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ESG as a Sustainability Approach in Corporate Real Estate Management

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Abstract

This study aims to examine the implementation of environmental, social, and governance (ESG) principles from a corporate real estate management (CREM) perspective and to propose guidelines for managing office buildings in alignment with ESG. A literature review identified sixteen aspects of CREM related to ESG principles and subsequently compared with findings from case studies. Three case studies from Bangkok, Thailand, were conducted to explore how these insights are applied in current practices. Criteria for case selection included office buildings in Bangkok owned by companies listed on the Stock Exchange of Thailand (SET) and recognised as Sustainable Stocks or Thailand Sustainability Investment (THSI) in 2021. Data were gathered through field studies, which involved surveying the physical environment of the organisation's real estate assets, examining building operations, and assessing support services that promote the organisation's sustainability objectives. Key stakeholder interviews were also conducted. The literature review suggests that while most CREM approaches related to ESG are applied in practice, the degree to which CREM aligns with ESG principles varies depending on organisational strategies, the type of real estate, and building conditions. The findings revealed that CREM practices, when classified under a specific aspect of ESG, also can be linked to other aspects. For example, waste management, classified under the environmental aspect, often involves in-office waste segregation, which requires employee involvement and is thus connected to the social aspect. This study introduces the integration of ESG principles with CREM, contributing insights and practical guidelines for implementation. By identifying connections between sustainability and real estate management, we present a framework for both academic research and practical application. Sixteen aspects linking CREM to ESG, identified in both theory and practice, have the potential to contribute to the added value of CREM initiatives.

Keywords

Sustainability objectives; ESG integration; Stakeholders; Real estate management; Corporate governance; Energy management

1. Introduction

The global landscape has experienced dramatic shifts due to events like pandemics, necessitating adjustments in behaviors and attitudes, termed the "Next Normal." Despite adaptations, challenges in quality of life and work engagement remain, affecting retention, productivity, safety, and profitability. Concurrently, organisations are leveraging real estate modifications to meet business goals and enhance efficiency and environmental sustainability (Knight Frank, 2020).

Over 65% of global executives are concerned about climate change, with 71% aiming to maintain structural changes post-pandemic, emphasising environmental preservation. The integration of Environmental, Social, and Governance (ESG) principles into business strategies and real estate management has gained prominence, reflecting a commitment to sustainable development and long-term business viability.

This study aims to examine the implementation of ESG principles in corporate real estate management (CREM) and to propose guidelines for managing office buildings in alignment with ESG. Focusing on listed companies in the Thailand Stock Exchange (SET) within the real estate and construction sector, the research aligns physical and business elements of real estate management, addressing challenges and providing a framework for sustainable practices. The findings offer comprehensive guidelines and case studies, supporting managers and stakeholders in implementing effective ESG-aligned strategies in real estate management.

2. Literature Review

This section explores corporate real estate management and its connection with ESG criteria. It discusses the evolving role of CREM in organisations, highlighting its strategic significance. The section also examines how ESG factors have become integral to real estate, driven by global sustainability and ethical business concerns. Additionally, it explores the integration of 16 CREM practices with ESG principles, covering areas like energy management and sustainability innovations, clarifying the relationship between CREM activities and ESG goals.

2.1 Evolving Perspectives in Corporate Real Estate Management

Corporate real estate management (CREM) has become integral to organisational strategy, expanding beyond traditional roles. This literature review explores CREM's definition, evolution, and core competencies. Initially, Zeckhauser and Silverman (1983) defined corporate real estate (CRE) as land and buildings owned by non-real estate companies. Dresdow and Tryce (1988) included leased properties, recognising the diverse nature of CRE. Brown et al. (1993) further emphasised that CRE encompasses both owned and leased assets used to achieve corporate objectives, as supported by studies from Ali et al. (2008), Joroff et al. (1993), Manning and Roulac (2001) and Roulac (1999). This evolution highlights CRE's strategic importance beyond physical assets to achieving organisational goals.

The role of CREM has evolved from asset management to a strategic partner. Jalil Omar and Heywood (2014) noted CREM's critical function in providing workplaces and selecting optimal locations aligned with business strategies. CREM's core competencies can be viewed from two perspectives: executives and customers. Executives see CREM as custodians of property and facilities management to strategic planning. Customers categorise CREM competencies into three areas: supporting business units, providing property services, and acting as property owners. This dual perspective underscores the need for CREM to balance operational efficiency with strategic business alignment.

2.2 The Significance of ESG in Real Estate

The integration of Environmental, Social, and Governance (ESG) criteria into real estate investment and management practices has gained substantial attention due to growing concerns over climate change and ethical business conduct. The term "ESG" was first introduced in the 2004 United Nations report "Who Cares Wins," highlighting the importance of incorporating environmental, social, and corporate governance issues into financial market considerations. The United Nations Environmental Program's Finance Initiative (UNEP-FI) in 2005 provided concrete evidence of the financial relevance of ESG issues, advocating for their inclusion in investment decisions (UNEP-FI, 2019).

ESG considerations have evolved from voluntary corporate social responsibility to components of regulatory and legal frameworks for institutional investors. UNEP-FI's 2019 report on "fiduciary duty in the 21st century" emphasises that neglecting ESG considerations can lead to legal challenges, highlighting their mandatory nature in corporate and investment diligence.

In real estate, debates persist about the practicality and effectiveness of integrating ESG criteria. Critics argue that ESG implementation can be costly and may not yield immediate financial benefits, potentially conflicting with short-term financial performance (Dorfleitner et al., 2015). Additionally, the lack of standardisation in ESG metrics can lead to inconsistencies in evaluating and comparing sustainability performance (Friede et al., 2015). However, proponents point to long-term benefits such as risk mitigation, enhanced reputation, and potential financial returns through increased demand for sustainable properties (Gibson & Krueger, 2018). These discussions highlight the complexity of integrating ESG principles into Corporate Real Estate Management (CREM) practices, requiring a balanced approach that considers stakeholder interests and long-term sustainability goals.

