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Ethical considerations in global climate and environmental business practices

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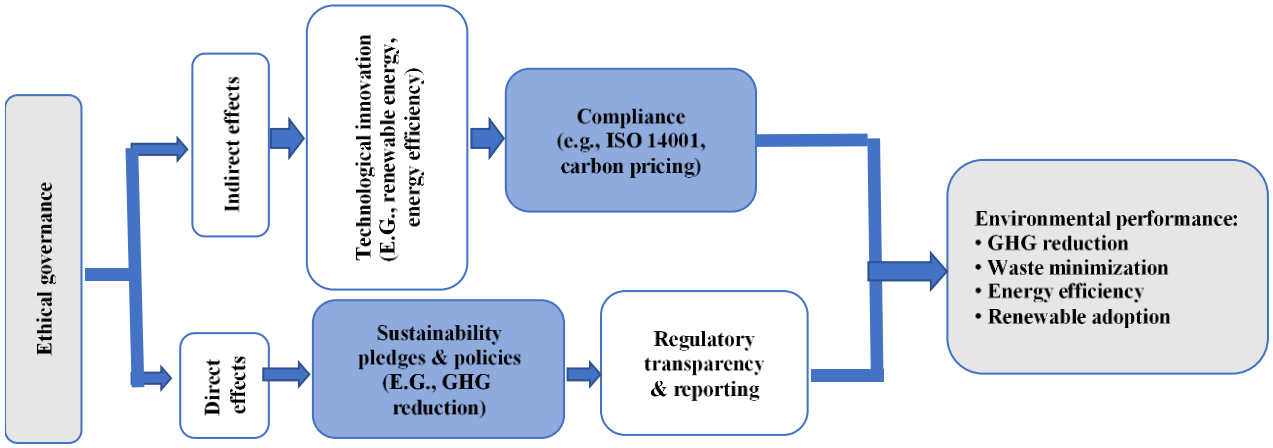
GRAPHICAL ABSTRACT



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ABSTRACT

Multinational corporations, seeking to reconcile economic goals with environmental stewardship, have found themselves at the center of an engaging academic discourse; one that has increasingly examined the role of ethical governance in promoting corporate environmental sustainability. This study analyses whether ethical integration positively correlates with proxies of environmental performance, including greenhouse gas (GHG) emissions mitigation, waste reduction, energy efficiency, and renewable energy adoption. Using a mixed research design—comprising descriptive statistics, multiple regression analysis, and structural equation modelling (SEM)—we find that organizations with strong ethical frameworks achieve significantly better environmental outcomes. Specifically, the Ethical Integration Index (EII) shows a strong correlation with waste reduction ($r = 0.72$), GHG emissions reduction ($r = 0.68$), and energy efficiency improvement ($r = 0.66$). Regression results further indicate that EII explains up to 76% of the variance in waste reduction and 71% in GHG mitigation. SEM analysis confirms both direct effects and indirect effects mediated by innovation ($\lambda = 0.52$, $p < 0.01$) and regulatory compliance ($\lambda = 0.47$, $p < 0.01$). These findings emphasize the crucial role of ethical decision-making in driving corporate environmental responsibility, suggesting that corporations should incorporate ethical governance into sustainability endeavors. The study offers actionable insights for corporate policymakers, environmental regulators, and sustainability practitioners concerned with long-term sustainability transformations.

1. Introduction

The contemporary global landscape is marked by unprecedented environmental crises, with climate change, biodiversity loss, and ecosystem degradation emerging as existential threats to planetary stability (Amini and Hesami, 2017). As anthropogenic activities continue to alter Earth's systems at alarming rates (Esmaeili *et al.*, 2024), the role of corporate entities in both exacerbating and mitigating these challenges has come under intense scrutiny. The industrial sector alone accounts for approximately 37% of global greenhouse gas emissions,

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while international supply chains drive nearly 80% of tropical deforestation, underscoring the profound environmental footprint of modern business operations (Liu *et al.*, 2024). This ecological reality has precipitated a paradigm shift in corporate governance, compelling businesses to reconcile their economic objectives with urgent environmental imperatives. The concept of Corporate Environmental Responsibility (CER) has evolved from a peripheral consideration to a central tenet of sustainable business strategy (Laljani & Butani 2024). Defined as the ethical obligation of firms to minimize ecological harm while maximizing positive environmental contributions, CER encompasses a spectrum of practices ranging from carbon footprint reduction to circular economy adoption (Hasanuddin *et al.*, 2024). However, the translation of CER principles into operational reality remains fraught with complexities. Multinational corporations (MNCs) in particular face a labyrinth of challenges, including conflicting regulatory regimes across jurisdictions, the tension between short-term profitability and long-term sustainability investments, and the inherent difficulties of monitoring extended supply chains (Esan *et al.*, 2024). These structural barriers are compounded by persistent market failures, where environmental externalities remain unpriced and unsustainable practices continue to yield competitive advantages in many sectors (Treepongkaruna *et al.*, 2024). The academic discourse on corporate environmental ethics has identified three primary drivers of sustainable business transformation. Regulatory frameworks constitute the first critical lever, with initiatives such as the European Union's Corporate Sustainability Reporting Directive (CSRD) establishing mandatory disclosure requirements for environmental impacts (Banso *et al.*, 2023). Market forces represent a second powerful catalyst, as evidenced by the growing influence of environmental, social, and governance (ESG) criteria on investment decisions - sustainable assets under management now exceed $40 trillion globally (Paužuolienė & Derkach, 2024). Perhaps most significantly, shifting societal expectations have created a new paradigm of consumer activism, where 66% of global consumers report willingness to pay premium prices for environmentally responsible products (Sahar *et al.*, 2023). These converging pressures have elevated environmental performance from a reputational concern to a strategic imperative, with industry leaders demonstrating that sustainability and profitability can be mutually reinforcing objectives (Baah *et al.*, 2024). Despite these encouraging developments, significant barriers impede the widespread adoption of ethical environmental practices. The phenomenon of greenwashing wherein companies exaggerate or falsify their sustainability credentials has emerged as a particularly pernicious challenge, undermining stakeholder trust and distorting market signals (Teichmann *et al.*, 2023). Recent analyses suggest that nearly 42% of corporate sustainability claims contain misleading elements, with particularly egregious cases observed in the fossil fuel and fast fashion sectors (Peng *et al.*, 2024). Furthermore, the absence of standardized metrics for measuring environmental performance has created a landscape of inconsistent reporting and verification, allowing poor performers to obscure their ecological impacts (Linnenluecke, 2022). These challenges are exacerbated by fundamental tensions in corporate governance structures, where quarterly earnings pressures often trump long-term sustainability considerations (Alay *et al.*, 2024). This research offers a vital contribution to the understanding of corporate environmental ethics by bridging theoretical insights with practical applications, aiming to reshape prevailing narratives about the supposed trade-off between environmental responsibility and financial performance.

