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Sustainability Under ESG Uncertainty: Digital Capability, Green Innovation, and Environmental Tax Pressure

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ABSTRACT

Purpose – This study aims to examine how sustainability uncertainty influences environmental sustainability performance through organizational capability development and regulatory pressure, with particular emphasis on the mediating role of green investment intention. It seeks to clarify how firms strategically respond to sustainability uncertainty by leveraging digital capability and green innovation to enhance sustainability outcomes.

Design/methodology/approach – A quantitative research design was employed using survey-based data and analysed through partial least squares structural equation modelling (PLS-SEM). The proposed framework integrates sustainability uncertainty, digital sustainability capability, green innovation capability, and environmental tax pressure to explain environmental sustainability performance, while explicitly testing the mediating mechanism of green investment intention.

Findings – The results indicate that sustainability uncertainty exerts a negative effect on environmental sustainability performance. In contrast, digital sustainability capability and green innovation capability significantly enhance sustainability outcomes. Environmental tax pressure also contributes positively, though its effectiveness depends on firms' internal strategic orientation. Importantly, green investment intention plays a central mediating role, translating organizational capabilities and policy pressure into improved environmental performance.

Originality/value – This study advances sustainability research by integrating uncertainty theory with capability-based and investment-oriented perspectives. It provides novel empirical evidence on the mediating role of green investment intention, offering a nuanced understanding of how firms navigate sustainability uncertainty to achieve stronger environmental performance.

1. Introduction

This issue is currently being discussed at length in economic and policy discourse around the world. Countries and organizations are facing increasing pressure to maintain ecological balance in line with growth. Research has shown that sustainability performance is no longer achieved solely through technological improvements or regulatory effectiveness. Institutional stability and governance quality are now increasingly important factors. In this context, the growing uncertainty surrounding environmental, social, and governance (ESG) considerations is proving to be a significant obstacle to sustainability-sensitive decision-making. Research indicates that inconsistency in sustainability-related policies can have a detrimental effect on long-term environmental outcomes, as it has been demonstrated to reduce both green investment and future organizational support for sustainable practices (Barra & Falcone, 2024; Ongan et al., 2025). At the same time, digital transformation and green innovation are frequently regarded as the 'silver bullet' solution for promoting environmental sustainability. However, their effectiveness is contingent on broader institutional environmental conditions (Feroz et al., 2021; Zheng et al., 2021).

In recent years, the field of global sustainability governance has experienced notable turbulence. The rapid development of environmental legislation, carbon pricing, and sustainability reporting criteria has led to significant confusion among economic stakeholders. Research indicates that between 2023 and 2026, frequent policy alterations and the implementation of diverse fiscal mechanisms, notably environmental taxes, have elicited varied responses from different sectors and regions (Dong et al., 2025; Qamruzzaman, 2026). Concurrently, global digitalization is advancing, with sophisticated monitoring technologies and data analysis techniques poised to become increasingly prevalent in sustainability management (Chen et al., 2026). However, recent empirical results also call into question the assumption that digital capabilities to navigate environmental complexities automatically improve environmental outcomes in situations of high policy uncertainty (Barra et al., 2025; Böttcher et al., 2024). These results indicate unresolved tensions in contemporary sustainability discourse.

Theoretically, institutional theory places great importance on the impact of regulatory stability and legitimacy on organizational behavior. It is therefore evident that uncertainty undermines compliance as well as long-term investment incentives. This is in contrast to the ecological modernization theory, which suggests that technological progress will resolve the tension between economic growth and environmental protection. Despite the well-established nature of these models, they have hitherto been the subject of separate studies. Contemporary empirical studies continue to prioritize macro-level factors that influence uncertainty and sustainability, with limited consideration of how uncertainty is perceived and translated into behavioral intentions at the micro level (Li & Lin, 2024). This mismatch indicates a theoretical gap in the current understanding of how uncertainty regarding sustainability issues impacts environmental performance, particularly in terms of organizational behavior and investment. This discrepancy must be addressed promptly, as the current literature contains conflicting evidence. Research has demonstrated that environmental taxes and digitalization can significantly enhance sustainability performance by promoting cleaner production and resource efficiency (Ahmed et al., 2022; Radmehr et al., 2024; Dong et al., 2024; Qamruzzaman, 2026). However, other studies have indicated that intense fiscal pressure and regulatory instability can displace green investments and reduce environmental effectiveness (Nguyen et al., 2021; Barra et al., 2025; Chu & Le, 2022; Goyal et al., 2018). These findings highlight the necessity for a comprehensive model that can elucidate the interplay between sustainability uncertainty, digital capability, green innovation, and environmental taxes on environmental performance, as influenced by investment intentions.

Therefore, this study aims to investigate the relationship between sustainability-related uncertainty and digital sustainability capability (DSC), green innovation capability (GIC), environmental tax pressure, green investment intention, and environmental sustainability performance. By synthesizing the institutional context, technological capacity, financial tools, and behavioral drivers within a globally applicable analytical framework to provide insights into how to create more resilient, sustainable outcomes in uncertain environments, this paper has implications for policymakers, organizational leaders, and sustainability strategists.