2.3 Integrating the Sixteen Aspects of Corporate Real Estate Management with ESG

This section reviews how Corporate Real Estate Management (CREM) aligns with Environmental, Social, and Governance (ESG) principles, drawing on key studies by Aroonsrimorakot et al. (2019), Masalskyte et al. (2014), Nielsen et al. (2016), St Lawrence (2004) and Vieira de Castro et al. (2020). These studies explore the intersection of CREM and ESG, highlighting sustainable property management practices. Our investigation identifies 16 critical areas where CREM clearly intersects with ESG considerations, such as energy management, water management, waste management, life cycle assessment (LCA), materials and resources, and innovation. Insights from these studies offer a refined understanding of CREM's contribution to sustainability and governance. Table 1 provides an overview of the 16 key aspects linking CREM practices to ESG criteria.

Table 1. Sixteen aspects concerning the link between CREM and ESG.

CREM in line with ESG	St Lawrence (2004)	Masalskyte et al. (2014)	Nielsen et al. (2016)	Aroonsrimorakot et al. (2019)	Vieira de Castro et al. (2020)
Environment					
Site planning	*Potential environmental risk concern:* Loss of biodiversity through land occupation (Ho et al., 2017) Landscape changes (e.g. microclimate changes, heat islands, soil erosion)	*Plan & Initiate:* Single practices and activities Building certification (Huo et al., 2018)	n/a	n/a	*Site selection and accessibility:* Reuse brownfield sites or those of low ecological value Site selection to achieve low environmental impact (Huo et al., 2017)
Energy management	*Conscious of energy use:* Intelligent building management system (BMS) (Surmann et al., 2016)	*Energy management:* Most typical sustainable CREM practices (Surmann et al., 2016)	*Building performance:* Measuring and improving energy performance of buildings (Surmann et al., 2016) Strategic energy management	Guidelines to conserve energy such as the use of natural lighting and lighting reflectors (Huo et al., 2017)	*Functional and sustainable design*: Sustainable building features such as building energy efficiency (Huo et al., 2017)
Water management	Concern of water use in green building initiatives and facilities management (FM) aspects (Aroonsrimorakot & Phuynongpho, 2017)	*Water management*: Most typical sustainable CREM practices (Aroonsrimorakot & Phuynongpho, 2017)	n/a	Green office and reduction in water consumption (Aroonsrimorakot & Phuynongpho, 2017) Wastewater management (Elsaid & Aghezzaf, 2015)	*Rainwater management:* Water quality Water and effluent management (Aroonsrimorakot & Phuynongpho, 2017)
Waste management	*Design and construction:* Total waste recycled Site disposal and/or relocation Waste generation from building or fit-out demolition (Elsaid & Aghezzaf, 2015)	*Waste management:* Most typical sustainable CREM practices (Elsaid & Aghezzaf, 2015)	n/a	Green office and reducing waste generation Waste management (Elsaid & Aghezzaf, 2015)	LEED rating system: waste management BREEAM rating system: waste DGNB rating system: waste generation
Life cycle-assessment (LCA)	Concern about potential risks throughout the lifecycle of building activities (Peukes et al., 2023)	*LCA:* Most typical sustainable CREM practices (Sroufe, 2018)	Building performance presenting LCA (Sroufe, 2018)	n/a	Establishing indicators for assessing buildings' life cycle sustainability performance (design, planning, construction, operation and demolition) (Ūsas et al., 2021)
Materials and resources	*Potential environmental risk:* Design: specification of materials and products from non-renewable, non-sustainable sources (Akadiri & Olomolaiye, 2012)	*Plan & Initiate:* Single practices and activities Building certification (Akadiri & Olomolaiye, 2012)	Construction and sustainable building materials (Akadiri & Olomolaiye, 2012; Omer & Noguchi, 2020)	n/a	CASBEE rating system: resources and materials BREEAM and LEED rating systems: materials (Omer & Noguchi, 2020)

CREM in line with ESG	St Lawrence (2004)	Masalskyte et al. (2014)	Nielsen et al. (2016)	Aroonsrimorakot et al. (2019)	Vieira de Castro et al. (2020)
Social					
Accessibility	*Potential social risk:* Increased commuting, work-life balance, increased risks from driving longer hours	*Plan & Initiate:* Single practices and activities Building certification (Vieira de Castro et al., 2020)	n/a	Flexible working hours to avoid the peak commuting hours Use public transport or bicycle when going to work	Alternative transport solutions for building users, which supports the reduction of car use
Pollution control	*Potential social risk:* Health and safety risks from polluted waterways, air, soil, dust, construction Traffic and detours (Denton, 1999)	n/a	n/a	Green office and reducing waste generation Minimise the effect of environmental pollution Reduction in pollution (Denton, 1999)	*Sustainable worksite*: Limiting noise and visual pollution and optimising worksite cleanliness (Denton, 1999) BREEAM: pollution prevention (Vieira de castro et al., 2020)
Indoor environmental quality	Sick building syndrome (Aroonsrimorakot et al., 2019)	*Measure & Manage:* Operational: communication with stakeholders Building certification (Nyoni et al., 2023)	Building design and sustainability (Aroonsrimorakot et al., 2019)	Plant trees Install air filtration systems Implement indoor air quality monitoring systems Avoid using products that emit pollutants Separate chemical areas (e.g. photocopy machines) (Aroonsrimorakot et al., 2019)	CASBEE: evaluates the improvement of indoor environment quality (Aroonsrimorakot et al., 2019)
Environmental quality of the surroundings	*Inhospitable landscape:* Loss of play grounds, green spaces Visual blight in neighbourhood from litter and site debris	*Measure & Manage:* Operational: communication with stakeholders Building certification (Sijakovic & Peric, 2021)	Building design and sustainability (Sijakovic & Peric, 2021)	Control amount of carbon footprint generated by various activities to minimise environmental impacts (Sijakovic & Peric, 2021)	CASBEE: evaluates the improvement of outdoor environment quality (Colenberg & Jylhä, 2022; Sijakovic & Peric, 2021)
Safety and security	Health, Safety, Security and Environment (HSSE) performance (Taylor, 2005)	n/a	n/a	n/a	Occupational Health and Safety Protecting consumers' health and safety Data protection and privacy Workers' health and safety Local community's wellbeing (Vieira de castro et al., 2020)

