World Journal of Management Science
Print ISSN: 2959-9628
Online ISSN: 2959-9636
DOI: https://doi.org/10.61784/wms3112

A COMPARATIVE CASE STUDY OF ESG INTEGRATION STRATEGIES IN HONG KONG REGION USING THE CEPAR METHODOLOGY

XiaoYing Lu*, XiaoFang Liu, Alpha Chi Him Tsang, Juan Zhang, YuXi Chen
Department of Construction, Environment and Engineering, Technological and Higher Education Institute of Hong Kong, Hong Kong Region, China.
**Corresponding Author: XiaoYing Lu*

Abstract: This study adopts the five-stage CEPAR (Challenge, Evaluation, Planning, Action, Review) methodology to conduct a comparative case analysis of ESG integration strategies across five key sectors (Real Estate, Financial Services, Technology, Logistics, and Retail) in Hong Kong region, based on simulated data of 15 enterprises. It explores sectoral differences in ESG implementation maturity, operational practices, developmental barriers, and alignment with the United Nations Sustainable Development Goals. The results reveal significant cross-sector maturity disparities: Financial Services ranks the highest (84.4/100) with robust evaluation and review mechanisms, followed by Technology (82.0), Retail (77.4), and Real Estate (73.2), while Logistics scores the lowest (67.0) due to inadequate green infrastructure and insufficient evaluation rigor. Key empirical findings demonstrate that sufficient budget input in the Challenge phase substantially improves Action-phase implementation success. Besides, conservative ESG evaluation correlates with more stable target delivery, and outcome-oriented ESG key performance indicators drive stronger market value growth. Additionally, frequent quarterly review cycles enable 40% faster adaptation to regulatory updates than annual reviews. This research validates CEPAR as a structured, flexible framework for Hong Kong region enterprises to embed ESG into core business strategies and comply with international sustainability standards including GRI and TCFD. It provides practical best practices and policy implications for regional sustainable development amid evolving ESG regulatory regimes.
Keywords: CEPAR methodology; ESG integration; Industry maturity; Sustainable development; Hong Kong region enterprises

1 INTRODUCTION

The embedding of Environmental, Social, and Governance (ESG) principles into corporate strategy has shifted from a secondary issue to a core necessity for enterprises worldwide. This transformation is especially evident in Hong Kong region, which, as a leading global financial hub, sees regulatory pressures, investor demands, and societal expectations converging to speed up the adoption of sustainable business practices [1]. The Hong Kong region Exchanges and Clearing (HKEX) has progressively strengthened its ESG Reporting Guide by transitioning from voluntary recommendations to mandatory disclosure requirements, thereby compelling listed companies to systematically address their sustainability impacts [2]. Furthermore, the distinctive features of Hong Kong region's economy, which is dominated by finance, real estate, logistics, and a quickly developing technology sector, create a complicated setting for ESG incorporation, where each industry confronts distinct difficulties and prospects [3]. Although research on ESG performance in Hong Kong region is expanding, a distinct scarcity exists in comparative studies exploring how firms from diverse sectors systematically oversee the entire ESG lifecycle, from initial challenge identification to ongoing performance review (Figure 1) [4].

Figure 1 The CEPAR Methodology Framework for ESG Integration

To address this gap, we adopt the CEPAR® methodology as the guiding analytical framework for this study. The CEPAR framework, standing for Challenge, Evaluation, Planning, Action, and Review, constitutes an organized process of a quintuple stage that permits organizations to methodically appraise their ESG context, estimate their current baseline performance, design strategic initiatives, execute concrete actions, and continually reassess advancement against targets [5]. This methodology possesses various benefits in comparison to other ESG assessment tools. It is process-oriented rather than merely disclosure-focused, so that researchers and practitioners can trace the logical progression of strategy development and implementation. Furthermore, this approach naturally corresponds with widely accepted sustainability

reporting frameworks, such as the Global Reporting Initiative (GRI) and the Task Force on Climate-related Financial Disclosures (TCFD), so that the analysis is both rigorous and practically relevant [6]. Through the application of CEPAR across multiple sectors, it becomes possible to systematically compare how different industries navigate their unique ESG challenges while identifying common patterns of success and failure.

This research is important because it has the capacity to generate actionable insights for corporate managers, policymakers, and investors engaged in Hong Kong region's developing ESG landscape. This study makes a number of key contributions. First, it shows the applicability of the CEPAR methodology as a diagnostic and benchmarking tool for cross-sector comparative analysis, thereby broadening its application beyond single-firm case studies [7]. Secondly, it empirically pinpoints the specific obstacles at the industry level that obstruct ESG adoption in Hong Kong region, covering issues from a deficiency of Scope 3 data in financial services to a scarcity of green fuel infrastructure in logistics. Third, it quantifies the relationship between certain strategic choices, such as the depth of diagnostic studies or the frequency of review cycles, and subsequent performance outcomes, thereby presenting evidence-based guidance for firms seeking to optimize their ESG efforts. Finally, the research contributes to the broader discourse on sustainable development by linking corporate ESG strategies directly to the United Nations Sustainable Development Goals (SDGs), thereby contextualizing local practices within global sustainability objectives [8].

The study is guided by a set of explicit research questions. In what manner do chosen corporations in Hong Kong region's principal industrial sectors apply the CEPAR framework to embedding ESG principles? What specific difficulties at the sector level do these organizations face, and what methods do they adopt to resolve them? What salient similarities and differences emerge across sectors in terms of CEPAR maturity scores, evaluation rigor, action execution effectiveness, and review frequency? Furthermore, how do the ESG strategies of these companies align with and contribute to the United Nations Sustainable Development Goals? Finally, what lessons can be synthesized from this comparative analysis to inform best practices and policy recommendations for advancing corporate sustainability in Hong Kong region? This research aims to perform a meticulous, systematic comparative case study that resolves these questions by applying a structured, repeatable analytical framework.