The remainder of this paper is organized as follows. Literature review and theoretical framework 2.1 Theoretical background Section 2 presents the literature review, theoretical framework, and hypothesis development. Section 3 discusses the research methodology, data collection, and analytical methods. Section 4 reports and discusses the empirical results. Section 5 presents the research conclusions by summarizing the main findings, highlighting policy and management implications, discussing limitations in our work, and providing directions for future research that also consider ethical implications.

2. Literature Review

2.1 Theoretical background

The study is largely based on institutional theory, providing a way of understanding how institutional stability, formal rules, and normative pressures frame the strategic behaviors and choices of organizations (North, 1990; Scott, 2014). Regarding environmental sustainability, the institutional uncertainty lowers compliance motivation and slows down long-term green investment commitments. In contrast, ecological modernization theory holds the assumption that advancements in technology and innovation can minimize trade-offs between economic development and environmental preservation Mol & Sonnenfeld (2000), while environmental taxation theory, which is grounded in Pigouvian economics, claims that increasing environmental taxes serves to internalize externalities and promote clean production (Pigou, 1920). This theoretical base is supported by recent empirical evidence that reveals how sustainability uncertainty hinders the environmental performance Barra & Falcone (2024) and Ongan et al. (2025), while digital capability and green innovation are related to sustainable outcomes under certain institutional conditions (Li & Lin, 2024).

2.2 Green investment intention

Drawing on the foundations of institutional theory North (1990) and ecological modernization theory Mol & Sonnenfeld (2000), it is evident that organizational performance in terms of sustainability is influenced by the stability of the board of directors, technological capabilities, and regulatory pressure. It is important to note that perceived uncertainty regarding sustainability governance can have a negative impact on institutional credibility, long-term environmental commitment, and environmental performance. Therefore, it is anticipated that there will be a negative relationship between perceived uncertainty regarding sustainability and ecological performance. Meanwhile, as digital capability theory demonstrates, digital sustainability capabilities enhance monitoring and efficiency and optimize resource utilization for high environmental performance (Li & Lin, 2024; Raihan et al., 2024). In addition, innovation-oriented environmental theory posits that the degree of sustainable corporate performance under ecological pressure will eventually attain clean production technology skills (Santana et al., 2015; Dong et al., 2024; Dong et al., 2024). From the standpoint of Pigouvian environmental taxes, the rates of such taxes internalize the costs of environmental externalities. This is achieved through the encouragement of companies to reduce pollution emissions and "upgrade" to better environmental performance (Goyal et al., 2018; Barra et al., 2025). Consequently, we hereby formulate the following hypotheses: H1, H2, H3, and H4.

2.3 Sustainability performance outcome

Environmental performance for sustainability is the degree to which environmental pressures declined and ecological resilience has been aided by strategic and behavioral contributions. According to the theory of planned behavior (Ajzen, 1991), intention is a proximal determinant of actual behavior; therefore, stronger green investment intention is expected to turn into more commitment towards environmentally responsible behaviors. Stakeholder theory (Creswell & Inoue, 2025), additionally supports this view to the extent that investing in environmental responsibility creates long-term ecological and social value. From the perspective of sustainability transition, green investing intention would enhance the process of de-emphasizing cleaner technologies, renewable energy, and resource-efficient practices, and thus is likely to improve its sustainability performance. The recent experimental results have consistently reported that better environmental performance has been led by the greater green

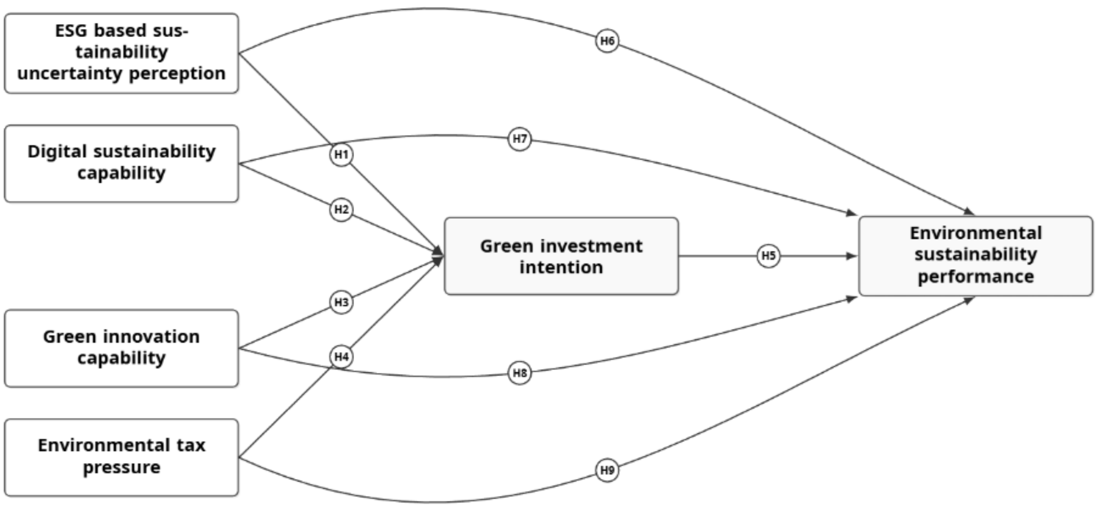

Fig. 1. Research framework integrating governance, technology, and regulation.

investment intention, such as lower ecological pressure (Raihan et al., 2024; Dong et al., 2025).