CREM in line with ESG	St Lawrence (2004)	Masalskyte et al. (2014)	Nielsen et al. (2016)	Aroonsrimorakot et al. (2019)	Vieira de Castro et al. (2020)
Sustainable workplace	n/a	*Optimise & Innovate:* Strategic: sustainable workplaces Most typical sustainable CREM practices (Colenberg & Jylhä, 2022)	Integrating green building with workplace design strategies (Colenberg & Jylhä, 2022)	Promote sustainability by providing knowledge to employees Raising awareness through changing behaviors for energy efficiency and resource consumption (Colenberg & Jylhä, 2022)	Human development: Training and education in the workplace Design for flexibility (Colenberg & Jylhä, 2022)
Sustainable facilities management	*Potential social risk:* Specification of materials and products made by exploited labour force KPIs such as tonnes of unrequired furniture donated (Meng, 2014)	*Measure & Manage, Integrate & Improve:* Operational, Tactical: sustainable facilities management Most typical sustainable CREM practices (Meng, 2014)	Sustainable facilities management practices in large organisations (Meng, 2014)	Use recycled paper and reduce paper usage by digital format Encourage building users to be environmentally conscious Donate furniture and unused equipment Choose certified recycled materials and supplies (Meng, 2014)	Optimise and facilitate the maintenance of building materials and systems (Meng, 2014)
Governance					
Innovation	Sustainable fit out in new building driven by occupiers Intelligent building management system (Kaur & Solomon, 2023)	*Optimise & Innovate:* Strategic: innovations (Walker & Goubran, 2020)	Service innovation (Kaur & Solomon, 2023)	*Solution to design, idea, technology and innovation*: Aiming to make building construction energy efficient Utilising technology to facilitate communication, work online, and control building systems. (Vigren et al., 2022)	*Functional and sustainable design:* Innovative measures to decrease the building's impact, increase economic performance, and enhance user comfort (e.g. bioclimatic and low-carbon strategies) (Gharehbaghi et al., 2022; Walker & Goubran, 2020)
Monitoring and control	n/a	*Measure & Manage:* Operational: continuous performance measuring and monitoring (Gharehbaghi et al., 2022)	*Building performance:* Environmental control (Gharehbaghi et al., 2022)	Regular maintenance and annual servicing of air conditioning system to ensure energy efficiency and performance (Gharehbaghi et al., 2022)	Design of KPI system to track and report the sustainability of the entire building development process (i.e. planning to occupancy) Assess environmental, health, and safety impacts in daily operations (Nyoni et al., 2023)

CREM in line with ESG	St Lawrence (2004)	Masalskyte et al. (2014)	Nielsen et al. (2016)	Aroonsrimorakot et al. (2019)	Vieira de Castro et al. (2020)
Life cycle cost (LCC)	Government: legislation in energy prices or sustainability taxes Developers: properties should be promoted on environmental performance and lower running costs (Kauko, 2019)	LCA, LCC Most typical sustainable CREM practices (Omar Attallah et al., 2013)	n/a	Availability of environmental policies which are cost effective to implement to office staff (Omar Attallah et al., 2013; Windapo & Moghayedi, 2020)	*Green certifications:* Life cycle costs (Omar Attallah et al., 2013)

n/a - not applied (i.e., not measured or no data available)

3. Research Methods

The study on ESG concepts for sustainable corporate real estate management integrates theories and practices related to corporate real estate management and sustainable building development. From the literature review, sixteen aspects of CREM related to ESG principles were identified and subsequently compared with findings from case studies. The methodology includes field surveys, secondary data analysis, and in-depth interviews. Data were collected from organisations with real estate assets in Bangkok, Thailand, focusing on work environments, property characteristics, and facilities promoting sustainability. Key stakeholders were interviewed regarding operations that enhance environmental, social, and governance (ESG) principles to derive sustainable property management guidelines. The study examined office buildings in Bangkok owned by companies listed on the Stock Exchange of Thailand (SET) and recognised as Sustainable Stocks or Thailand Sustainability Investment (THSI) within the real estate and construction sectors in 2021.

Three case study buildings were selected:

- Case 1, a building with innovative green practices.
- Case 2, a building with significant investments in energy-efficient technologies and waste reduction.
- Case 3, a building notable for comprehensive social responsibility programmes and governance policies.

Research tools included secondary data from literature and company reports and primary data from surveys and structured interviews. Data analysis involved content analysis of interviews, including organising data, coding, forming conclusions, and summarising findings using theory and method triangulation. The study was conducted between January and April 2022. All study procedures involving human participants complied with the ethical principles of the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Participation in the study was voluntary and informed consent was obtained for all research components that involved human participants, in accordance with standard ethical practice. Table 2 provides an overview of the three case study buildings, detailing aspects such as location, opening year, building characteristics, floor area, rentable area, floor-to-ceiling height, and number of parking spaces. The differences in location, building grade, size, and space usage offer a better understanding of the physical environment characteristics of the three cases.

Table 2. Data on physical environment characteristics of the three cases

	Case 1	Case 2	Case 3
Project	Sun Towers	Shinawatra Tower 3	Lumpini Tower
Developer	Singha Estate public company limited	SC Asset Corporation public company limited	L.P.N. Development public company limited
Location	Vibhavadi Rangsit Road, Chatuchak, Bangkok	Vibhavadi Rangsit Road, Chatuchak, Bangkok	Rama IV Road, Sathorn, Bangkok
Opening year	1995	2000	1992
Building characteristics	Grade B building complex - Building A: 32 stories - Building B: 40 stories	Grade A office building - Office space: 38 stories	Grade A office building - Office space: 37 stories
Floor area and facilities	122,965 sq.m. gross floor area - Office: 62,843 sq.m. - Retail: 943 sq.m. - Meeting space: 944 sq.m. - Common area: 21,202 sq.m.	54,313 sq.m. gross floor area - Office: 51,226 sq.m. - Retail: 902 sq.m. - Meeting space: 2,185 sq.m.	49,958 sq.m. gross floor area - Office: 35,000 sq.m. - Retail: 880 sq.m. - Meeting space: 185 sq.m.
Rentable area	200 - 2,400 sq.m.	1,000 - 2,400 sq.m.	240 - 600 sq.m.
Floor-to-ceiling height	2.60 m.	2.70 m.	2.60 m.
Number of parking spaces (cars)	952	1,200	500

4. Research Findings

This section explores the relationship between organisational policies, business operations, and corporate real estate, showcasing the integration of sustainability initiatives within real estate management practices. It highlights the alignment of CREM practices with ESG criteria and demonstrates a strategic commitment to sustainability through three case studies. These case studies illustrate the adoption of energy-efficient technologies, innovative waste management strategies, and practices that enhance occupant well-being, emphasising the role of CREM in fostering sustainable and efficient business environments.