Its core objective is to critically examine how leading organizations are integrating ethical considerations into their environmental strategies, particularly within high-impact sectors such as energy, agriculture, and manufacturing. By addressing systemic barriers, such as financial constraints, regulatory fragmentation, and organizational resistance, the study uncovers innovative practices that successfully align environmental stewardship with business performance. Notably, it provides empirical evidence challenging the myth of a zero-sum relationship, demonstrating that ethical environmental actions can foster innovation, unlock new markets, and enhance competitive advantage over the long term. Additionally, the research identifies key policy interventions, including the harmonization of international standards, reform of harmful subsidies, and the strengthening of transparency mechanisms, to accelerate the transition towards sustainable business models. Ultimately, this work aims to inform both academic discourse and practical decision-making, offering actionable insights and a roadmap for companies striving to embed sustainability at the core of their operations amidst urgent planetary imperatives.

2. Materials and methods

This study employs a comprehensive mixed-methods approach to investigate how ethical considerations are integrated into global climate and environmental business practices. It combines a systematic literature review of 37 peer-reviewed studies published between 2018 and 2024 with in-depth case studies of both successful and problematic implementations of environmental ethics in industry. The literature review provides a broad theoretical foundation, while the case studies include exemplary initiatives such as regenerative agriculture projects that have demonstrably reduced emissions and improved yields (Zhao *et al.*, 2023), alongside cautionary cases like financial institutions whose investment portfolios continue to facilitate deforestation (Glowik *et al.*, 2024). The methodology follows a stepwise execution plan, culminating in the development of a robust theoretical framework, extensive data collection, and the construction of multi-parameter indices of cross-country competitiveness. These are complemented by statistical analyses to examine correlations and validate findings. With increasing attention to ethical governance and sustainable development, recent studies highlight the growing importance of ethical business practices in fostering environmental consciousness (Leal Filho *et al.*, 2024; Alay *et al.*, 2024), making this approach particularly timely and relevant. The development of the theoretical framework was guided by the need to establish a connection between corporate ethics and environmental sustainability. This research combines several well-founded theories to identify key variables and develop testable hypotheses. The study draws on Stakeholder Theory, Triple Bottom Line, Institutional Theory, Agency Theory, and Diffusion of Innovation, which together constitute the conceptual framework (Iliopoulou *et al.*, 2024; Elli *et al.*, 2024). These theories shape the normative aspects being considered and create an organized framework for empirical evaluation. These theoretical foundations are synthesized in Table 1, which organizes the primary constructs, associated theories, key variables, and their evaluated relevance within the study's conceptual model.

Table 1. Theoretical framework and key constructs.

Construct	Theory/Model	Key variable	Relevance rating
Corporate ethics	Stakeholder theory	Ethical practices	High
Environmental stewardship	Triple bottom line	Resource management	High
Regulatory compliance	Institutional theory	Policy adherence	Medium
Transparency	Agency theory	Disclosure practices	High
Innovation	Diffusion of Innovation	Technological Adaptation	Medium

This framework provides the conceptual underpinnings for evaluating the role of ethical integration in corporate sustainability strategies, ensuring alignment with existing regulatory and environmental governance models (Hasanuddin *et al.*, 2024; Leal Filho *et al.*, 2024).

2.1. Data collection and ethical integration index construction

A structured multi-source data collection approach is implemented to enhance reliability and cross-industry applicability. The sample comprises multinational corporations (MNCs) selected based on their inclusion in sustainability indices and verified environmental certifications: The MNCs were selected based on a multi-stage screening process to ensure they were relevant and leaders in sustainability reporting. The primary criteria for inclusion were: (1) Listing on prominent global sustainability indices, specifically the Dow Jones Sustainability Index (DJSI) World or Europe, or the FTSE4Good Index Series, which provided an initial filter for companies with robust sustainability practices; (2) Possession of verified, internationally recognized environmental certifications such as ISO 14001 (Environmental Management Systems) or an equivalent industry-specific certification, ensuring a baseline commitment to environmental management; and (3) Availability of comprehensive, publicly accessible sustainability or CSR reports for the study period (2013-2020), which was essential for data extraction and content analysis. This multi-faceted approach ensured the selection of a sample that was not only influential but also transparent in its environmental disclosures (Anin *et al.*, 2024; Wahyuni *et al.*, 2024). The diversity and quality of the data sources utilized in this study are summarized in Table 2, emphasizing the breadth of temporal coverage, data types, and validation standards applied in the sampling process.

Table 2. Data collection sources and attributes.

Source type	Sample size	Collection period	Data type	Quality score
Sustainability Reports	50	2015-2020	Quantitative	9/10
CSR Disclosures	40	2016-2020	Mixed	8/10
Third-Party Audits	30	2014-2020	Quantitative	9/10
Media Articles	70	2013-2020	Qualitative	7/10
Regulatory Filings	35	2015-2020	Quantitative	8/10

To clarify the composition of the dataset, it should be noted that the 50 sustainability reports and 40 CSR disclosures do not represent 90 distinct corporations. Several multinational companies published more than one type of report or issued reports across multiple years. After consolidating overlapping sources and ensuring that each company was counted only once, the final analytical sample comprised N = 65 multinational corporations. This clarification ensures that the statistical analyses reflect company-level observations rather than duplicated report counts.