2.4 Mediating investment mechanism

The influence of green investment intention can be explained by reference to the intention-behavior model and institutional transmission theory, which illustrate that structural conditions can shape sustainability outcomes through investment decisions. Perceived uncertainty in sustainability hurts environmental performance. This is because confidence in long-term green returns is reduced due to uncertainty. However, this effect is largely mitigated by a decline in green investment intentions (Hu et al., 2023; Li et al., 2022). Digital sustainability capability and green innovation capability can positively impact environmental sustainability. These skills can encourage the development of environmentally led initiatives by increasing motivation and readiness to invest in environment-related projects, which in turn could have a negative impact on psychological ownership (Liu et al., 2020). Conversely, the imposition of environmental taxes has the effect of altering the cost-benefit equation, thereby encouraging investors to switch to greener options. In this context, it is understood that green investment attitudes function as a behavioral channel through which governance signals, technological capabilities, and regulatory pressure are translated into specific sustainability outcomes. This mediation process is further substantiated by recent empirical findings indicating that investment intentions play a mediating role in the relationship between institutional conditions and technological enablers concerning environmental performance (Raihan et al., 2024; Ongan et al., 2025; Dong et al., 2024).

This gap highlights the need for a more holistic approach that considers both internal capabilities and external pressures simultaneously.

2.5 Conceptual research framework

We developed a conceptual model that integrates governance structure, technological capabilities, and regulatory pressure into an integrated sustainability pathway. This model is based on institutional theory and the intention-behavior approach. Perceptions of ESG-oriented sustainability uncertainty, corporate digital sustainability capabilities, green innovation capabilities, and environmental tax pressure are structural factors. Green investment intentions, in turn, are behavioural transmission mechanisms that can explain how these factors influence environmental sustainability performance. This comprehensive model makes a unique contribution by combining uncertainty, digital sustainability, innovation capabilities, and fiscal regulation into a single, intention-based sustainability model (see Figure 1).

3. Methods Innovation

3.1 Research Design

The present study is informed by a quantitative explanatory research design rooted in positivist research theory, which focuses on hypothesis testing and verifying theories using empirical evidence (Creswell & Inoue, 2025). The design is suitable for testing the structural relationships among sustainability uncertainty, digital sustainability capability, green innovation capability, environmental tax pressure, green investment intention, and environmental sustainability performance. Based on the theory of planned behavior (Ajzen, 1991), this design permits pathways to be examined through intention-based routes. Current sustainability research demonstrates that explanatory quantitative designs are appropriate for capturing complex behavioral and policy-related dynamics of sustainability (Hair, 2014; Hair Jr et al., 2021).

3.2 Research Population and Data

The study's sample consists of a community of workers in Indonesia who are exposed to matters related to sustainability, digital transformation, and investment decisions. The community includes professionals, entrepreneurs, managers, and educated workers. Indonesia has been selected as an illustrative context for an emerging economy, with consideration given to its rapid digitalization, prospects for green policy, and environmental tax practices. While research into how uncertainty surrounding sustainability and regulatory signals affects investment behavior is ongoing, the insights offered by institutional context theory (North, 1990), are particularly relevant when considering the investment behaviors of developing countries. The Indonesian economy's heterogeneity suggests that it is an ideal location for investigating global sustainability mechanisms that are not biased towards any specific geographical area. For the sake of transparency and reproducibility, detailed population and demographic details are provided in Appendix A Data.

Details regarding the population characteristics and data screening procedures are provided in **Appendix A**.

3.3 Variable Measurement and Research Instrument

Our research analyzed all latent variables using a structured questionnaire instrument in accordance with Construct Measurement Theory (Hair, 2014). Each construct was measured using multi-item indicators adopted from the existing literature on sustainability, innovation, and environmental governance. Perceived sustainability uncertainty, based on ESG, measures instability in sustainability governance, while digital sustainability capability describes the level of readiness to use or adopt digital technology in environmental management (Wei & Zheng, 2024; Liu et al., 2020; Kang & Arikrishnan, 2024). Green innovation capability, which indicates the technological tendency toward ecological innovation; environmental tax pressure, which captures perceived regulatory and fiscal constraints; green investment intention, which represents behavioral engagement; and environmental sustainability performance, which indicates perceived environmental outcomes. Reliability and comparability are achieved because all indicators are recorded on a Likert scale. Details of these measurements are provided in Appendix B Data.

A complete list of measurement items and their operational definitions is presented in **Appendix B**.

3.4 Data Analysis Technique

Data analysis was conducted using a two-stage procedure. First, descriptive statistics were employed to summarize respondent characteristics and variable distributions. Second, inferential analysis was performed to test the proposed relationships among constructs. Reliability and validity were evaluated using internal consistency measures and factor analysis. Subsequently, regression-based analysis was applied to assess the influence of innovation capability and data-driven practices on organizational performance. All statistical tests were conducted at a 5% significance level to ensure analytical robustness.