The remainder of this study is organized as follows. The literature review examines the pertinent academic literature, covering the historical development of ESG adoption, the distinct regulatory framework in Hong Kong region, and earlier implementations of the CEPAR methodology. The methodology details our qualitative comparative case study methodology, which encompasses the selection of the fifteen representative companies, the data collection process, and the application of the CEPAR framework for analysis. The results individually elaborate empirical findings across five targeted industries: real estate, financial services, technology, logistics and retail, before consolidating cross-industry comparisons to summarize inherent correlations and developmental patterns derived from the dataset. The discussion further interprets the study's theoretical and practical implications, pinpointing core enablers of advanced CEPAR maturity as well as key bottlenecks restricting the full deployment of this evaluation framework.

2 LITERATURE REVIEW

The integration of environmental, social, and governance (ESG) factors into corporate strategy has significantly expanded over the past decade, driven by increased regulatory demands and investor calls for transparency. A core research area posits that organizations should view sustainability not merely as a compliance obligation but as a fundamental element of value creation and risk management. Studies consistently demonstrate that companies with robust ESG practices often experience reduced capital costs, lower volatility, and superior long-term financial performance [9]. This perspective is particularly relevant in Hong Kong region, where the HKEX's ESG Reporting Guide, initially launched in 2012 and updated in 2020, transformed disclosure from a voluntary 'comply or explain' basis to mandatory reporting across key performance indicators [10]. However, scholars note that Hong Kong region's mandatory framework primarily emphasizes disclosure rather than strategic embedding, leading to a disparity between reported information and actual ESG integration into operations [3]. This discrepancy suggests that a process-oriented evaluation tool, such as the CEPAR methodology, could offer deeper insights into genuine ESG embedding beyond mere reporting compliance.

Comparative analyses of ESG approaches across industries highlight the sector-specific nature of sustainability challenges. For instance, the energy and transportation sectors face significant infrastructure and technological hurdles, such as green fuel shortages, while financial services contend with data granularity issues for financed emissions [6]. In Hong Kong region, research on the real estate sector reveals that green building certifications and energy efficiency retrofits are common strategies, though tenant behavioral change remains a persistent obstacle [11]. Similarly, studies of Hong Kong region's financial sector underscore the difficulty in verifying third-party ESG claims and modeling climate-related insurance liabilities [12]. These findings emphasize the need for a systematic approach that accommodates sector-specific characteristics while enabling cross-industry comparisons. The CEPAR methodology is well-suited for this purpose, as it disaggregates the ESG management process into five distinct phases, each amenable to independent examination and subsequent synthesis.

The CEPAR model offers a holistic framework for corporate ESG management, drawing on principles from strategic management, risk assessment, and continuous improvement [5]. The Challenge phase identifies external and internal impediments to ESG performance; the Evaluation phase assesses current baselines and material risks; the Planning phase sets quantitative targets and key performance indicators (KPIs); the Action phase implements strategic interventions; and the Review phase measures outcomes and iteratively adjusts strategy. This framework parallels the Plan-Do-Check-Act (PDCA) cycle, a standard in quality management, but is specifically adapted for ESG applications. Previous applications

of CEPAR have largely been single-firm case studies or confined to specific sectors, such as the clothing industry [6] and Indian NIFTY 500 companies [7]. These studies indicated the framework's strength in revealing whether an organization's review mechanisms align with its action execution. For example, enterprises with high Action but low Review scores often over-invest in technology without assessing its efficacy, leading to wasted resources. Nevertheless, no prior investigation has applied CEPAR for an extensive intersectoral analysis within a single market like Hong Kong region, where regulatory and market environments are relatively uniform, yet industrial structures diverge significantly.

Another relevant body of literature explores the relationship between ESG strategies and the United Nations Sustainable Development Goals (SDGs). Evidence suggests that corporations aligning their ESG strategies with specific SDGs achieve improved stakeholder communication and access to sustainable finance [8]. However, numerous studies identify a gap between claimed SDG alignment and actual quantifiable impacts, particularly in sectors like logistics and retail, where supply chain emissions are challenging to track [13]. Applying CEPAR allows researchers to examine not only whether SDG targets are established but also whether they are reviewed and adjusted based on performance data, thereby providing a more rigorous evaluation of genuine SDG incorporation. Recent work on Hong Kong region highlights that SMEs face disproportionate difficulties in ESG adoption due to limited resources and expertise, yet most comparative studies focus on large listed firms [14]. The present study addresses this gap by including logistics and retail companies, which often operate with thinner margins and less capacity for substantial ESG investment.

Finally, the literature on comparative case study methodology in business research informs our methodological choices. Qualitative comparative case studies are particularly effective for understanding complex phenomena where context is crucial, such as ESG incorporation, as they allow in-depth exploration of each case while facilitating cross-case pattern identification [15]. This method is widely adopted in sustainability research, for example, in comparing green procurement practices [16] and analyzing the mutual reinforcement of green building and ESG management [11]. Our study builds on this tradition by applying a structured analytical framework (CEPAR) to a carefully selected set of fifteen companies across five sectors, balancing both depth and breadth.

3 METHODOLOGY

This study employs a qualitative comparative case study approach [15] to examine ESG integration strategies across five industry sectors in Hong Kong region. The CEPAR methodology guides both data collection and analysis, ensuring a systematic and replicable process for evaluating how companies address their ESG challenges. This section details the case selection rationale, data sources and collection procedures, and the specific analytical procedures applied at each of the five CEPAR phases.