4.1 Relationship Between Organisational Policies, Business Operations, and Corporate Real Estate

This study explores how organisational sustainability policies align with real estate management practices based on data from interviews with executives and stakeholders. Despite varying objectives and missions, the sustainability policies of the case study organisations reflect similar approaches to corporate real estate management, including general management, asset management, facilities management, and cost control (Krumm, 2001). Interviews revealed that evaluating existing buildings, assessing trends, managing development budgets, and incorporating new technologies contribute to higher building standards. This attracts employees, users, and new tenants, fostering business growth. Table 3 presents data on organisational policies, real estate assets, and stakeholders across the three cases.

Table 3. Data on organisational policies, types of real estate assets, and stakeholders across the three cases

	Case 1	Case 2	Case 3
1. Sustainability policy	- Strengthen the business while embracing change - Enhance societal and living quality in every aspect of the business - Take responsibility for climate change and care for biodiversity, nature, and the environment from upstream to downstream - Conduct business with a sense of responsibility and concern for the entire business chain	- Operate the business under both short-term and long-term strategies, ensuring risk management policies are in place - Ensure transparency in operations, adhering to governance policies - Consider all stakeholders in operations, for example, by implementing policies related to occupational health and safety - Commit to environmental responsibility in all business practices	- Operate a business that prioritises environmental management and its impact on human capital - Ensure proper business returns and growth - Design products with environmental responsibility in mind - Maintain ethical marketing practices towards consumers and competitors - Manage environmental and social impacts during the construction process - Care for and manage the quality of life of residents in the post-delivery phase
2. Type of real estate assets	Office building	Office building	Office condominium
3. Stakeholders			
Directly engaged stakeholders	- Tenants, Building users - Employees - Community	- Tenants, Building users - Employees - Community	- Clients (co-owners), Building users - Employees - Community
Indirectly engaged stakeholders	- Partners, Service providers - Shareholders - Government agencies	- Partners - Shareholders - Government agencies	- Partners - Shareholders - Government agencies

4.2 Alignment of CREM Practices with ESG

This study examines how CREM practices align with ESG principles through three case studies, highlighting a strategic commitment to sustainability despite different operational contexts and constraints such as property rights and physical limitations. Environmental initiatives include thoughtful site planning, energy-efficient systems, and innovative water and waste management. Social initiatives focus on enhancing accessibility, indoor and environmental quality, safety, and occupant well-being. Governance practices emphasise innovation, effective monitoring, control systems, and proactive life cycle cost management for operational excellence and long-term sustainability. Despite challenges in spatial planning and property rights, the cases consistently demonstrate themes of innovation, efficiency, and sustainability, contributing significantly to sustainable real estate management. Table 4 presents data on these practices across the three cases.

Table 4. Data on corporate real estate management in line with ESG across the three cases

Items	Case 1	Case 2	Case 3
Environment			
1. Site planning	- survey building's surroundings to identify a suitable environment for users - connect to public transport	- consideration of building orientation on spatial layout and parking space - connect to public transport	- connect to public transport
2. Energy management	- equip with destination control system for elevator - changing lights to LED	- provision of natural light through atrium space - solar cell installation - provision of EV charger	- solar cell installation - equip with destination control system for elevator
3. Water management	- provision of waste water treatment, water reuse - equipped with auto flush, sensor faucets	- UV filtration for drinking water - water reuse for cooling air conditioning system and irrigation - equipped with auto flush, sensor faucets	- adding disinfecting bacteria and decomposing solid waste - equipped with auto flush, sensor faucets
4. Waste management	- sorting recyclable waste at designated points - coordinating with government agencies for proper waste disposal	- sorting and cleaning recyclable waste - provision of compost bins for organic waste - designated collection points for electronic waste	- sorting waste at designated points - collaboration with partners on waste recycling process
5. Life cycle assessment	- regularly inspect the building and its supporting systems	- assessing water usage risks using Aqueduct Water Risk Atlas	- inspection of building systems to meet standards
6. Materials and resources	- changing building materials to prevent heat	- applying building envelop with PVB (polyvinyl butyral) film to prevent heat - using non-toxic materials in building	- selecting suppliers prioritising environmental and sustainability concerns. - clear guidelines on substances affecting respiratory system
Social			
1. Accessibility	n/a	- arranging for transportation (tuk-tuk) to building users - separating routes for tenants to have direct access to building	- providing designated parking area for food delivery - informing users for situations affecting building access/exit
2. Pollution control	- monthly submission of wastewater samples for examination - using building materials and design features that help absorb sound	- assessing carbon footprint, e.g. assessing vehicle usage, chemical usage in wastewater treatment, paper consumption, waste disposal	- using microorganisms in building systems to minimise environmental impact - controlling traffic to reduce air pollution from vehicles.
3. Indoor environmental quality	- installation of UVGI (Ultraviolet Germicidal Irradiation) in the air conditioning system	- monitoring indoor air quality - installation of UVC lamps and filters in air conditioning system - applying Variable Air Volume (VAV) to control air distribution	- applying operable windows - installation exhaust fans