4. Results and Discussion

4.1 Measurement model assessment

Table 1 shows that all indicators exhibit strong indicator reliability, with outer loadings ranging from 0.785 to 0.891, exceeding the recommended minimum threshold of 0.70. Digital sustainability capability demonstrates consistently high loadings (0.831–0.877), while environmental sustainability performance remains robust (0.796–0.856). Environmental tax pressure presents strong measurement quality (0.792–0.884), and ESG-based sustainability uncertainty perception is also stable (0.785–0.855). Green innovation capability indicators load strongly on their construct (0.810–0.865), and green investment intention achieves the highest loading levels overall (0.831–0.891). Collectively, these results indicate that each indicator substantially reflects its intended latent construct, supporting retention of all measurement items.

Table 1. Indicator reliability and outer loadings

Construct	Number of indicators	Range of outer loadings
Digital sustainability capability	6	0.831–0.877
Environmental sustainability performance	6	0.796–0.856
Environmental tax pressure	6	0.792–0.884
ESG-based sustainability uncertainty perception	6	0.785–0.855
Green innovation capability	6	0.810–0.865
Green investment intention	6	0.831–0.891

Table 2 confirms excellent internal consistency reliability and convergent validity across all constructs. Cronbach's alpha values range from 0.908 to 0.927, indicating strong internal consistency well above the recommended threshold of 0.70. Composite reliability measures further support this finding, with ρ_c values between 0.929 and 0.943 and ρ_a values ranging from 0.910 to 0.942, demonstrating stable and reliable measurement properties. Green investment intention exhibits the highest reliability ($\alpha = 0.927$, $\rho_c = 0.943$), followed by digital sustainability capability and environmental tax pressure, both showing very strong internal consistency. In terms of convergent validity, all average variance extracted (AVE) values exceed the minimum criterion of 0.50, ranging from 0.686 to 0.733, indicating that each construct explains more than half of the variance of its indicators. Overall, these results confirm the adequacy of the measurement model for subsequent structural model analysis.

Table 3 demonstrates satisfactory convergent validity, as all reliability indices exceed conventional thresholds. Cronbach's alpha values remain consistently high (0.908–0.927), indicating strong internal consistency. The alternative reliability estimates, ρ_a (0.910–0.942) and composite reliability ρ_c (0.929–0.943), further confirm stable construct measurement. Green investment intention records the strongest overall reliability profile ($\alpha = 0.927$, $\rho_c = 0.943$), followed closely by digital sustainability capability and environmental tax pressure. Environmental sustainability performance also shows robust reliability ($\alpha = 0.913$, $\rho_c = 0.932$). Overall, these results support the adequacy of the measurement model and indicate that the constructs are measured consistently enough to proceed to discriminant validity and structural model testing.

Table 4 supports discriminant validity under the Fornell–Larcker criterion. For each construct, the square root of AVE (diagonal values) exceeds the corresponding inter-construct correlations in the same row/column. For instance, green investment intention shows a diagonal value of 0.856, which is larger than its correlations with environmental sustainability performance (0.583) and digital sustainability capability (0.562). Environmental sustainability performance also demonstrates an adequate separation (0.835 on the diagonal) relative to its strongest correlation (0.583 with green investment intention).

Table 2. Internal consistency reliability and convergent validity

Construct	Cronbach's α	ρ_a	ρ_c	AVE
Digital sustainability capability	0.923	0.924	0.940	0.723
Environmental sustainability performance	0.913	0.913	0.932	0.697
Environmental tax pressure	0.922	0.942	0.939	0.719
ESG-based sustainability uncertainty perception	0.909	0.916	0.929	0.687
Green innovation capability	0.908	0.910	0.929	0.686
Green investment intention	0.927	0.928	0.943	0.733

Table 3. Convergent validity results

Construct	Cronbach's α	ρ_a	ρ_c
Digital sustainability capability	0.923	0.924	0.940
Environmental sustainability performance	0.913	0.913	0.932
Environmental tax pressure	0.922	0.942	0.939
ESG-based sustainability uncertainty perception	0.909	0.916	0.929
Green innovation capability	0.908	0.910	0.929
Green investment intention	0.927	0.928	0.943

Table 4. Discriminant validity: Fornell–Larcker criterion

	DSC	ESP	ETP	EUP	GIC	GII
DSC	**0.851**	0.408	0.145	-0.183	0.363	0.562
ESP	0.408	**0.835**	0.220	-0.381	0.382	0.583
ETP	0.145	0.220	**0.848**	-0.073	0.028	0.301
EUP	-0.183	-0.381	-0.073	**0.829**	-0.220	-0.335
GIC	0.363	0.382	0.028	-0.220	**0.828**	0.476
GII	0.562	0.583	0.301	-0.335	0.476	**0.856**

Notes: Diagonal values (bold) represent the square root of AVE. DSC = Digital sustainability capability; ESP = Environmental sustainability performance; ETP = Environmental tax pressure; EUP = ESG-based sustainability uncertainty perception; GIC = Green innovation capability; GII = Green investment intention.

Table 5. Discriminant validity: Heterotrait–Monotrait (HTMT) ratio

	DSC	ESP	ETP	EUP	GIC	GII
DSC	–	0.443	0.149	0.195	0.395	0.607
ESP	0.443	–	0.232	0.411	0.417	0.634
ETP	0.149	0.232	–	0.083	0.054	0.314
EUP	0.195	0.411	0.083	–	0.239	0.360
GIC	0.395	0.417	0.054	0.239	–	0.517
GII	0.607	0.634	0.314	0.360	0.517	–

Notes: DSC = Digital sustainability capability; ESP = Environmental sustainability performance; ETP = Environmental tax pressure; EUP = ESG-based sustainability uncertainty perception; GIC = Green innovation capability; GII = Green investment intention.