To systematically quantify ethical integration, an Ethical Integration Index (EII) is constructed, incorporating five core ethical dimensions as Eq. 1 (Glowik *et al.*, 2024):

$$EII = w_1P + w_2I + w_3M + w_4S + w_5N \quad (1)$$

where, P is policy commitment, I is implementation mechanisms, M is performance monitoring, S is stakeholder engagement, N is innovation in sustainability. The score for each dimension is equally weighted (0.20) to determine a true representation of corporate ethical integration, rather than influence by bias. The EII scores are quantitative, based on content analysis of corporate reports, regulatory disclosures, and third-party evaluations, standardized against industry norms for sustainable business practices (Liu *et al.*, 2024). This standardization process involved calculating z-scores for each company's raw EII components relative to the average and standard deviation of their respective industry sector (e.g., Energy, Manufacturing, Consumer Goods). This approach mitigates industry-specific biases, allowing for a more equitable comparison of ethical integration levels across different sectors. The industry classifications were based on the Global Industry Classification Standard (GICS).

2.2. Statistical analysis and model specification

To assess the relationship between ethical integration and corporate environmental performance, this study applies Pearson correlation analysis and multiple regression models.

2.3. Correlation analysis

The degree of association between EII and environmental performance indicators is examined through Pearson correlation coefficients. The correlation model is expressed as Eq. 2 (Amini *et al.*, 2009):

$$r = \frac{\sum(X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\sum(X_i - \bar{X})^2 \sum(Y_i - \bar{Y})^2}} \quad (2)$$

where, X_i is ethical integration index (EII) score of company i, Y_i is environmental performance indicator for company i, $\bar{X}, \bar{Y}$ are mean values of respective variables.

2.4. Multiple regression analysis

To further analyze the impact of ethical integration on corporate sustainability performance, a multiple regression model is applied according to Eq. 3 (Baah *et al.*, 2024):

$$\mathrm{Y} = \beta_0 + \beta_1\mathrm{X}_1 + \beta_2\mathrm{X}_2 + \beta_3\mathrm{X}_3 + \epsilon \quad (3)$$

where, Y is environmental performance indicator, X_1 is integration index (EII), X_2 is company size (log of revenue), X_3 is industry type (dummy variable), $\beta_0$is intercept and ϵ is error term. This model enables a quantitative assessment of the extent to which ethical integration contributes to sustainability performance, controlling for corporate size and industry-specific factors (Bao *et al.*,2024).

2.5. Hypothesis development and testing

This study formulates hypotheses to examine the impact of ethical integration on corporate environmental performance.

- H_{01}: Ethical integration has no significant impact on greenhouse gases (GHG) emissions reduction.
- H_{11}: Higher ethical integration leads to greater GHG emissions reduction.
- H_{02}: Ethical integration does not significantly influence water consumption reduction.
- H_{12}: Ethical integration correlates positively with water consumption reduction.
- H_{03}: Ethical integration has no significant effect on waste reduction.
- H_{13}: Ethical integration leads to higher waste reduction.

Hypothesis testing follows multiple regression analysis, t-tests, and structural equation modeling (SEM), ensuring statistical validity and robustness (Banso *et al.*, 2023; Hummieda *et al.*, 2023).

2.6. Validation and reliability assessment

Ensuring the validity and reliability of the research design and data analysis is fundamental to producing credible and replicable results. This study adopts a multi-faceted approach to methodological validation, combining both quantitative and qualitative techniques to evaluate the robustness of the Ethical Integration Index (EII) and the accuracy of statistical inferences. Content validity is first established through the careful selection of ethical dimensions based on established theoretical models and prior empirical research (Carroll & Shabana, 2010). Each dimension of the EII—policy commitment, implementation mechanisms, monitoring systems, stakeholder engagement, and sustainability innovation—has been conceptually grounded in the relevant literature to ensure its relevance and theoretical soundness (Freeman and Mc Vea 2005; Elkington, 1997).

Construct validity is assessed via confirmatory factor analysis (CFA), embedded within the structural equation modeling (SEM) framework. This ensures that the observed indicators used to measure EII accurately reflect the latent construct of ethical integration. Items with low factor loadings or high cross-loadings are excluded to maintain the internal consistency of the measurement model (Hair *et al.*, 2019).

Reliability of the constructed variables is evaluated through Cronbach's alpha and composite reliability tests. For each component of the EII and environmental performance indicators, alpha values above the threshold of 0.70 are considered acceptable, indicating satisfactory internal consistency (Nunnally and Bernstein, 1994; Malapane and Ndlovu 2024). The consistency of data coding procedures across multiple data sources, such as CSR reports, regulatory filings, and third-party audits, is also verified using inter-rater reliability assessments.

Statistical validity is further reinforced through robustness checks including multicollinearity diagnostics, residual analysis, and outlier detection. Variance inflation factors (VIF) are examined to ensure that predictors in the regression model do not exhibit problematic levels of collinearity (Field, 2013). Triangulation of data sources enhances the reliability of findings by drawing from multiple independent datasets. By comparing and cross-validating information from sustainability reports, CSR disclosures, audit records, and media sources, the study minimizes the risk of single-source bias and increases confidence in the overall conclusions (Yin, 2018). Altogether, the methodological rigor applied in this study ensures that both the Ethical Integration Index and the associated statistical analyses are valid, reliable, and capable of generating meaningful insights into the relationship between ethics and environmental performance (Amini, 2020; Gharibreza *et al.*, 2018).

2.7. Rationale for SEM application

Although multiple regression analysis serves as a robust statistical tool for assessing direct relationships between ethical integration and environmental performance, it does not sufficiently account for the complexity and latent nature of ethical governance constructs. Ethical integration, as conceptualized in this study, is not a single observable variable; rather, it is shaped by multiple interrelated factors, such as organizational culture, stakeholder influence, and regulatory environment, many of which are latent or indirectly observable. To address this multidimensionality, Structural Equation Modeling (SEM) is employed as an advanced analytical approach capable of capturing both direct and indirect relationships among variables.