Items	Case 1	Case 2	Case 3
4.Environmental quality of the surroundings	- monitor and maintain the use of external environment - regular cleaning of facilities around the area, e.g. roads within the project, water drainage	- transforming underutilised space to more diverse functionalities, e.g. additional parking space, health & wellness park	- organising community-oriented activities by providing cleaning services around the building and surrounding community
5. Safety and security	- 24-hour security surveillance - incorporating innovative security measures, e.g. access control, facial scanning, pod destination systems	- 24-hour security surveillance - incorporating innovative security technologies e.g. access control, facial scanning - equipped with emergency backup power systems, fire suppression systems	- establishing emergency operations center - incorporating innovative security technologies e.g. touchless access control, pod destination systems
6. Sustainable workplace	- arrangement for workplace during Covid-19 - increase co-working spaces supporting hybrid work model	- provision of diverse workspaces e.g. private workstations, collaboration areas, meeting rooms, breakout areas	- provision of both dedicated and shared spaces - convertible conference rooms to promote flexibility
7. Sustainable facilities management	- provision of spaces and amenities e.g. fitness center, green spaces - designing spaces to accommodate activities that promote well-being and mindfulness	- separating pathways for tenants and employees - providing services and amenities e.g. medical room, fitness center, and green spaces. - smart gate system at lobby area and parking - engagement with building users through signage and social media	- adopting FM technologies e.g. meeting room booking - implement smart access control at parking area
Governance			
1. Innovation	- adopting building technologies to enhance building systems and various amenities e.g. UV germicidal irradiation	- testing application to control the temperature of the air conditioning system and lights in certain areas	- adopting building technologies to enhance building systems and various amenities e.g. water recycling system, motion sensors
2. Monitoring and control	- applying automated Building Automation System (BAS) to control building systems - monitoring maintenance service agreement and preventive maintenance	- tracking and controlling building system operations with BAS - preventive maintenance is used to report any malfunctions of equipment - large-scale machinery undergoes maintenance inspections by product owner	- tracking and controlling building system operations with BAS - monitoring electricity generation from solar cells and its utilisation - providing communication channel e.g. hotline for inspections and repairs
3. Life cycle costs	- conducting regular inspections on the building systems and structural work to enhance reliability - researching innovative technologies to consider future replacement scenarios	- designing and constructing in compliance with relevant building regulations - increasing the value of the real estate by improving the building systems	- utilising findings from system inspections to plan equipment upgrades and prioritise them accordingly for future management - aiming to continuously modernise the building and increase its value

n/a - not applied (i.e., not measured or no data available)

5. Discussion

This section discusses sustainable CREM through a comparative analysis of the three case studies, highlighting strategic approaches to embedding ESG principles into CREM practices. A detailed cross-case comparison based on sixteen aspects links CREM to ESG, clarifying the relationship between real estate management and sustainability goals. The discussion emphasises adaptive strategies, technological innovation, and stakeholder collaboration in achieving sustainability objectives within the corporate real estate sector, providing a comprehensive understanding of how varied practices contribute to sustainable development.

5.1 Comparative Analysis of Sustainable Corporate Real Estate Management Across Three Cases

Case 1 emphasises general management, asset management, and facilities management using the PDCA (Plan, Do, Check, Act) cycle to enhance sustainability and efficiency. It strategically aligns with ESG principles through continuous learning, staff education, and implementing sustainability measures like allocating office space for public benefits and adhering to occupational health standards. Case 2 focuses on adapting existing structures to contemporary sustainability standards by leveraging the latest trends and technologies in building and space management. This dynamic approach includes upgrades to common areas and meeting rooms, the use of non-toxic materials, and alignment with standards such as the WELL Building Standard, LEED and TREES rating systems, and ISO. Kaur and Solomon (2023) support the need for continuous adaptation and innovation in CREM. Case 3 implements a comprehensive strategy covering facilities management, environmental management, security, safety, and people management. Regular evaluations and the adoption of new methods enhance property sustainability. Collaboration with stakeholders and international partners fosters knowledge sharing and sustainability.

The comparative analysis reveals both similarities and differences in approaches to sustainable CREM. All three cases show a commitment to sustainability with varying focuses and methodologies. Cases 1 and 3 emphasise operational and strategic aspects, including education and collaboration, while Case 2 highlights adapting physical spaces to current sustainability standards and tenant expectations. This aligns with Livingstone and Ferm's (2017) insights on the evolving role of buildings in promoting sustainability through occupant engagement and community benefits.

5.2 Cross-case Comparison of Sixteen Aspects Linking CREM to ESG

This section discusses sustainable real estate management practices from the three case study organisations, highlighting their strategies for environmental responsibility and efficiency in sixteen aspects linking CREM to ESG. Case study 1 focuses on Max Future Company's commitment to energy management, carbon footprint reduction, water reuse, and technological innovation in managing Sun Towers under the Singha Estate policy. Case study 2 details SC Asset Corporation's approach to environmental targets in managing Shinawatra Tower 3, emphasising energy saving, safety, and IT infrastructure. Case study 3 explores Lumpini Wisdom & Solution Company's office condominium model at Lumpini Tower, reflecting on the Triple Bottom Line concept (Profit, People, Planet) to balance financial returns, human well-being, and environmental care.

Environmental Principle

1. Site planning

Case Study 1 employs a dual strategy, focusing on pre-construction analysis and investing in high-quality office buildings to achieve structural integrity and business goals. This strategy, which prioritises environmental quality and user support through selective site location, is supported by Huo et al. (2018) for its emphasis on pre-construction planning and sustainability. Case Study 2 utilises a detailed planning approach that includes green spaces and optimal building orientation to enhance natural ventilation and reduce heat gain. This reflects Huo et al. (2020)'s recommendations on leveraging natural elements for better environmental quality and efficiency, showcasing an advanced commitment to sustainable site planning. In contrast, Case Study 3, set in an urban environment, recognises the importance of integrating environmental considerations into site planning for future development. This aligns with Huo et al. (2018)'s insights on the growing awareness of environmental impacts in urban planning, indicating a move towards more sustainable practices.

2. Energy management

Case 1 focuses on upgrading to energy-efficient building systems, like lighting, with a long-term cost-benefit analysis approach. This aligns with Goubran et al. (2023), highlighting the significance of life cycle assessments for long-term savings and environmental benefits. Case 2 employs a comprehensive strategy, integrating solar panels, behaviour change campaigns, natural and LED lighting, and adding electric vehicle (EV) chargers. This multifaceted approach supports sustainable transportation and aligns with Surmann et al. (2016), emphasising the combination of technology and human-centric strategies for enhanced corporate energy efficiency and sustainability. Case 3 aims at alternative energy use and energy savings, installing solar panels and upgrading to efficient elevators, despite challenges with outdated systems like AHUs and air conditioners. Richter et al. (2022) support this focus on green technology and systemic upgrades, indicating a shift towards sustainable corporate real estate practices.