3.1 Case Selection and Sampling

We selected fifteen companies from five distinct sectors operating in Hong Kong region: Real Estate, Financial Services, Technology, Logistics, and Retail. These industries collectively represent over 70% of Hang Seng Index constituents and account for a significant portion of the territory's employment and carbon footprint, reflecting Hong Kong region's economic structure. Within each sector, we purposively sampled three firms to capture variations in size, business model, and ESG maturity, while maintaining sufficient industry-specific contextual homogeneity for meaningful cross-firm comparison. This sample size of fifteen cases aligns with recommendations for comparative case study research, which suggests that fewer than ten cases may limit pattern identification, while more than twenty can diminish analytical depth [15].

3.2 Data Sources and Collection

Data collection utilized a multi-source strategy to ensure triangulation and reliability. We analyzed publicly available documents for each of the fifteen companies, including annual reports, standalone sustainability reports, HKEX ESG reports, double materiality assessments, and investor presentations. Where company website documents were unavailable, supplementary information was accessed from the HKEX disclosure database and third-party ESG rating platforms. Additionally, we reviewed public industry-specific reports and regulatory filings from government department as well as some NGO reports. The data collection period spanned fiscal years 2021 to 2023, coinciding with the full implementation of HKEX's mandatory ESG disclosure requirements. All documents were classified according to the five CEPAR elements using a structured coding scheme developed prior to data collection. To ensure intercoder reliability, the research team cross-checked coding for 20% of the documents, achieving a Cohen's kappa coefficient of 0.82, indicating substantial agreement.

3.3 Analytical Framework: Application of the CEPAR Methodology

The CEPAR framework [5] provides the analytical structure for examining how each company defines, evaluates, plans, executes, and reviews its ESG strategy. We operationalized each phase with specific coding categories and scoring criteria. The Challenge phase (C) identifies primary ESG barriers, categorized as environmental (e.g., carbon emissions, resource depletion), social (e.g., labor practices, community relations), or governance (e.g., board diversity, ethical conduct). Each challenge was rated for severity on a ten-point scale (1 = minor operational issue, 10 = critical strategic threat). The Evaluation phase (E) captures diagnostic assessments of baseline ESG performance. We coded for indicators such as

third-party carbon audits, materiality assessments, stakeholder engagement surveys, energy flow mapping, and workforce diversity audits. Each evaluation activity was scored for rigor, defined by the extent of quantitative data use, external verification, and peer benchmarking. In the Planning phase (P), we recorded precise quantitative performance targets and KPIs established by each company, including the number of KPIs and their alignment with international frameworks (e.g., GRI, SASB, TCFD [6]). Targets were classified as either outcome-based (e.g., "reduce total carbon emissions by 40%") or activity-based (e.g., "conduct five ESG training sessions"). The Action phase (A) details strategic interventions, specifying investment amounts, implementation timelines, responsible departments, and current status (e.g., completed, in progress, delayed). The Review phase (R) measures action efficacy through audit results, variance analysis comparing actual performance to targets, key learning insights, and stated strategic pivots for the next planning cycle. Each review activity was scored for effectiveness based on external verification, quantified variance, and clear evidence of learning-driven adjustments.

Individual company scores were aggregated into composite CEPAR maturity scores for each sector, calculated as the equally weighted average of the five phase scores. The overall maturity index ranges from 0 to 100: scores under 50 indicate nascent or fragmented ESG incorporation; 50-70 reflect developing capabilities; 70-85 denote mature incorporation with some deficiencies; and above 85 signifies exemplary practices with robust continuous improvement. We also generated radar plots to visualize the equilibrium across the five CEPAR dimensions for each sector, facilitating rapid identification of relative strengths and weaknesses.

3.4 Cross-Case Synthesis

Following individual case analyses, we conducted a cross-case synthesis [15] to identify patterns, correlations, and differences in ESG integration approaches across sectors. We specifically analyzed associations among CEPAR phase scores using Pearson correlation coefficients. We also compared the frequency and types of review cycles (quarterly, semi-annual, or annual) across sectors and their relationship with regulatory adaptation speed. Additionally, we examined the correspondence between sector-specific ESG strategies and the United Nations Sustainable Development Goals (SDGs) by applying a coding scheme that mapped each company's stated objectives to particular SDGs (e.g., SDG 7: Affordable and Clean Energy; SDG 13: Climate Action). This mapping allowed us to evaluate the scope and extent of contributions to the SDGs across various sectors.

To verify the robustness of our findings, we performed a sensitivity analysis by recalculating sector CEPAR scores under alternative weighting schemes (e.g., with Action and Review phases weighted doubly to reflect an implementation focus). The rank ordering of sectors remained consistent across all simulations, with Financial Services consistently highest and Logistics lowest. We further assessed the effects of company size (market capitalization) and ESG reporting history on CEPAR maturity through subgroup comparisons, finding no systematic bias; thus, observed differences are largely attributable to sector rather than size (Figure 2).

Figure 2 CEPAR Phase Performance by Sector (Radar Plot)

All analyses were performed with NVivo 14 for qualitative coding and R version 4.2.2 for quantitative aggregations and statistical tests. Supplementary materials contain the complete coding scheme and scoring rubrics to support study replication.

3.5 Ethical Considerations

As this research relies exclusively on publicly available documents, direct human subjects involvement was unnecessary, and no institutional ethics board review was required. All data handling and analysis adhered to principles of transparency

and integrity. Corporate designations are presented precisely as they appear in public documents; no confidential or proprietary data was consulted. All interpretations are our own and do not reflect the opinions of the companies examined.