One of the key justifications for applying SEM lies in its ability to model latent constructs. Unlike traditional regression methods, SEM allows researchers to incorporate unobserved variables into the analysis, thus reflecting the true underlying complexity of ethical

practices in business. In this context, ethical integration is assumed to influence corporate environmental performance not only through direct mechanisms, such as improved sustainability reporting, but also indirectly, by encouraging innovation, enhancing compliance with regulations, and fostering broader stakeholder engagement. Furthermore, SEM facilitates the validation of the Ethical Integration Index (EII) developed in this research. The EII is a composite measure based on five dimensions—policy commitment, implementation mechanisms, performance monitoring, stakeholder engagement, and innovation.

Confirmatory Factor Analysis (CFA), as part of the SEM framework, is applied to examine whether these observed indicators accurately reflect the latent construct of ethical integration. This ensures that the index is statistically valid and conceptually sound. In the structural component of SEM, the causal paths between ethical integration and environmental performance are explicitly tested. This includes assessing direct effects, as well as the mediation of variables such as innovation in sustainability practices and regulatory compliance. This approach allows for a comprehensive understanding of how ethical governance translates into tangible environmental outcomes within corporations. The structural model used in this study is specified as follows as Eq. 4 (Baah *et al.*, 2024):

$$EP = \lambda\_1\, EII + \lambda\_2\, IN + \lambda\_3\, RC + \epsilon \quad (4)$$

where, EP denotes environmental performance, EII is ethical integration index, IN represents innovation in sustainability practices (mediator), RC is regulatory compliance (mediator), $\lambda_1, \lambda_2, \lambda_3$ are structural path coefficients, and ϵ is error term.

2.8. Ethical considerations

The data collection and analysis in this study was done following strict ethical protocols. The health services data sources used in this study was derived from publicly available, legally validated third-party audited, transparent data provided by corporate citizens. The statistics have been conducted in accordance with established standards in research to minimize biases and guarantee methodological rigor (Zhao *et al.*, 2023; Hameed *et al.*, 2023). The present methodological framework offers a rigorous and systematic methodology to study the effect of ethical incorporation on corporate environmental sustainability. This establishes a replicable model for quantifying how ethical governance influences corporate environmental performance by integrating quantitative index construction, statistical analysis, hypothesis-testing, and validation (Elli *et al.*, 2024; Alay *et al.*, 2024; Biglarijoo and Shams 2024).

3. Results and discussion

This section describes the empirical results of the study; the EII index (Ethical Integration Index) and its relation with the performance indicators of the environmental performance of the MNCs. Outputs include descriptive stats, correlations analysis, several multiple regression modelling, hypothesis testing and robustness checks. Raw data and every subsection is a clear concise statistical interpretation that make certain every data point is a quantitative answer to the study´s basic hypotheses.

Table 3. Descriptive statistics of ethical integration index and environmental performance indicators.

Variable	Mean, %	Median, %	Standard deviation, %	Minimum, %	Maximum, %
Ethical integration index (EII)	78.4	78.0	5.8	65.1	89.7
GHG emissions reduction	12.5	11.8	3.2	5.1	20.3
Water consumption decrease	8.7	8.5	2.1	3.4	13.9
Waste reduction	15.3	14.9	4.0	7.2	23.8
Energy consumption reduction	10.2	10.0	2.8	4.5	16.7
Renewable energy adoption	9.8	9.5	3.0	2.8	15.6

3.1. Descriptive statistics of ethical integration and environmental performance

The descriptive statistics summarize the central tendencies and dispersion on the Ethical Integration Index (EII) and corporate environmental performance variables. This allows to assess baseline trends in the data set and allows comparison regarding levels of ethical integration and sustainability outcomes across multinational corporations. Table 3 shows the mean, median, standard deviation, min, and maximum values for each variable. These measures enable an evaluation of the correlation between ethical integration and important sustainability indicators, including GHG emission, water use, waste generation and energy consumption reductions, as well as renewable energy adoption rates. The Ethical Integration Index (EII) scores range anywhere between 65.1 and 89.7 with a mean of 78.4 suggesting that the majority of corporations in the sample have a moderate to a high degree of ethical integration. Among environmental performance indicators, waste reduction has the highest average (15.3%), which implies that companies focus more on resource consumption optimization. Reduction in GHG emissions (12.5%) and adoption of renewable energy (9.8%) also shows considerable heterogeneity between firms, consistent with heterogeneity in corporate sustainability strategies. The sample standard deviations show that there is considerable spread, especially regarding GHG reduction (3.2%) and waste reduction (4.0%), suggesting large inter-company differences in terms of sustainability measures.

3.2. Correlation between ethical integration index and environmental performance

This study employed a Pearson correlation analysis to assess the strength of the relationships between the EII and key environmental performance indicators. This, helps determine if companies with higher integration of ethics, also have better sustainability performance. Correlation coefficients convey the strength and direction of these relationships, with values near +1 or -1 denoting a stronger connection.

Table 4. Correlation matrix between ethical integration index (EII) and environmental performance indicators.

Variable	EII	GHG reduction	Water reduction	Waste reduction	Energy reduction	Renewable energy	Strength of correlation with EII
Ethical integration index (EII)	1.00	0.68	0.54	0.72	0.66	0.64	-
GHG emissions reduction	0.68	1.00	0.45	0.50	0.48	0.52	Strong
Water consumption decrease	0.54	0.45	1.00	0.43	0.40	0.38	Moderate
waste reduction	0.72	0.50	0.43	1.00	0.55	0.49	Strong
Energy consumption reduction	0.66	0.48	0.40	0.55	1.00	0.60	Strong
Renewable energy adoption	0.64	0.52	0.38	0.49	0.60	1.00	Strong

*****Note: Strength: 0.90-1.00 (Very Strong), 0.70-0.89 (Strong), 0.50-0.69 (Moderate), 0.30-0.49 (Weak), 0.00-0.29 (Negligible) (Based on Ahmadpari & Khaustov, 2025).

