of GHG emissions	1	1	1	0	0	0	0	0	0	1	1	1	1	0	1
305-6 Emissions of ozone-depleting substances (ODS)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
305-7 Nitrogen oxides (NOx), sulfur oxides (SOx), and other significant air emissions	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0
306-1 Waste generation and significant waste-related impacts	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
306-2 Management of significant waste-related impacts	1	0	1	1	0	0	0	1	0	1	1	0	1	0	0
306-3 Waste generated	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0

Table A6. *Cont.*[illegible]

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