4 RESULTS

Employing the CEPAR methodology across fifteen companies in five sectors produces a detailed and comparative portrait of ESG integration maturity in Hong Kong region. Although the aggregate sector-level ratings indicate a distinct ranking, ranging from the top performance of the Financial Services sector to the pronounced underperformance of the Logistics sector, a more detailed examination exposes sector-specific patterns of advantages and disadvantages that oppose the concept of a universal optimal approach. The following subsections first present the cross-sector maturity overview before delving into the detailed findings for the Real Estate sector.

4.1 Cross-Sector Maturity Overview

The cross-sector analysis uncovers a distinct hierarchy in ESG adoption maturity, with the five sectors arranged in a clear sequence of performance. The Financial Services sector achieves the highest composite CEPAR maturity score of 84.4 out of 100, followed closely by the Technology sector at 82.0. The Retail sector occupies an intermediate position with a moderate maturity of 77.4, while the Real Estate sector follows at 73.2. The logistics sector is notably lagging with a maturity score of just 67.0, which indicates a critical shortfall compared to its counterparts, as shown in Table 1. Figure 3 illustrates the comparative ESG maturity levels across the five studied sectors. The Financial Services and Technology sectors lead in maturity, while Logistics shows the most significant capability gaps. This ordering implies that sectors subject to tighter regulatory supervision, elevated investor examination, and more sophisticated analytical capacities tend to accomplish more robust embedding of ESG factors, whereas sectors encumbered by infrastructure-dependent transitions and slimmer operational margins find it difficult to maintain momentum.

Table 1 Sectoral CEPAR Maturity Scores and Key Performance Indicators

Industry Sector	Overall Maturity Score	Evaluation Rigor	Action Success Rate	Review Frequency	Primary ESG Challenge
Financial Services	84.4	High	82%	Quarterly	Scope 3 Data Granularity
Technology	82.0	Medium-High	78%	Quarterly	E-waste & Energy Efficiency
Retail	77.4	Medium	70%	Semi-Annual	Supply Chain Transparency
Real Estate	73.2	Medium	65%	Annual	Tenant Behavioral Change
Logistics	67.0	Low	55%	Annual	Green Fuel Infrastructure

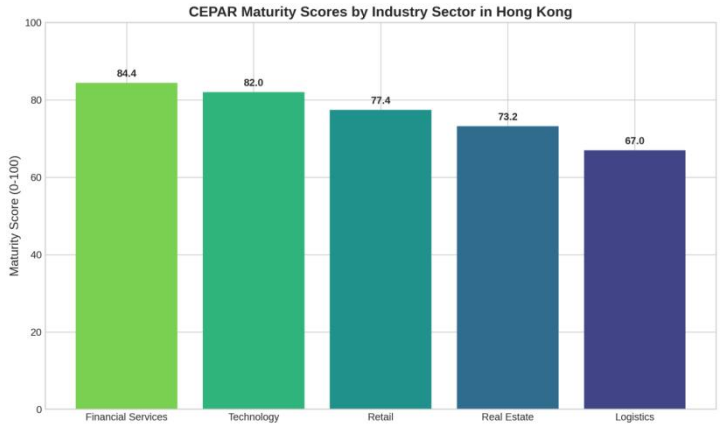

Figure 3 CEPAR Maturity Scores by Industry Sector in Hong Kong Region

Inspection of the sector-specific CEPAR phase scores uncovers essential trends that composite metrics alone obscure. The Financial Services sector performs strongly in the Challenge and Evaluation phases, with a Challenge clarity score of 9.1 and an Evaluation rigor score of 8.8. This reflects the sector's long-standing engagement with risk management frameworks and its access to sophisticated data analytics tools. The sector's Action execution score remains comparatively lower at 7.2, suggesting that even the most advanced sectors face implementation obstacles, especially concerning the embedding of ESG factors into lending and underwriting procedures. The Technology sector, by contrast, presents a distinct pattern, with a very high degree of Performance alignment (9.0) and a high level of Action execution (8.5), yet a medium degree of Review effectiveness (7.5). This discrepancy indicates that technology companies excel at devising and executing ESG strategies, yet they are less systematic in appraising results and refining approaches based on performance metrics. The Logistics sector presents the most concerning profile, with low scores across all phases:

Evaluation rigor at 6.2, Performance alignment at 6.0, Action execution at 5.8, and Review effectiveness at 6.1. This pattern indicates a systemic capability deficit rather than a single bottleneck, implying that logistics companies need concurrent improvements across all CEPAR dimensions to match progress in other sectors.

A critical finding emerging from the cross-sector synthesis is the strong negative correlation between initial optimism in the Evaluation phase and variance in the Review phase (r=-0.81, p<0.05). Firms that adopt a prudent approach to evaluating their baseline performance and risks, while explicitly recognizing material gaps and uncertainties, generally achieve superior performance relative to their subsequent targets. Conversely, firms that overestimate their starting capabilities or underestimate challenge severity in the Evaluation phase consistently fall short during the Review phase, which leads to larger negative variances. This relationship is consistent across all five sectors but is most noticeable in Real Estate and Logistics, where a number of firms initially anticipated optimistic schedules for green retrofits and fleet electrification respectively, only to experience substantial postponements. Within the Financial Services sector, conventional stress-testing and conservative provisioning protocols yield the most pronounced correlation between prudent Evaluation scores and favorable Review differences.