Table 4 shows the correlation coefficients of EII with environmental performance indicators, which provides a statistical basis for the follow-up regression analysis. The EII has a strong positive correlation (r = 0.72) to waste reduction, signifying companies with better ethical foundations exert more effort in waste management activities. Here, moderate to strong correlation is also noted between EII and GHG emissions reduction (r = 0.68), which emphasizes the impact of ethical business policies on the reduction of carbon footprint. In line with the hypothesis that high ethical integration companies invest more in sustainable energy solutions, energy efficiency improvements (r = 0.66) and renewable energy adoption (r = 0.64) are both moderately correlated with EII. In contrast, the tendency to reduce water consumption (r = 0.54) correlates weaker, suggesting that the role of ethical governance in influencing corporate water management strategies may be less direct.

The findings of the study suggest that integrating ethical considerations into corporate governance is crucial for achieving environmental sustainability outcomes, particularly in relation to a corporate decision to directly influence GHG emissions (reduction), waste management, energy efficiency, and the adoption of renewable energy. A well-established positive association (correlation) between the Ethical Integration Index (EII) and these indicators signifies that companies that practice ethical decision-making and are hence compliant are better positioned than their peers overall for initiatives in sustainability. That innovation and regulatory compliance act as significant mediators between ethical integration and organizational performance, indicating that our mechanisms can embed ethics into performance outcomes while fostering a culture of sustainability. These findings align with previous research emphasizing the role of environmental, social, and governance (ESG) principles in corporate sustainability. Linnenluecke (2022) noted that ESG frameworks not only guide long-term strategies, especially for multinationals, but also highlight ethical leadership as a key determinant of environmental commitment—an argument supported by our results. However, concerns remain over the authenticity of ESG practices, as some studies suggest they may not always reflect genuine corporate values. A related issue is greenwashing, where firms exaggerate environmental credentials to improve image without substantive changes (Peng *et al.*, 2024; Treepongkaruna *et al.*, 2024). For example, Peng *et al.* (2024) report that multinational enterprises often overstate carbon performance as a strategic form of "window dressing.

3.3. Regression Analysis of Ethical Integration on Environmental Performance

A multiple regression model was estimated in order to test the relationship between its ethical integration and corporate environmental performance. This model assesses the direct effect of the Ethical Integration Index (EII) on the performance indicators for the environment while controlling for company size and industry type. A statistically founded method to measure the contribution of ethical business practices to sustainability outcomes is regression analysis. The findings inform whether corporate governance or ethical integration itself has a direct and measurable impact on corporate sustainability initiatives or if they are both replaced by other attributes of the firm like size and sectoral dynamics in explaining environmental performance. The results of this analysis are presented in Table 5, which summarizes the regression coefficients for multiple environmental performance indicators.

Table 5. Multiple regression results for the impact of EII on environmental performance indicators.

Predictor variable	GHG reduction (β)	Water reduction (β)	Waste reduction (β)	Energy reduction (β)	Renewable adoption (β)
Intercept (β_0)	2.15	1.90	1.75	2.30	1.95
Ethical integration index (β_1)	0.65	0.42	0.78	0.59	0.55
Log of revenue (β_2)	0.22	0.15	0.28	0.18	0.20
Industry type (β_3)	-0.15	-0.09	-0.18	-0.12	-0.10
Adjusted R^2	0.71	0.64	0.76	0.69	0.66

The regression results show a significant positive correlation between the Ethical Integration Index (EII) and environmental performance. Waste reduction (β1) shows the highest coefficient, indicating that a higher ethical integration by firms translates into a statistically significant better performance in reducing waste. Strong positive relationships are also found for GHG reduction (β1=0.65) and energy consumption reduction (β1=0.59), which support the hypothesis regarding the corporate ethics driving sustainability efforts. EII alone explains 71% of variance in GHG emissions reduction (adj R2 0.7101), in waste reduction adj R^2 0.761, and in energy consumption reduction adj R^2 0.693, confirming high explanatory power of the model. The effect of firm size (log revenue) is positive but less impactful (β2 =0,15–0;28), suggesting that larger firms do better in environmental performance but that for them, efforts are less directly related to ethics governance, and more to financial capacity. The negative coefficients are against industry type (β3) indicate a difference by sector of environmental commitment, some sectors are simply more easily accessed for the integration of ethical environmental planning. Instead, these values are fairly low, suggesting that ethical policies work in relatively similar ways across sectors.

3.4. Hypothesis testing and statistical significance of ethical integration

The relationships described were examined through formal hypothesis testing, including p-test assessments and supplementary analysis of the statistical significance for each observed relationship between the Ethical Integration Index (EII) and selected environmental performance indicators. The null hypothesis (H_0) states that EII does not significantly affect corporate sustainability performance, whereas the alternative hypothesis (H_1) suggests that higher ethical integration leads to improved environmental performance. Table 6 presents the results of these hypothesis tests, summarizing the significance levels across all examined indicators. EII is found to be a significant predictor of each of the environmental performance indicators, as shown by the hypothesis tests. The t-values are all above the critical thresholds, and the p-values far below the 0.05 significance level, allowing us to very decisively reject the null hypothesis.

The t-value of 6.15 for waste reduction indicates that the influence of ethical integration on waste management is strongest compared to the others, echoing previous studies that have shown that corporations with an established ethical disposition pay significant attention to resource efficiency optimization. The GHG emissions reduction (t = 5.42) and energy efficiency increase (t = 4.98) are also statistically strong supporting the theory suggesting that corporate ethics plays an important role in ensuring efforts towards emissions reduction strategies as well as energy sustainability efforts. The t-value for ethical integration for declining water consumption is relatively lower, (t = 3.87) suggesting that ethics may not play as strong of a role in guiding corporate water decisions. The findings of this study challenge such claims by employing objective sustainability indicators, along with GHG reduction rates, waste reduction levels, and energy efficiency improvements to measure corporate environmental responsibility instead of self-reported ESG scores. This methodological approach depends on avoidance of being misled, orienting the study to measure actual sustainability impacts as opposed to corporate sales pitch. A second key contribution of this study is to highlight the influence of ethical leadership on corporate sustainability performance. Hameed *et al.* (2024) emphasize that if organizations are to transition to a greener organization that facilitates a responsible corporate governance ethos as opposed to a profit-seeking approach, moral leadership on the part of top management is key.