Negative relationships involving ESG-based Sustainability uncertainty perception remains well below its diagonal value (0.829), indicating that the construct captures a distinct concept. Overall, the matrix indicates that all latent variables are empirically separable and represent different theoretical dimensions.

Table 5 reports the heterotrait–monotrait (HTMT) ratios as an additional assessment of discriminant validity. All HTMT values are well below the conservative threshold of 0.85, indicating that each construct is empirically distinct from the others. The highest observed HTMT value is 0.634 between environmental sustainability performance and green investment intention, which remains comfortably below the recommended cut-off. Lower HTMT values are observed for pairs involving environmental tax pressure and ESG-based sustainability uncertainty perception, suggesting weak cross-construct similarity. Overall, the HTMT results corroborate the Fornell–Larcker findings and provide strong evidence that discriminant validity is adequately established for the measurement model.

Figure 2 presents the measurement model results, including indicator loadings and construct reliability estimates. All observed indicators load strongly on their respective latent constructs, with standardized loadings exceeding the recommended threshold of 0.70. The values displayed within the latent constructs represent the average variance extracted (AVE), confirming adequate convergent validity across all constructs. Digital sustainability capability, green innovation capability, and environmental tax pressure exhibits particularly strong measurement quality, while ESG-based sustainability uncertainty perception and environmental Sustainability performance also demonstrates satisfactory reliability. Overall, the measurement model satisfies established criteria for an indicator reliability and construct validity, supporting its suitability for subsequent structural model analysis.

4.2 Structural model assessment

Table 6 reports the collinearity diagnostics for the structural model using variance inflation factor (VIF) values. All VIF

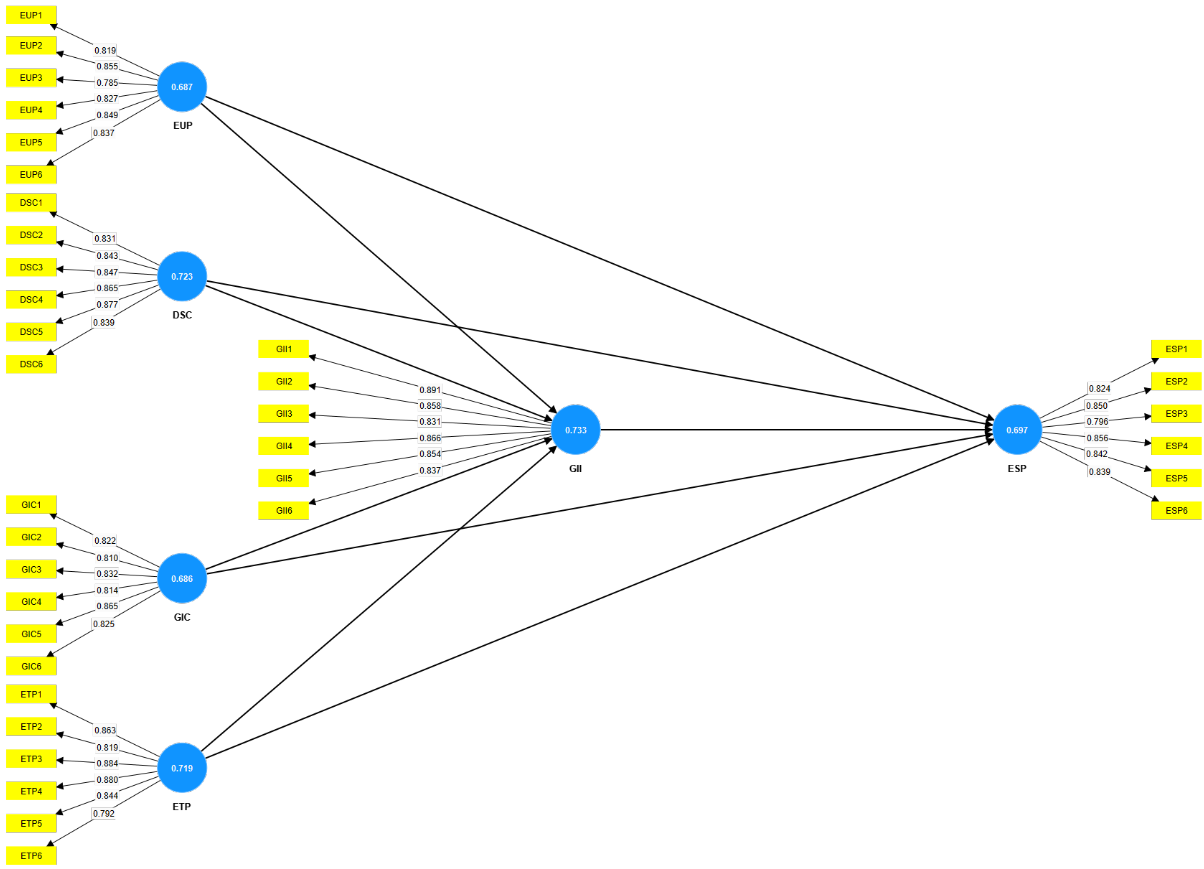

Fig. 2. Measurement model results.