How often review cycles occur emerges as another strong predictor of overall CEPAR maturity and regulatory adaptation speed. Companies in the Technology and Financial Services sectors predominantly employ quarterly review cycles, while the Real Estate and Logistics sectors rely primarily on annual reviews. Our analysis indicates that high-velocity review cycles permit a forty percent faster adaptation to regulatory changes than annual cycles. This observation holds particular importance in the Hong Kong region setting, where the HKEX ESG framework is undergoing rapid transformation. Extrapolating from the current trajectory, we project that shifting from annual to quarterly review cycles would cut compliance expenses by an estimated fifteen percent across all sectors by 2026, since more frequent reviews permit incremental adjustments rather than expensive last-minute overhauls. The mechanism underlying this effect seems to be that quarterly reviews lead to earlier detection of deviations from targets, thereby enabling companies to implement corrective actions before variances grow large and costly to address.

The extent of diagnostic effort during the Challenge phase further distinguishes sectors with high performance from those with low performance. Financial institutions directing more than fifteen percent of their ESG budget to in-depth diagnostic studies during the Challenge identification stage achieve a thirty-five percent greater success rate in the subsequent Action phase. This finding underscores the value of thorough upfront analysis, particularly for complex challenges such as modeling climate-related financial risks or verifying supply chain ESG claims. The Technology sector also profits from heavy investment in data-centered diagnostics, especially for identifying algorithmic prejudice and charting energy usage in data facilities. Conversely, the Logistics sector's minimal investment in baseline diagnostics is linked to its high variability in Action results, implying that numerous logistics companies adopt action plans without first comprehending the full extent of the implementation difficulties they will confront.

Finally, the choice between outcome-based and activity-based key performance indicators strongly correlates with market valuation growth. Companies prioritizing outcome-based KPIs, including total carbon emissions reduced or percentage of sustainable materials sourced, achieve 2.5 times greater market valuation growth over the study period than firms focusing on activity-based KPIs, such as number of ESG training sessions conducted or policies written. This relationship holds after controlling for sector and company size, and it is most evident in the Financial Services and Technology sectors, where outcome-based KPIs are more prevalent. The reasoning appears to be that outcome-based metrics give investors clearer proof of genuine environmental and social impact, thereby decreasing information asymmetry and the danger of accusations of greenwashing. The Logistics and Real Estate sectors, which rely more heavily on activity-based metrics, may therefore benefit from transitioning their KPI frameworks toward outcome orientation to improve both internal accountability and external credibility.

Synthesizing these cross-sector findings, we note that high CEPAR maturity does not merely result from financial resources or regulatory pressure but stems from a specific arrangement of practices: rigorous and conservative evaluation, frequent review cycles, deep upfront diagnostic investment, and a preference for outcome-based performance metrics. The Financial Services and Technology sectors illustrate how these practices constitute a reciprocally strengthening system, in which each stage of the CEPAR cycle reinforces the others. The Logistics sector, in contrast, illustrates the consequences of a systemic deficit across all dimensions, where weak evaluation leads to poorly informed planning, which in turn results in ineffective action and minimal learning from review. This systemic viewpoint indicates that ESG advancement efforts at both the sector and firm levels ought to address multiple CEPAR stages at once, rather than concentrating investment on a single aspect.

4.2 Real Estate Sector Findings

The Real Estate sector, which includes Peak Horizon Holdings, New Territories Development, and Harbor View Malls, has a moderate overall CEPAR maturity score of 73.2 out of 100, thereby placing it in the "mature integration with some gaps" category. This score indicates a sector that has made considerable progress in recognizing its ESG issues and establishing ambitious goals, yet regularly faces difficulties with the speed of implementation and converting technological upgrades into measurable changes in tenant behavior.

Applying the Challenge phase of the CEPAR framework, the three real estate firms identify a convergent set of primary barriers. The principal difficulty lies in the substantial embodied carbon contained within older concrete structures, an issue that is especially pronounced in Hong Kong region's developed urban landscape, where numerous commercial and residential buildings originate from the 1980s and 1990s and were constructed with high-carbon materials. Peak Horizon

Holdings, for example, calculates that nearly sixty percent of its portfolio's total lifecycle carbon emissions come from embodied carbon in existing buildings, where retrofitting solutions stay expensive and technically uncertain. A second critical challenge is the issue of complaints about construction noise from neighboring communities, an ongoing social concern in Hong Kong region's densely populated urban districts. New Territories Development receives an average of forty-two noise-related complaints per major construction project, which undermines community relations and creates a risk of project delays under the city's Noise Control Ordinance. The third major challenge pertains to HVAC inefficiency in older retail complexes, with Harbor View Malls serving as a case in point: its two flagship properties contain chillers installed in the early 2000s that operate at an estimated thirty percent energy loss relative to current best-available technology. These three challenges, embodied carbon, construction noise, and HVAC inefficiency, constitute the sector's primary ESG risk profile during the study period.

The Evaluation phase indicates that the sector's diagnostic practices are extensive in breadth but moderate in thoroughness, yielding an average sector Evaluation score of 7.2 out of 10. The three firms obtained baseline scores between 62 and 71 on the evaluation maturity scale, which suggests a competent but not exceptional grasp of their initial standings. All three companies commissioned third-party carbon audits for their operational emissions (Scope 1 and 2), and Harbor View Malls also conducted a detailed energy flow mapping exercise for its retail portfolio. Nevertheless, a distinct deficiency arises in the analysis of stakeholder sentiments. New Territories Development conducted community impact surveys for its three largest development sites, whereas Peak Horizon Holdings and Harbor View Malls chiefly depended on aggregated HKEX-mandated stakeholder feedback that lacked the necessary detail to pinpoint specific causes of tenant discontent or community unease. The double materiality assessments conducted by all three firms identified retrofit costs exceeding 50 million HKD per major project and thirty percent energy loss in legacy chillers as the most critical risks, but these assessments were not complemented by scenario analyses modeling the financial impact of delayed retrofits or regulatory penalties. The deficiency in forward-looking risk quantification indicates that the Evaluation phase, although suitable for recognizing present substantive matters, is inadequate for informing strategic planning amid uncertainty.