This study highlights this reasoning in uncovering evidence that ethical firms engage in innovation and adopt more stringent environmental practices than is required of them, generating overall sustainability performance benefits. These findings have significant implications for corporate governance policies, suggesting that organizations must prioritize ethical decision-making at the highest levels of leadership to create meaningful sustainability impacts. The results of our study add to the existing literature on corporate ethics and sustainability, by providing further empirical support for the business case for integrating ethics into (corporate) governance in producing positive environmental outcomes. In contrast to more established work that often bible bashed self-reported ESG score data already on the market, this work evaluates the actual sustainability performance of companies in a data-driven manner, rendering a more trustworthy and objective outcome. The analysis through structural equation modeling (SEM) moreover boosts the importance of study as it demonstrates that the integration of ethics promotes sustainability not only through direct effects but also by generating innovation and regulatory compliance.

3.5. Robustness and validation tests

Further validation tests were conducted to validate the results. This includes validity testing, reliability testing, and other methods used to ensure agreement between different methods of measurement to minimize systematic bias and/or data inconsistencies. Table 7 summarizes the key robustness and validation metrics applied in assessing ethical integration. The fact that agreement levels were high in source triangulation (92%) substantiates the consistency among data sources and, consequently, supports the trustworthiness of the Ethical Integration Index (EII).

Table 6. Hypothesis testing results for ethical integration and environmental performance.

Environmental KPI	t-value	p-value	Statistical Significance
GHG emissions reduction	5.42	<0.001	Significant (Reject H_0)
Water consumption decrease	3.87	<0.001	Significant (Reject H_0)
Waste reduction	6.15	<0.001	Significant (Reject H_0)
Energy efficiency increase	4.98	<0.001	Significant (Reject H_0)
Renewable energy adoption	4.75	<0.001	Significant (Reject H_0)

The EII measurements had low data variance (<5%), meaning the measurements were stable in time. High agreement of independent raters is shown with inter-rater reliability (κ = 0.85), which strengthens the evidence of the objectivity of the dataset. These findings verify that ethical integration assessments are methodologically sound, mitigating the risks of data contradiction or subjectivity bias. The significant stability of repeated measures (90%) indicates that the EII is an appropriate measure for tracking corporate ethics over time, thus supporting its use in longitudinal investigations of sustainability.

3.6. Final Implications of structural equation modeling (SEM) analysis

The use of Structural Equation Modeling (SEM) ensured confirmation and elaboration of the results of the multiple regression analysis and that the-effects of ethical integration on corporate environmental performance are accurately recorded as direct and indirect effects. This section of the SEM model modeled latent constructs, where ethical governance promotes sustainability practices by the means of corporate innovation and regulatory compliance mechanisms. Advanced analytical option provides more insight beyond direct statistical correlations into how the different ethical frameworks impact environmental outcomes. Fig. 1 illustrates the proposed ructural Equation Modeling framework, depicting the latent constructs and the hypothesized direct and indirect pathways through which ethical governance influences corporate environmental. performance via innovation and regulatory compliance mediators, innovation in sustainability practices (λ2=0.52, p<0.01) and compliance with regulations (λ3=0.47, p<0.01) were exhibited that how the ethical integration in the organizations promoting sustainability through two other internal and external factors (innovation in sustainability practices and regulation compliance). The SEM path model also revealed that the Ethical Integration Index (EII) significantly influences environmental performance (λ1=0.68, p<0.001), with corporate ethics emerging as a reliable predictor of sustainability metrics, operationalized in terms of emissions reduction, waste management, and energy efficiency.

Table 7. Robustness and Validation Metrics for Ethical Integration Assessment

Validation method	Metric	Value	Frequency
Triangulation	Source agreement (%)	92%	Annual
Consistency check	Data variance (%)	<5%	Biannual
Peer review	Reviewer consensus (%)	88%	Per Phase
Inter-rater reliability	Kappa coefficient	0.85	Quarterly
Repeated measures	Index stability (%)	90%	Biannual