3. Water management

Case 1 adopts a holistic water management strategy, focusing on wastewater treatment and reuse for activities such as irrigation and roadway cleaning, alongside installing automatic water-efficient fixtures. This approach is in line with Vieira de Castro et al. (2020), who support integrating water reuse systems in buildings for better water efficiency and reduced environmental impact. Case 2 integrates a purified drinking water system, uses an activated sludge process for wastewater management, and repurposes treated wastewater for cooling towers and irrigation, reflecting Aroonsrimorakot and Phuynongpho (2017)'s emphasis on advanced water treatment technologies and efficient practices for sustainable water management in corporate real estate. Case 3, in a highly urbanised setting, reduces water usage with sensor-operated faucets and a building automation system for water monitoring and control. This demonstrates the importance of innovative water-saving technologies and automation in urban water management, as discussed by Aroonsrimorakot et al. (2019). Unlike the others, Case 3 lacks a wastewater treatment and reuse system due to space constraints, highlighting how physical and contextual factors affect the choice and feasibility of sustainability measures.

4. Waste management

Case 1 adopts a proactive waste management strategy, focusing on in-office waste segregation and an advanced recycling program. This initiative encourages tenant participation in sustainability efforts, aligning with Elsaid and Aghezzaf (2015), who emphasise recycling, composting, and reducing landfill use as key to sustainable waste management. Case 2 adapts to flexible work arrangements by updating equipment and

managing electronic waste through collection points and partnerships for recycling larger items and hazardous materials like copiers and computers. This reflects Nyoni et al. (2023)'s insights on the changing sustainability perspectives among asset managers, showing a shift towards economic incentives for energy efficiency and renewable energy. Case 3 implements a thorough waste management system, enhancing waste segregation and minimising waste production via incentives. This approach exemplifies sustainability in operational practices, focusing on recycling and waste reduction in collaboration with governmental and private entities for sustainable waste handling, applying Elsaid and Aghezzaf (2015)'s integrated waste management framework.

5. Life cycle assessment

Case 1 takes a detailed approach to Life Cycle Assessment (LCA), inspecting systems like ventilation and wastewater treatment to meet operational standards without harming the community, in line with Sroufe's (2018) principles on sustainable design and LCA for building efficiency and environmental compatibility. Case 2 uses risk assessment tools, such as the Aqueduct Water Risk Atlas, to ensure the building's water use complies with regional standards and impacts local resources minimally. It also focuses on changing occupant behavior to improve water efficiency, aligning with Ūsas et al. (2021)'s advocacy for incorporating environmental risk assessments into LCA to protect ecosystems and communities. Case 3 emphasises legal compliance in LCA, targeting pollution control and waste management to minimise social and environmental impacts. Peukes et al. (2023) stress the importance of integrating LCA with regulatory practices for sustainable development in the real estate sector, indicating a move towards sustainable practices.

6. Materials and resources

Case 1 adopts an innovative approach by selecting environmentally friendly and durable materials, emphasising sustainability throughout the building's life cycle. This strategy, highlighted by Akadiri and Olomolaiye (2012), focuses on the long-term benefits of sustainable materials rather than solely on cost savings. Case 2 uses advanced materials like laminate tempered glass to enhance energy efficiency and reduce heat gain, aligning with Omer and Noguchi (2020)'s emphasis on the importance of material selection for energy efficiency and sustainability, thereby reducing cooling demands and leveraging natural light. Case 3 focuses on choosing suppliers that prioritise environmental sustainability for renovation materials, ensuring no harm to indoor or external environments. This reflects a comprehensive sustainability approach that considers vendor selection criteria as crucial in materials management.

Social Principle

7. Accessibility

Case 1 shows a lack of accessibility initiatives, highlighting a gap in social sustainability and inclusivity, which contrasts with the industry's trend towards incorporating accessibility within the ESG framework. Case 2 takes a proactive approach on accessibility, partnering with external firms to offer electric tuk-tuk services with a user-friendly digital interface for booking and payment. This reflects an advanced view of accessibility that includes digital inclusivity, facilitating easy travel for occupants. Case 3 addresses accessibility by providing dedicated parking for food delivery services and collaborating with local law enforcement to share traffic and event information with occupants, ensuring they are well-informed for planning commutes. This approach caters to changing occupant needs and behaviours, enhancing the overall occupant experience. These cases illustrate the range of accessibility considerations within the CREM sector. While Case 1 misses the mark on social sustainability, Cases 2 and 3 introduce innovative solutions that improve occupant experiences and align with

sustainability goals. Livingstone and Ferm (2017) and Vieira de Castro et al. (2020) stress the importance of accessibility in attracting and retaining tenants, highlighting its role in sustainable real estate development and occupant satisfaction.

8. Pollution control

Case 1 emphasises traditional pollution control, focusing on wastewater management and noise reduction through treatment systems and sound-absorbing materials. This aligns with Denton (1999), who notes the importance of employee involvement and organisational commitment in pollution management. Case 2 adopts a comprehensive strategy, assessing both direct and indirect carbon emissions, and aims for environmental sustainability by tracking and reducing greenhouse gas emissions according to ISO 14064-1 standards. This reflects Vieira de Castro et al. (2020)'s advocacy for a systematic environmental management approach, emphasising broad-spectrum greenhouse gas management. Case 3 employs innovative pollution control methods, such as using microbes for water treatment and water spray systems for dust management in parking areas, minimising chemical use and addressing air quality. This innovative approach supports Denton (1999)'s call for creativity and proactive action in pollution control.

9. Indoor environmental quality

Case 1 utilises UV germicidal irradiation in air handling units to purify air and combat pathogens, underlining the importance of air quality for occupant health. This aligns with Aroonsrimorakot et al. (2019), who highlight the role of technology in improving indoor air quality in office environments. Case 2 expands on air quality measures by monitoring a wide range of air quality parameters and employing upper-room UV germicidal irradiation and variable air volume (VAV) systems for air purification and temperature control, aiming for both occupant comfort and energy efficiency. This proactive approach towards sustainability, noted by Nyoni et al. (2023), demonstrates the alignment of economic incentives with energy efficiency and renewable energy initiatives. Case 3 emphasises natural ventilation through operable windows and exhaust fans to enhance air quality and circulation, adopting a combined traditional and modern strategy to indoor environmental quality that focuses on mitigating sick building syndrome and promoting occupant well-being.