Table 6. Collinearity assessment using variance inflation factor (VIF)

Structural relationship	VIF
Digital sustainability capability → Environmental sustainability performance	1.489
Environmental tax pressure → Environmental sustainability performance	1.121
ESG-based sustainability uncertainty perception → Environmental sustainability performance	1.134
Green innovation capability → Environmental sustainability performance	1.346
Green investment intention → Environmental sustainability performance	1.945
Digital sustainability capability → Green investment intention	1.189
Environmental tax pressure → Green investment intention	1.025
ESG-based sustainability uncertainty perception → Green investment intention	1.068
Green innovation capability → Green investment intention	1.186

values range between 1.025 and 1.945, which are well below the recommended threshold of 3.0 for PLS-SEM models. The highest VIF is observed for green investment intention predicting environmental sustainability performance (VIF = 1.945), indicating acceptable but non-problematic overlap among predictors. Overall, these results confirm the absence of multicollinearity issues and suggest that the estimated path coefficients are not biased by excessive intercorrelations among the latent constructs.

Table 7 presents the coefficients of determination for the endogenous constructs. Green investment intention achieves an R^2 value of 0.486, indicating that 48.6% of its variance is explained by digital sustainability capability, environmental tax pressure, green innovation capability, and ESG-based sustainability uncertainty perception. Environmental sustainability performance records an R^2 of 0.402, suggesting that 40.2% of its variance is explained by its direct predictors and the mediating construct. The adjusted R^2 values remain close to the original estimates, indicating model stability. According to PLS-SEM guidelines, these results reflect moderate explanatory power and support the adequacy of the proposed structural model.

Table 7. Coefficient of determination results

Endogenous construct	R^2	Adjusted R^2
Environmental sustainability performance	0.402	0.393
Green investment intention	0.486	0.480

Table 8 reports the standardized structural path coefficients. ESG-based sustainability uncertainty perception shows negative effects on both environmental sustainability performance ($\beta = -0.204$) and green investment intention ($\beta = -0.184$). Digital sustainability capability exerts the strongest positive influence on green investment intention ($\beta = 0.392$), followed by green innovation capability ($\beta = 0.287$) and environmental tax

Table 8. Structural path coefficients and hypothesis testing

Hypothesis	Path	Path coefficient
H1	ESG-based sustainability uncertainty perception → Environmental sustainability performance	−0.204
H2	Digital sustainability capability → Environmental sustainability performance	0.105
H3	Green innovation capability → Environmental sustainability performance	0.117
H4	Environmental tax pressure → Environmental sustainability performance	0.072
H5	ESG-based sustainability uncertainty perception → Green investment intention	−0.184
H6	Digital sustainability capability → Green investment intention	0.392
H7	Green innovation capability → Green investment intention	0.287
H8	Environmental tax pressure → Green investment intention	0.222
H9	Green investment intention → Environmental sustainability performance	0.378

Table 9. Effect size (f^2) results

Hypothesis	Path	f^2
H6	Digital sustainability capability → Green investment intention	0.252
H7	Green innovation capability → Green investment intention	0.135
H8	Environmental tax pressure → Green investment intention	0.094
H9	Green investment intention → Environmental sustainability performance	0.123
H2	Digital sustainability capability → Environmental sustainability performance	0.012
H3	Green innovation capability → Environmental sustainability performance	0.017
H4	Environmental tax pressure → Environmental sustainability performance	0.008

Table 10. Indirect effects and mediation results

Hypothesis	Indirect path	Indirect effect	Mediation type
H10	ESG-based sustainability uncertainty perception → Green investment intention → Environmental sustainability performance	−0.069	Partial mediation
H11	Digital sustainability capability → Green investment intention → Environmental sustainability performance	0.148	Partial mediation
H12	Green innovation capability → Green investment intention → Environmental sustainability performance	0.108	Partial mediation
H13	Environmental tax pressure → Green investment intention → Environmental sustainability performance	0.084	Partial mediation

pressure (β = 0.222). Green investment intention demonstrates a substantial positive effect on environmental sustainability performance (β = 0.378), exceeding the direct effects of the other predictors. In contrast, the direct effects of digital sustainability capability, green innovation capability, and environmental tax pressure on environmental sustainability performance are comparatively weaker, highlighting the importance of indirect mechanisms.

Table 9 summarizes the effect size (f^2) estimates for each structural relationship. Digital sustainability capability exhibits a large effect on green investment intention (f^2 = 0.252), underscoring its dominant role in shaping investment decisions. Green innovation capability (f^2 = 0.135) and green investment intention on environmental sustainability performance (f^2 = 0.123) demonstrate medium effect sizes. Environmental tax pressure shows a small-to-medium effect on green investment intention (f^2 = 0.094). In contrast, the direct effects of digital sustainability capability, environmental tax pressure, and green innovation capability on environmental sustainability performance are small. Overall, the findings confirm that green investment intention functions as a critical mechanism translating strategic and policy drivers into sustainability performance outcomes.