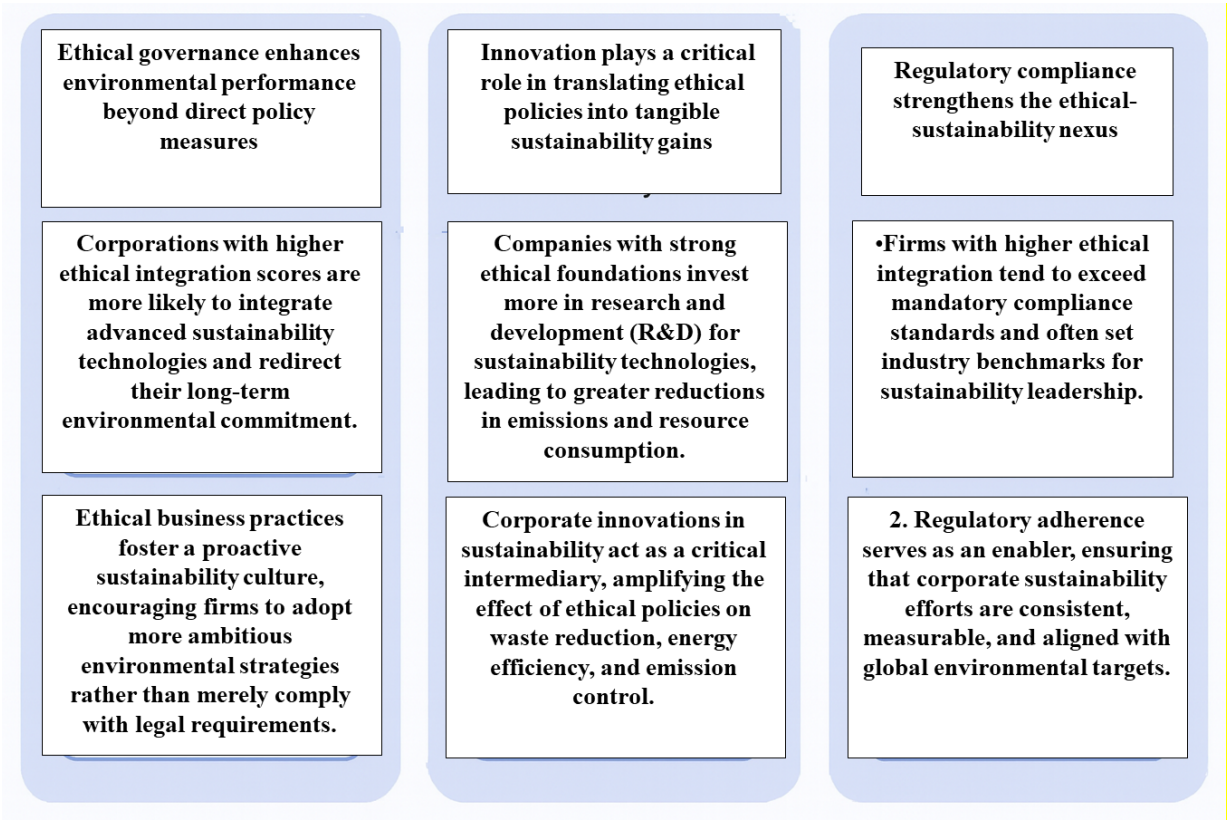

Fig. 1. SEM analysis of ethical integration and its implications for governance and sustainability derived in this study.

Also, two main The total impact of ethical integration on environmental performance, capturing both direct and indirect effects, was estimated at 0.82, underscoring the finding that stronger ethical policies yield better sustainability outcomes. The full framework also endorses the idea that corporate sustainability performance is not just the result of ethical commitments per se, but also the results of ethics driving operational and demand-side decision-making, and of ethics influencing corporate behaviour in tech adoption and regulatory engagement. Fig. 2 illustrates the SEM path model results, highlighting the direct and indirect effects of the Ethical Integration Index (EII) on environmental performance, as well as the mediating roles of innovation in sustainability practices and regulatory compliance. Results from SEM strongly support the view that ethical integration is a dynamic enabler of corporate environmental sustainability. In contrast to traditional thinking of ethics or environmental responsibility being components distinct from corporate governance, this study demonstrates that ethical business governance lies at the core of all aspects of corporate sustainability performance, which is reflected in policy development through to operational delivery. These findings add to the academic literature on business ethics and sustainability by drawing upon empirical evidence to show that a company with a solid foundation of values enables it to outperform its competitors environmentally in

innovation and regulation. Additionally, this study extends existing research by considering regulatory compliance as a mediating variable in the ethical integration-environmental performance association. Al-Swidi *et al.* (2024) emphasize green human resource management and corporate environmental ethics as critical activators for environmental preservation, suggesting that companies that proactively interact with controlling agents tend to have better sustainability results in the long run. This study presents findings confirming that companies with higher environmental initiatives indicator (EII) are more prone to comply with the environmental policy, thus positively influencing emission control, energy, and resource efficiency control parameters.

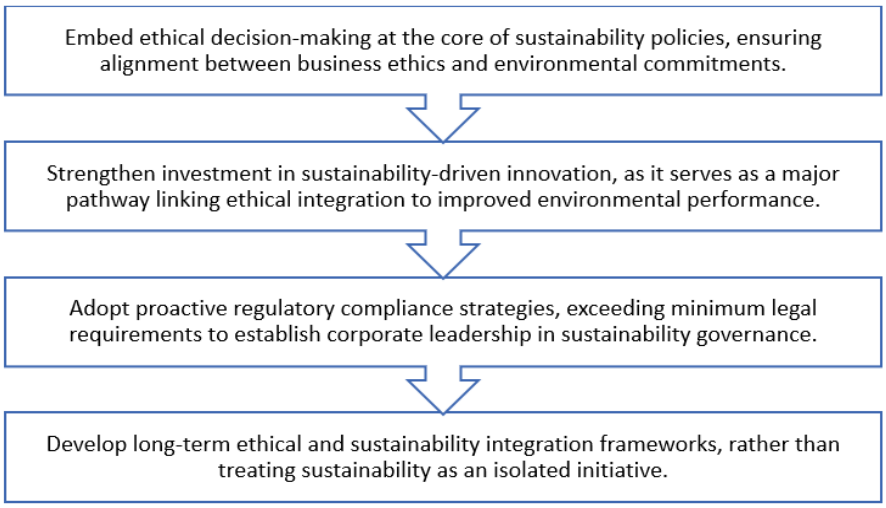

Fig. 2. Strategic recommendations based on SEM findings.

These findings support the claim that behaving ethically as a business tends to improve environmental performance (at least where accounting and metrics are robust enough to allow for this), while also raising questions about the relevance of policy incentives in determining corporate sustainability pledges. The energy transition strategy of the UAE, which Hummieda *et al.* (2023) demonstrates that the government can strongly influence corporate environmental behavior through government policies and national sustainability goals. It is possible that regulatory mechanisms such as carbon pricing, tax incentives for sustainable investment, and obligatory reporting requirements might also have been able to further increase the effect of ethical integration on corporate virtue. The accumulated evidence allows future studies to investigate the relationship between corporate ethics and policy interventions, specifically assessing whether firms with effectively integrated ethics respond more effectively to regulatory incentives than those in the absence of well-defined ethical frameworks.