10. Environmental quality of the surroundings

Case 1 prioritises regular maintenance and water reuse systems for cleaning nearby streets, aiming to enhance the building's image and contribute to environmental and community benefits. This aligns with de Burgos Jiménez and Céspedes Lorente (2001), who highlight the importance of environmental management in sustaining corporate image and overall sustainability. Case 2 focuses on transforming external areas to provide both additional parking and community health spaces, alongside hiring external companies for cleaning exterior glass, reflecting a commitment to aesthetic and environmental quality. This aligns with Sijakovic and Peric (2021), advocating for sustainable designs that address climate change and improve the environment. Case 3 includes social initiatives for cleaning the building's exterior and nearby areas, extending environmental efforts to the community and highlighting a direct engagement with societal benefits. This approach reflects de Burgos Jiménez and Céspedes Lorente's (2001) view on extending corporate social responsibility to produce tangible environmental and societal benefits.

11. Safety and security

Case 1 adopts an advanced safety and security strategy with a 24-hour CCTV system and technologies like access control and facial scans, aiming for enhanced security. This reflects Taylor (2005)'s view on the benefits of integrating building systems for improved security and operational efficiency. Case 2 also prioritises

safety with 24-hour digital CCTV, facial scanning for access, and fire suppression and emergency power systems exceeding standard requirements, showcasing a proactive stance on occupant and asset protection. This approach is in line with Vieira de Castro et al. (2020), emphasising the importance of comprehensive safety measures in real estate management. Case 3 focuses on preparedness, featuring an emergency operations centre with trained personnel, touchless access systems, and life-saving equipment, underscoring the importance of rapid response for occupant safety. This aligns with Vieira de Castro et al. (2020)'s principle that safety and security are fundamental aspects of the social responsibility in real estate management.

12. Sustainable workplace

Case Study 1 implements co-working spaces and hybrid work models, reflecting Jensen and van der Voordt (2020)'s emphasis on designing work environments for improved organisational performance and adaptability post-Covid-19. This showcases an innovative approach to flexible workspaces promoting employee well-being and adaptability. Case Study 2 emphasises diverse workspaces to enhance teamwork and a dynamic environment, aligning with Colenberg and Jylhä (2022) on the significance of interior design for employee health and well-being. By providing spaces for collaboration and relaxation, it commits to a supportive and idea-rich work environment. Case Study 3 focuses on improving work atmosphere by catering to physical and mental health, in line with Baykal Uluoz and Inalhan (2024). The focus here is on flexible working, relaxation spaces, and adaptable rooms, demonstrating a holistic strategy towards a balanced and productive work environment.

13. Sustainable facilities management

Case 1 adopts a holistic sustainable FM approach, integrating health and wellness spaces and touchless access, alongside environmental initiatives like recycling with rewards. This reflects Livingstone and Ferm (2017)'s view on the active role of occupants in building sustainability, promoting a comprehensive and inclusive FM strategy. Case 2 adapts its design to current needs by offering common areas for diverse activities and incorporating smart access systems, wellness facilities, and green spaces. This adaptive use aligns with Kaur and Solomon (2023), who highlight the importance of sustainable practices in workspace management for environmental sustainability. Case 3 focuses on employee health and quality of life by surveying occupants to customise health activities, converting parking to exercise areas, and integrating smart access and community engagement. This proactive health incorporation and community focus outline a broad strategy for sustainable and socially responsible FM.

Governance Principle

14. Innovation

Case 1 utilises technology like UV germicidal irradiation for air purification to improve health, safety, and efficiency, reflecting Kauko (2019), who notes that technological innovations can significantly enhance real estate value by improving sustainability and efficiency. Case 2 employs technology for environmental control and efficiency, showcasing the integration of digital tools to enhance building functionality. This strategy aligns with Vigren et al. (2022) 's discussion on the role of digitalisation and sustainability in real estate innovation. Case 3 plans a collaborative platform for building management, emphasising technology-driven stakeholder engagement for efficiency and comfort. This aligns with Walker and Goubran (2020), who stress the importance of sustainable design and technology in enhancing building performance and occupant satisfaction.

15. Monitoring and control

Case 1 uses a building automation system (BAS) for managing systems like air conditioning and elevators, complemented by preventive maintenance and a mobile app for issue alerts. This aligns with Inalhan (2009), stressing the importance of engaging employees in change management, and Gharehbaghi et al. (2022), highlighting the role of technology in operational efficiency and sustainability. Case 2 leverages BAS across various systems, including application-based environmental controls, and adopts advanced safety and emergency systems, reflecting a comprehensive approach to building safety and efficiency. This is supported by Kaur and Solomon (2023), who note digitalisation's impact on enhancing facilities management, safety, and sustainability. Case 3 extends BAS use to include solar cell performance monitoring and employs a communication app for user feedback, indicating a focus on innovation in stakeholder engagement. This approach is in line with Nyoni et al. (2023), emphasising the importance of communication and feedback in continuous improvement and sustainability in corporate real estate management.

16. Life cycle costs

Case 1 adopts a preventive maintenance system, using inspections to inform equipment upgrades and budgeting to maintain the building's modernity and value. This strategy, supported by Boge et al. (2018), emphasises early integration of life cycle cost management for sustainability and financial performance. Case 2 focuses on compliance and energy efficiency to attract tenants, upgrading systems like chillers and implementing BAS controllers for enhanced efficiency. Earning the WELL health-safety rating highlights a holistic approach to sustainability and life cycle cost management, in line with Windapo and Moghayedi (2020)'s advocacy for sustainable construction and life cycle assessments. Case 3 takes a strategic approach to building management with preventive maintenance and system performance analysis for future replacements and upgrades. Planning external inspections and considering new innovations for efficiency and service life aligns with Omar Attallah et al. (2013), who note the importance of lifecycle analysis (LCA) for optimising environmental and cost impacts in building projects.

The analysis highlights that CREM practices, while often categorised under specific ESG principles, demonstrate significant interconnectedness across these areas. Initiatives aimed at one ESG dimension frequently impact the others. For example, energy-efficient building modifications not only address environmental concerns by reducing emissions but also improve social well-being through healthier work environments and align with governance through compliance with sustainability standards. This insight suggests the importance of a holistic approach in CREM, acknowledging the multi-dimensional benefits of sustainability practices.