4.3 Mediation analysis

Table 10 reports the indirect effects of the exogenous constructs on environmental sustainability performance through green investment intention as a mediating mechanism. ESG-based sustainability uncertainty perception shows a negative indirect effect (β = −0.069), indicating that higher perceived uncertainty suppresses environmental sustainability outcomes by weakening green investment intentions. In contrast, digital sustainability capability (β = 0.148), green innovation capability (β = 0.108), and environmental tax pressure (β = 0.084) exhibit positive indirect effects, confirming the mediating role of green investment intention in translating organizational capabilities and regulatory pressure into sustainability performance. As the corresponding direct effects remain significant in the structural model, the mediation effects are classified as partial mediation. Overall, these findings highlight green investment intention as a critical transmission channel linking strategic resources and policy instruments to environmental sustainability performance.

Table 11 presents the predictive relevance of the structural model assessed using the blindfolding procedure. Both endoge-

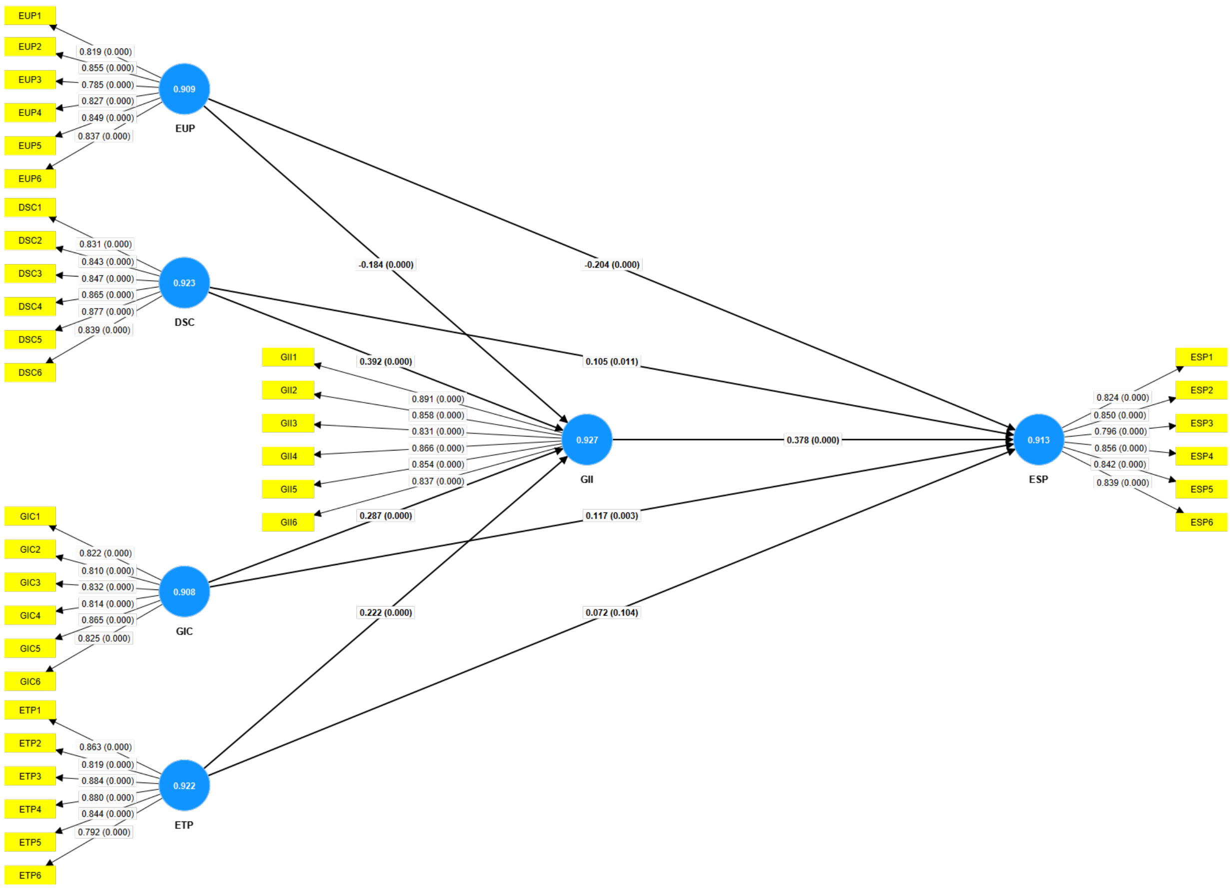

Fig. 3. Structural model results showing standardized path coefficients and explained variance.

Table 11. Predictive relevance results

Endogenous construct	SSO	SSE	Q^2
Environmental sustainability performance	2,100,000	1,526,743	0.273
Green investment intention	2,100,000	1,362,814	0.351

nous constructs report positive Q^2 values, indicating adequate predictive capability. Green investment intention records a Q^2 value of 0.351, suggesting strong predictive relevance for future-oriented sustainability investment behavior. Environmental sustainability performance achieves a Q^2 value of 0.273, reflecting moderate predictive accuracy. These results confirm that the proposed structural model not only explains in-sample variance but also demonstrates meaningful out-of-sample prediction capability, thereby strengthening the robustness and practical relevance of the sustainability framework.

Figure 3 illustrates the estimated structural relationships, including standardized path coefficients and the explained variance of the endogenous constructs.