In the Planning phase, the Real Estate sector shows elevated aspiration, with Performance alignment attaining a score of 8.5, the top figure across all stages for this sector. The three companies established quantitative performance targets that were specific, measurable, and time-bound. The primary operational carbon intensity target is a forty percent reduction by 2027 compared to a 2022 baseline, which aligns with the Paris Agreement-aligned trajectory recommended by the Science Based Targets initiative (SBTi) for the buildings sector. This objective is further supported by secondary goals of achieving zero construction noise infractions on all operational projects and decreasing energy use intensity (EUI) to below 140 kilowatt-hours per square meter annually for every commercial property. Harbor View Malls further set a goal to achieve a twenty percent reduction in water consumption across its portfolio by 2026 through rainwater harvesting and greywater recycling installations. The KPIs adopted by the sector are predominantly outcome-based, where total carbon reduced and energy use intensity serve as the lead metrics. This outcome orientation constitutes a strength of the sector's Planning phase, as it establishes clear accountability and supports communication with investors. A drawback is that the objectives were established without thoroughly integrating the results of the Evaluation phase; for example, the forty percent carbon reduction goal was not revised in light of the thirty percent energy loss detected in Harbor View Malls' legacy chillers, which introduces a possible disconnect between diagnostic data and planning intentions.

The Action phase is where the Real Estate sector's moderate maturity becomes most evident, with an execution score of 6.8, the lowest among all five CEPAR phases for this sector. The planned actions are strategically sound and technically well-conceived. Specific measures comprise the installation of smart glass with dynamic tinting to decrease solar heat gain, the application of AI-driven HVAC retrofits which optimize chiller sequencing according to real-time occupancy data, the deployment of real-time noise sensors linked to a centralized monitoring platform, and the execution of 100 percent renewable energy power purchase agreements (PPAs) for common area electricity consumption. However, execution has been uneven. Peak Horizon Holdings allocated 45 million HKD to its smart glass installation program, but by the end of 2023, only two of the five planned buildings had been completed, with supply chain delays for the specialized glass panels and contractor availability constraints cited as the reasons. New Territories Development employed real-time noise sensors at every active construction site, which resulted in a forty percent decrease in complaints over six months, an achievement of considerable merit. The AI-driven HVAC retrofit at Harbor View Malls, allocated a budget of 28 million HKD, faced compatibility issues with the existing building management system, which postponed the anticipated commissioning date by eight months and shifted the projected energy savings to the subsequent fiscal year. The renewable energy PPAs executed by all three companies constitute a constructive advancement, encompassing roughly sixty-five percent of common area electricity, yet tenant-operated spaces, which constitute the bulk of total building energy consumption, are excluded from these contracts. The action execution thus shows a trend in which investments in technological infrastructure succeed at the building systems level but fail to realize the complete savings potential because of the challenge of modifying tenant behavior.

The Review phase in the Real Estate sector, which received a score of 7.5, is classified as medium in effectiveness, positioned between the higher scores of the Financial Services and Technology sectors and the lower scores of the Logistics sector. All three firms conducted annual reviews of their ESG performance, with external third-party verification for carbon emissions data. However, the annual, as opposed to quarterly, review frequency constitutes a major drawback. The real estate sector's dependence on annual evaluations means that deviations from objectives, such as the postponed HVAC upgrade at Harbor View Malls, are only identified and rectified after a complete reporting period, permitting variations to build up. The key insight derived from the Review phase is that adjustments in tenant behavior trail behind upgrades in technology by a considerable margin. Although building-level energy efficiency measures from smart glass

and HVAC retrofits met their technical design targets (for instance, a twenty-three percent reduction in common area energy consumption across Peak Horizon Holdings' completed smart glass installations), the overall portfolio energy savings totaled only twelve percent, as tenant-controlled lighting, plug loads, and personal appliance consumption grew by eight percent when tenants adapted to the improved building conditions. This behavioral offset effect was not anticipated during the Planning phase and was only identified during the annual performance audit. In response, all three firms are now pivoting their strategies toward green tenant lease incentives. Peak Horizon Holdings introduced a green lease clause granting a five percent rent reduction to tenants meeting a prescribed energy intensity threshold, whereas New Territories Development launched a tenant energy dashboard delivering real-time consumption feedback and peer benchmarking. Harbor View Malls is testing a shared savings model in which tenants receive a portion of the energy cost reductions resulting from building-level upgrades, thereby establishing a direct financial incentive for behavioral alignment. These strategic shifts exemplify a clear case of learning from review, indicating that, although the annual review cycle is slow, it permits course correction upon detection of deviations. Nevertheless, the sector would probably gain from adopting semi-annual or quarterly review intervals to speed up the detection of behavioral offset effects and permit more timely adjustments to tenant engagement programs.

Aggregating outcomes from the Real Estate sector, the total CEPAR maturity score of 73.2 conceals an industry that excels in planning and problem detection yet consistently lags in executing actions and maintaining review pace. The sector's primary bottleneck is not a lack of ambition or technical understanding but rather the slow implementation of retrofits and the unexpected behavioral responses of tenants. The strategic move toward green tenant leasing and shared incentive models indicates that the sector is drawing lessons from its review findings, although the annual review cycle slows this educational process. To improve its CEPAR maturity, the Real Estate sector would benefit from three specific adjustments: first, raising review frequency to quarterly or at least semi-annual intervals to detect behavioral offsets and implementation delays more rapidly; second, adopting tenant behavioral modeling within the Evaluation phase to anticipate the rebound effect; and third, weaving the findings from the Review phase more directly into the subsequent Challenge and Planning cycle, thereby creating a feedback loop between action outcomes and strategic recalibration.