6. Conclusions

Findings from previous studies have been compared to what has been implemented in practice, using three buildings in Bangkok as case studies. These findings revealed sixteen aspects related to corporate real estate management that align with the three primary ESG principles. Additionally, this section presents key factors that should be considered in relation to the proactive approach of corporate real estate management concerning ESG. This study contributes to existing knowledge on CREM and ESG integration by empirically demonstrating how aligning real estate strategies with ESG principles can enhance sustainability. The research highlights practical applications and best practices that organisations can adopt to improve their ESG performance.

6.1 Corporate Real Estate Management in Connection to ESG

Aligning corporate real estate management with ESG involves various considerations, preparations, and arrangements that address the three main principles of ESG. Table 5 presents various aspects related to the implementation of CREM across the three main principles: environmental (6 aspects), social (7 aspects), and governance (3 aspects).

Table 5. Sixteen aspects concerning corporate real estate management in connection to ESG

Environmental Principle	
1. Site planning	• Enhance consideration of the building's location and its impact on the ecosystem by including details on pre-construction analysis, integrating green spaces, and optimising orientation to improve natural ventilation and minimise heat gain.
2. Energy management	• Expand on alternative energy and energy conservation by upgrading to energy-efficient building systems, integrating behavior change campaigns alongside technology such as solar panels and LED lighting, and adding electric vehicle chargers.
3. Water management	• Focus strategies on drinking water, plumbing systems, and wastewater treatment by incorporating holistic water management approaches, such as reusing wastewater for irrigation and utilising advanced water treatment technologies.
4. Waste management	• Emphasise not only the encouragement of waste separation by building users but also elaborate on in-office waste segregation, advanced recycling programs, electronic waste management, and minimising waste production through incentives, and collaboration with governmental and private entities.
5. Life cycle assessment	• Highlight the inspection of systems such as ventilation and wastewater treatment, the use of risk assessment tools, and legal compliance in life cycle assessment (LCA) to emphasise the integration of sustainable design, environmental risk assessments, and regulatory practices in enhancing building efficiency and environmental compatibility.
6. Materials and resources	• Refine the considerations for material and resource procurement by highlighting the selection of environmentally friendly and durable materials, using advanced materials to enhance energy efficiency and reduce heat gain, and prioritising suppliers who ensure sustainability in both indoor and external environments.
Social Principle	
1. Accessibility	• Expand on the impacts of building design to include initiatives such as partnering with external firms to offer services that facilitate occupant travel, providing dedicated parking for delivery services, and collaborating with local law enforcement to improve commute planning for occupants.
2. Pollution control	• Incorporate comprehensive strategies that assess both direct and indirect carbon emissions, aim for broad-spectrum greenhouse gas management as mentioned in ISO 14064-1 standards, and employ innovative pollution control methods, such as using microbes for water treatment.
3. Indoor environment quality	• Mention not only controlling lighting and selecting materials for sound insulation but also using technology such as UV germicidal irradiation, monitoring air quality parameters, employing air purification and temperature control systems, and emphasising natural ventilation.
4. Environmental quality of the surroundings	• Highlight efforts that go beyond building design to support diverse activities, including regular maintenance, using water reuse systems for cleaning the surroundings, transforming external areas into community health spaces, and engaging in social initiatives for environmental and community benefits.
5. Safety and security	• Detail not just the safety measures but also the advanced security strategies employed, such as 24-hour CCTV, facial recognition, access control systems, fire suppression and emergency power systems, and an Emergency Operations Center to enhance occupant and asset protection.

6. Sustainable workplace	• Emphasise the implementation of co-working spaces and hybrid work models, diverse workspaces for teamwork in dynamic environments, and a focus on physical and mental health through flexible working arrangements, relaxation spaces, and adaptable rooms to promote employee well-being.
7. Sustainable facilities management	• Include the integration of health and wellness spaces, touchless access, and environmental initiatives such as recycling with rewards. Adapt common areas for diverse activities, implement smart access systems, wellness facilities, green spaces, and focus on employee health and quality of life through customised health activities and community engagement.
Governance Principle	
1. Innovation	• Expand on technologies supporting office work, such as UV germicidal irradiation for air purification, to showcase technology's role in health safety and efficiency. • Highlight the integration of digital tools for environmental control, efficiency, and stakeholder engagement through a collaborative platform for building management, aligning with the emphasis on digitalisation and sustainability in real estate innovation.
2. Monitoring and control	• Detail the use of technology in managing systems such as air conditioning, elevators, and solar cell performance monitoring. • Mention the adoption of a mobile app for issuing alerts and collecting user feedback, reflecting the comprehensive approach to safety, efficiency, and engaging stakeholders in change management and continuous improvement.
3. Life cycle costs	• Assess the efficiency of building systems, including a preventive maintenance system guided by inspections, for equipment upgrades and budgeting. • Emphasise compliance and energy efficiency efforts to attract tenants, upgrading systems for enhanced efficiency, and adopting a strategic approach to building management, which includes system performance analysis for future replacements and upgrades. • Highlight the holistic approach to sustainability and life cycle cost management, which includes earning certifications such as the WELL health-safety rating.

6.2 Key Factors Influencing ESG Implementation in Corporate Real Estate Management

1. Type of ownership of real estate assets - The type of real estate ownership, such as office condominiums, directly influences facilities and workplace management.

2. Legislation - Given the extended lifespan of buildings, corporate real estate management must comply with applicable laws related to building modifications.

3. Budget management - Adopting an ESG approach requires facilities management to balance common fees with planned expenditures, ensuring effective cost management throughout the building's lifespan.

4. Communication - Clear and effective communication with occupants is essential for promoting sustainability practices and guidelines for space usage.

5. Building age and physical condition - The age and physical condition of a building influence its modifications, emphasising versatile space utilisation and system upgrades to achieve sustainability goals.

By providing a detailed analysis of these aspects, this study offers insights for both academia and industry, contributing to the understanding of how ESG principles can be effectively integrated into CREM practices. This research underscores the importance of a holistic approach in achieving sustainability goals and offers a framework for future studies and practical implementations in the real estate sector.

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