4.4 Discussion

This study provides robust empirical evidence on how environmental sustainability performance is shaped under conditions of ESG-related uncertainty through organizational capabilities, regulatory pressure, and green investment behavior in an emerging economy context. The findings confirm that ESG-based sustainability uncertainty perception negatively affects environmental sustainability performance, both directly and indirectly through green investment intention. This result is consistent with uncertainty-oriented sustainability literature, which argues that heightened policy and ESG uncertainty discourages long-term environmental commitment by increasing perceived risk and delaying strategic investments (Barra & Falcone, 2024; Zheng et al., 2021; Ongan et al., 2025). In developing economies, where institutional volatility is relatively high, uncertainty functions as a stronger deterrent to proactive sustainability strategies.

Conversely, digital sustainability capability demonstrates a strong positive effect on both green investment intention and environmental sustainability performance, with the largest indirect effect observed in the mediation analysis (Luo et al., 2024; Rehman et al., 2022; Li & Lin, 2024). This finding reinforces digital transformation theory, which positions digital capability as a critical enabler of resource efficiency, transparency, and sustainability-oriented decision-making (Feroz et al., 2021; Li & Lin, 2024). In emerging markets, digital tools help reduce information asymmetry and operational inefficiencies, enabling firms—particularly small and medium-sized enterprises—to overcome financial and technological barriers to sustainability adoption.

The results further indicate that green innovation capability significantly enhances environmental sustainability performance, both directly and via green investment intention. This supports the circular economy and innovation-based sustainability perspective, which emphasizes innovation as a central driver of environmental performance improvement (Geissdoerfer et al., 2017; Ul-Durar et al., 2023; Perotti et al., 2025; Suchek et al., 2021). Firms with stronger green innovation capabilities are better positioned to transform regulatory and market pressures into competitive advantages, particularly in environmentally sensitive sectors.

In addition, environmental tax pressure is found to positively influence sustainability performance, although with a smaller effect size compared to digital and innovation capabilities. This finding corroborates environmental regulation and ecological modernization theories, suggesting that well-designed fiscal instruments encourage firms to internalize environmental costs and invest in cleaner technologies (Ahmed et al., 2022; Chu & Le, 2022; Raihan et al., 2024). However, the relatively modest magnitude of the effect implies that regulatory pressure alone is insufficient in the absence of complementary internal capabilities.

Importantly, the mediation analysis highlights green investment intention as a critical transmission mechanism linking organizational capabilities and regulatory pressure to sustainability outcomes (Jirakraisiri et al., 2021; Kraus et al., 2020; Zhang et al., 2019). The presence of partial mediation across all structural paths suggests that while direct effects remain significant, investment intention amplifies the translation of strategic resources into environmental performance. This finding aligns with sustainable finance and investment literature emphasizing intentional capital allocation as a bridge between corporate strategy and measurable environmental impact (Radmehr et al., 2024; Li & Lin, 2024).

From a broader developing-country perspective, these findings indicate that sustainability transitions cannot rely solely on regulatory enforcement mechanisms. Instead, they require a synergistic alignment between digital transformation, green innovation capability, and investment incentives—particularly in emerging economies where ESG-related uncertainty is persistent. The strong predictive relevance of the proposed model further confirms its practical applicability for both policy design and managerial decision-making in sustainability-driven development agendas.

5. Conclusion

This study provides empirical insights into how firms navigate sustainability uncertainty to enhance environmental sustainability performance through organizational capabilities, regulatory pressure, and investment-oriented decision mechanisms. The findings demonstrate that sustainability uncertainty constrains environmental performance, confirming the disruptive role of uncertainty in strategic sustainability execution. In contrast, digital sustainability capability and green innovation capability emerge as critical internal drivers that enable firms to translate sustainability challenges into performance-enhancing outcomes. Environmental tax pressure also plays a constructive role by reinforcing firms' commitment to environmental improvement when aligned with internal strategic readiness. Importantly, green investment intention functions as a central mediating mechanism, bridging organizational capabilities and regulatory stimuli with tangible sustainability outcomes. By integrating uncertainty theory, capability-based perspectives, and investment intention mechanisms, this study advances the understanding of sustainability-driven strategic behaviour and provides a coherent framework for explaining how firms achieve environmental performance under sustainability uncertainty.

Limitations

This study has several limitations. First, the cross-sectional research design limits the ability to capture dynamic changes in sustainability strategies over time. Second, the reliance on perceptual survey data may introduce respondent bias despite the application of rigorous measurement validation procedures. Third, broader institutional and market-level factors influencing sustainability performance were not explicitly incorporated into the model.

Implications

The findings offer important implications for both practitioners and policymakers. Firms are encouraged to strengthen digital sustainability capability and green innovation capability to mitigate the adverse effects of sustainability uncertainty. Policymakers may design environmental tax frameworks that incentivize proactive green investment rather than compliance-driven responses.

Future research directions

Future research may employ longitudinal designs, integrate objective sustainability performance indicators, or extend the proposed framework across different institutional contexts to enhance generalizability and theoretical robustness.

Declarations

Author Contributions

S.B.N. Aini: Conceptualization, Methodology, Data curation, Formal analysis, Writing - original draft.
Umatun Markhumah: Supervision, Validation, Writing - review & editing.

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Conflict of Interest

The authors declare no conflict of interest.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethical Approval

This article does not contain any studies with human participants or animals performed by any of the authors.

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