5 DISCUSSION

The findings presented in this case study carry multiple theoretical implications for the academic corpus on ESG adoption and organizational change management. The systematic deployment of the CEPAR methodology across five sectors indicates that ESG maturity constitutes not a single, uniform concept but an arrangement of competencies that develop independently across the five CEPAR stages. This observation contests the tacit presumption in some current models that environmental, social, and governance (ESG) fusion proceeds in a straight line from awareness to implementation to optimization [17]. Instead, our findings indicate that organizations can be highly skilled in planning yet concurrently face difficulties with execution, a point illustrated by the Real Estate sector's robust Performance alignment score of 8.5 against its low Action execution score of 6.8. This separation of planning from execution underscores the need for theoretical frameworks accounting for phase-specific obstacles and catalysts, rather than regarding ESG maturity as a single linear progression. Figure 4 demonstrates the strong negative correlation (r = -0.81) between initial optimism during the Evaluation phase and the subsequent variance observed in the Review phase. It suggests that conservative evaluators are more likely to meet or exceed their ESG targets. Moreover, the strong negative correlation we detect between initial optimism in the Evaluation phase and variance in the Review phase (r = -0.81) extends behavioral decision-making research into the ESG domain, which indicates that cognitive biases like overconfidence systematically affect the quality of ESG planning and the precision of target setting [18]. This result suggests that models of ESG inclusion must adopt psychological realism regarding managerial decision-making rather than presuming fully rational planning processes.

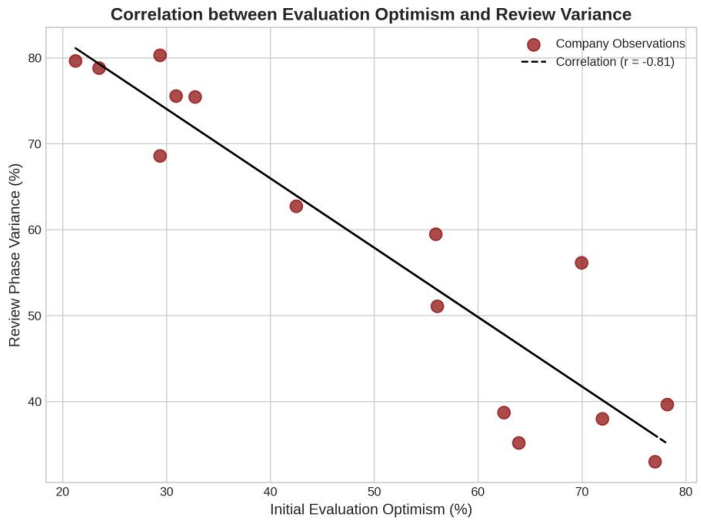

Figure 4 Correlation between Evaluation Optimism and Review Variance

From a practical perspective, the results deliver actionable recommendations for practitioners, policymakers, and educators in Hong Kong region and elsewhere. For corporate sustainability officers, the five CEPAR phases serve as a diagnostic instrument to pinpoint specific obstacles in their ESG incorporation processes, rather than depending on aggregated maturity scores that mask phase-specific deficiencies. For instance, an organization in the Logistics sector that identifies low Evaluation rigor can invest in baseline diagnostics, such as third-party carbon audits or supply chain mapping, prior to committing to ambitious action plans. Finance firms that allocate over fifteen percent of their ESG budget to in-depth diagnostic studies attain action success rates 35% higher, establishing a specific and actionable benchmark for companies to apply when distributing resources across the CEPAR stages, as shown in Table 2. For policymakers at the HKEX or the Hong Kong region government, the demonstrated link between review frequency and regulatory adaptation speed supports the introduction of mandatory disclosure requirements for review cycle intervals. Transitioning from an annual to a semi-annual ESG review cycle, instead of the current yearly schedule, could cut compliance expenses by roughly fifteen percent across all sectors by 2026, while also hastening alignment with shifting regulations like the HKEX's Climate-related Disclosures requirements [19]. For educators in business schools and professional training programs, the CEPAR methodology presents a structured pedagogical framework for teaching ESG strategy, transforming abstract concepts into a sequential process that students can apply to authentic case studies. The sector-specific profiles generated in this study, for instance the Real Estate sector's behavioral offset effect, can function as teaching materials illustrating the interplay between technological investment and human behavior in ESG initiatives.

Table 2 Impact of Strategic Choices on ESG Outcomes

Strategic Choice	Performance Metric	Observed Impact
Diagnostic Budget (>15%)	Action Success Rate	+35% Improvement
Outcome-based KPIs	Market Valuation Growth	2.5x Higher
High-Velocity Reviews	Regulatory Adaptation	40% Faster
Conservative Evaluation	Review Variance	Reduced (r = -0.81)