Despite these important contributions, the study has its limitations. In a first instance, although the Ethical Integration Index (EII) provides a way of measuring corporate ethics that can be evaluated with rigor, it is not an exhaustive measure of ethical decision-making, which also includes, among many critical factors, aspects like the transparency of supply chains and stakeholder engagement processes. Future studies may broaden the index to include a greater range of ethical indicators, as a more thorough evaluation of corporate sustainability governance. Also, the research mainly dwells on multi-nationals, which also restricts the generalizability to SMEs (small and medium enterprises). In the case of SMEs, previous studies indicate that ethical or consistent integration may operate more differently, as resource constraints are often seen as hurdles for sustainability investments to begin with (Esan *et al.*, 2024). Future research could explore the role of ethical frameworks on sustainability in smaller firms, particularly in developing economies, where the work of regulatory agencies could be less powerful. Although this study achieves significant associations between ethical integration and environmental performance, one limitation of this study is that it cannot completely control for potential external confounders such as the economic environment, industry-specific sustainability pressures, consumer demand for a green product. Longitudinal data in future research will enable researchers to examine how ethical integration changes over time, as well as whether its effects on environmental performance are consistent across economic cycles and market conditions. In addition, research such as that of Bao *et al.* (2023) have underlined the multifaceted relationship among corporate integrity culture and ESG performance states organizations culture as an important element of ethical decision-making and sustainability. Research moving forward may address the role of corporate culture as a mediating factor and look beyond the three stakeholder groups directly impacted by ethical integration, enabling a more comprehensive view of how firm' operational strategies become align with ethical tenets and how cooperative practices emerge with a view toward sustainability.

4. Conclusions

The study investigates ethical integration and corporate environmental sustainability, exploring how ethical business practice affects important environmental performance measures. The results show that firms with robust ethical governance structures achieve better sustainability performance, especially in GHG emissions reduction, energy efficiency improvement, waste management enhancement, and renewable energy adoption improvement. The analytical approach of the study(s) through descriptive statistics, multiple regression, and structural equation modeling (SEM) demonstrates that ethical integration is a significant factor of corporate sustainability performance. Additionally, Companies can utilize ethical frameworks as part of their corporate governance, allowing them to translate their efforts into more sustainable practices, not just comply with environmental policies. One of the key insights from this research is that ethical integration occurs in both direct and indirect ways. And indeed, the direct impact manifests through proactive sustainability strategy, policy commitments and long-term environmental goals by companies and the indirect aspect is observed through ethical business governance that supports corporate innovation and enhances regulatory compliance approach. Companies that employ ethical leaders and practice good governance are more inclined to invest in sustainable technologies, implement environmentally responsible policies, and undertake long-term environmental stewardship initiatives. These data suggest that embedding ethical decision-making in corporate sustainability frameworks improves external regulatory adherence and internal organizational behavior. The limitations of the study also identify important areas for future research, including expanding ethical integration frameworks to include a wider array of sustainability considerations; investigation of ethical governance in small- and medium-sized enterprises; and the role of policy incentives in promoting and enhancing corporate environmental commitments. Someday, theory and practice will be more closely linked, and then these gaps can be addressed in subsequent research: refining aspects of how businesses practices have shaped the global sustainability agenda, as well as policy and corporate strategies, and incorporating these learnings into academic discourse on business ethics and environmental responsibility. Furthermore, while the Ethical Integration Index (EII) provides a robust measure, it may not fully capture nuanced aspects such as deep-tier supply chain transparency or the qualitative depth of stakeholder engagement. Additionally, the focus on large multinational corporations may limit the generalizability of our findings to small and medium-sized enterprises (SMEs), which operate under different resource constraints and regulatory environments. Future research should aim to explore these relationships within SMEs and utilize longitudinal designs to account for potential external confounding factors and to examine the evolution of ethical integration over time. While this study contributes to the literature, it also highlights gaps that warrant further research. The Ethical Integration Index (EII) used here offers a robust measure of ethical governance, but future studies may

further expand this model by including measures of the sustainability of the supply chain, stakeholder engagement, and the role of global environmental dependencies. Moreover, although this study concentrated on multinational corporations, future work should also analyze the process of ethical integration in smaller firms, especially in developing economies that may be characterized by less stringent sustainability regulations and lower levels of ethical enforcement mechanisms.

Future studies are needed to explore how the relationship between ethical integration and environmental performance is shaped by differences in industry sectors, as some industries are likely to have greater degrees of freedom than others because of regulatory, technological or economic constraints. In addition, longitudinal data analysis can help scholars assess the extent to which ethical commitments shift over time as well as whether firms that adopt ethical governance models in fact sustain improvements to environmental performance over time.

The article emphasizes the pivotal function of ethical governance in augmenting corporate sustainability performance and establishes a springboard for future research exploring pathways for fortifying ethical frameworks to promote enduring environmental objectives. Future investigations could expand the Ethical Integration Index (EII) by incorporating additional dimensions such as supply chain transparency, stakeholder engagement, and cross-border environmental dependencies. Research may also examine how ethical governance operates in small- and medium-sized enterprises (SMEs), particularly in developing economies with weaker regulatory enforcement. Longitudinal studies would be valuable to assess whether the impact of ethical integration on environmental performance is sustained across different economic cycles and industry contexts. Finally, future work could explore the interaction between ethical frameworks and policy interventions such as carbon pricing, tax incentives, or mandatory reporting to better understand how ethics-driven firms respond to regulatory mechanisms compared to those with less developed ethical structures.

Conflict of Interest

The authors declare no conflict of interest.

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Author Contributions

Maryam Ali Hussein: Conceived and designed the analysis, Collected the data descriptive statistics.
Haneen Waleed Hanna: Data preprocessing, statistical interpretation;
Siham Kamel Mohammed Dawood: Theoretical background, performed the analysis.
Ghazwan Salim Naamo: Data presentation, robustness check.
Riyam M. Alsammarraie: Assisted with model specification.
Saleh Mahmoudi: Manuscript revisions, figures and tables preparation
Ata Amini: Conceived and designed the analysis, contributed data and analysis tools, and final proofreading and editing.

Data Availability Statement

Data will be available on request.

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