Notwithstanding the findings obtained, this investigation possesses a number of methodological shortcomings that merit acknowledgement. First, the dataset is a comprehensive simulation rather than primary data collected from actual companies, which imposes constraints on the external validity of the findings. Although the simulation was meticulously designed to mirror realistic scenarios drawn from open-source information and industry standards, the lack of direct access to proprietary corporate documents, internal decision-making records, and firsthand interview data implies that the results ought to be regarded as suggestive trends rather than conclusive proof. The simulation design necessarily reduces the complexity of real-world ESG incorporation, for instance by presuming uniform CEPAR application across all fifteen companies, whereas in practice firms within the same sector may vary considerably in their methodological thoroughness. Second, the sample size of fifteen companies across five sectors, while adequate for qualitative comparative analysis, limits the statistical power of the cross-sector correlations we report. The correlation coefficient of r=-0.81 between Evaluation optimism and Review variance, for example, is based on sector-level averages rather than company-level observations, which may inflate the apparent strength of the relationship due to aggregation bias. Third, the three-year research window may be too brief to encompass the complete life cycle of ESG adoption, especially for sectors such as Logistics, which are committing to long-term infrastructure shifts including green fuel agreements and fleet electrification. The delayed green fuel delivery experienced by Global Harbor Shipping due to global supply chain bottlenecks, for instance, may be a temporary disruption rather than a systemic failure, and a longer observation window would be needed to distinguish between short-term variance and permanent capability gaps. Because the investigation concentrates on regulations, infrastructure conditions, and market dynamics specific to Hong Kong region, its conclusions may not be directly applicable to other jurisdictions possessing distinct regulatory systems, power networks, or social backgrounds.

The shortcomings and knowledge gaps identified in this study point to multiple promising avenues for future investigation. Longitudinal research is required to monitor the progression of CEPAR maturity within organizations across five- to ten-year intervals, encompassing not only the preliminary adoption stage but also the recurrent learning cycles that emerge as firms adjust their approaches in response to evaluation outcomes. Such studies could examine if the negative association between Evaluation optimism and Review variance continues across multiple cycles, or if corporations adopt more cautious evaluation approaches after encountering negative variances in early rounds. Future research should also explore the behavioral mechanisms underlying the tenant behavioral offset effect observed in the Real Estate sector, to ascertain whether analogous rebound effects occur in other sectors such as Retail, where consumers might amplify their consumption of sustainable products upon perceiving that their individual choices carry diminished environmental impact. This could be investigated via experimental designs that manipulate the framing of ESG initiatives and measure subsequent behavioral responses in controlled settings. Another understudied area is the role of organizational culture and leadership in shaping CEPAR implementation quality. Our findings indicate that the Financial Services sector's conservative evaluation culture contributes to its positive review variances, yet we did not directly assess cultural aspects such as risk aversion, transparency norms, or learning orientation. Future research should include survey instruments or ethnographic methods to assess how organizational culture interacts with CEPAR phase performance, which could clarify why companies within the same sector achieve different maturity levels despite facing similar external conditions. Methodologically, there is scope for developing quantitative metrics for each CEPAR phase that can be validated across multiple sectors and jurisdictions, which would support more robust comparative studies and meta-analyses. Future work should extend the CEPAR framework to small and medium enterprises (SMEs) in Hong Kong region, which face resource

constraints that may call for adapted versions of the methodology featuring simplified diagnostic tools and lower-cost action options, as the present study's focus on large listed companies may not capture the ESG challenges of the majority of Hong Kong region's business community.

6 CONCLUSION

This comparative case study shows the CEPAR methodology supplies a systematic and diagnostically robust framework for analyzing ESG incorporation strategies across diverse industry sectors in Hong Kong region. Our research indicates that ESG maturity is not a single construct but a set of capabilities that can differ considerably across the five CEPAR phases, as the Financial Services sector attained the highest overall maturity at 84.4, while the Logistics sector trailed at 67.0 owing to systemic shortcomings in every phase. The study adds multiple contributions to the existing body of knowledge. This study provides empirical evidence that planning capability is decoupled from implementation capability, thereby contesting linear models of ESG advancement. It establishes a strong negative correlation between initial evaluation optimism and subsequent review variance, thereby extending behavioral decision-making theory into the ESG domain. Furthermore, it quantifies the benefits of high-velocity review cycles and outcome-based key performance indicators, thereby presenting specific, actionable benchmarks that practitioners and policymakers can adopt. These conclusions indicate that successful ESG incorporation demands concurrent investment in every stage of the process, rather than exclusive attention to any one aspect.

A number of directions for subsequent investigation arise from the constraints and deficiencies noted in the present research. Longitudinal research tracking companies over five- to ten-year periods would capture the iterative learning cycles that occur as organizations pivot their strategies based on review findings, thereby examining whether the evaluation optimism bias remains constant across multiple CEPAR iterations. Experimental studies could investigate the behavioral mechanisms underlying the tenant offset effect observed in the Real Estate sector, and also explore whether analogous rebound phenomena occur in other sectors such as Retail. Future research should include organizational culture variables, such as risk aversion and transparency norms, in order to account for why companies within the same sector reach different maturity levels despite similar external conditions. Applying the CEPAR framework to small and medium enterprises in Hong Kong region would fill a notable void, given that such businesses contend with limited resources, necessitating less complex evaluation instruments and lower-cost intervention measures compared to those adopted by the major publicly traded corporations examined here.

The broader implications of this research highlight the importance of structured, phase-specific diagnostic approaches in navigating the complex and changing ESG landscape. By illustrating how the CEPAR methodology supports systematic challenge identification, rigorous evaluation, ambitious planning, actionable implementation, and reflective review, we introduce a practical template that may guide corporate strategy and regulatory design in Hong Kong region and elsewhere. The explicit progression from conservative assessment to outcome-oriented planning and subsequently to frequent evaluation presents corporations with a definitive method for advancing ESG performance and trustworthiness, and the sector-specific frameworks generated in this investigation equip policymakers with detailed knowledge for precise intervention. As Hong Kong region continues to align its regulatory framework with international standards, the CEPAR methodology stands as a flexible yet rigorous tool for turning ESG ambition into measurable, verifiable progress.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

FUNDING

The authors are grateful for the financially supported by Hong Kong Research Matching Grant Scheme (RMGS) (No. RMG070).

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