A Conceptual Framework Linking Environmental Disclosure, Performance, and Foreign Direct Investment in Developing Countries

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ABSTRACT

This study proposes a conceptual framework explaining how environmental performance, environmental information disclosure, macroeconomic fundamentals and institutional quality jointly influence foreign direct investment (FDI) inflows in developing countries. The model argues that environmental performance alone is insufficient to attract sustainable FDI unless it is supported by transparent disclosure and credible institutional structures. Environmental information disclosure is presented as a key mediating mechanism that enhances investor confidence by reducing information asymmetry, while institutional quality is introduced as a moderating factor that shapes the credibility and effectiveness of environmental improvements. Macroeconomic fundamentals are integrated as essential structural conditions that frame investor responses to environmental and governance signals. The framework contributes to the literature by offering an integrated perspective on sustainable FDI attraction and highlights important policy implications for developing economies seeking to strengthen their environmental credibility, transparency systems and institutional governance.

Keywords: Foreign Direct Investment, Environmental Performance, Environmental Disclosure, Institutional Quality, Sustainable Investment
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1. INTRODUCTION

Over the past decades, sustainable development has emerged as a global priority as countries face growing environmental pressures linked to climate change, biodiversity loss and pollution. In this context, foreign direct investment (FDI) continues to be recognized as a fundamental driver of economic growth, technological transfer, and industrial modernization (Dunning, 1993; Borensztein et al., 1998). Yet, the environmental risks associated with industrial expansion have reshaped investment dynamics, leading to a stronger emphasis on green and sustainable forms of FDI that align economic development with ecological preservation (UNCTAD, 2024).

Within this evolving investment landscape, environmental information disclosure (EID) has gained significant importance.

Transparent, comparable, and credible environmental information reduces informational uncertainty and allows investors to assess a country's environmental risks and governance capacity (Clarkson et al., 2008; Hahn and Kühnen, 2013). According to signaling theory, environmental disclosure acts as a powerful signal of regulatory commitment and institutional credibility, reducing information asymmetry between host countries and foreign investors (Ioannou and Serafeim, 2019). As global investors increasingly integrate ESG considerations into decision-making, the availability of robust environmental data has become essential for evaluating long-term investment opportunities and risk exposure (Friede et al., 2015; Krueger et al., 2020).

Despite growing awareness of environmental transparency, the relationship between EID, environmental performance,

and FDI remains insufficiently understood in developing economies. Empirical evidence is mixed. Some studies suggest that greener environmental conditions and higher environmental transparency attract sustainability-oriented investments (Lee, 2020; Wang and Li, 2022). Others highlight inconsistent or context-dependent effects, particularly in countries where environmental governance frameworks are weak or regulatory enforcement is limited (Copeland and Taylor, 2004; Kolk et al., 2017). These inconsistencies reflect the structural challenges facing developing countries, including limited institutional capacity, fragmented reporting systems, and governance vulnerabilities.

At the same time, macroeconomic stability continues to be a critical determinant of FDI. Classical determinants such as GDP growth, infrastructure, and trade openness remain central to investors' evaluations of long-term profitability and risk (Asiedu, 2002; Chakrabarti, 2001). In many developing economies, strong macroeconomic fundamentals may strengthen environmental credibility, while economic instability may deter investment even in the presence of environmental improvements. This interdependency underscores the need for a holistic approach integrating economic and environmental dimensions.

Although numerous studies have examined environmental or economic factors independently, very few have integrated these dimensions into a unified conceptual model. Research combining environmental performance, environmental disclosure, macroeconomic variables, and institutional quality remain scarce, despite the increasing relevance of these interactions for international investment flows (Alvarado et al., 2021; Hunjra et al., 2023). In particular, the mediating role of environmental information disclosure and the moderating effect of institutional governance on the environmental–FDI relationship are seldom conceptualized together, which limits theoretical understanding and constrains policy formulation.

This paper seeks to address these gaps by proposing a comprehensive conceptual framework that articulates how environmental performance, environmental information disclosure, macroeconomic fundamentals, and institutional governance interact to shape FDI inflows in developing countries. Grounded in Institutional Theory (North, 1990), information asymmetry theory (Akerlof, 1970), and the Sustainable Development Framework (UNCTAD, 2024), the model explains how environmental transparency enhances credibility, how macroeconomic stability strengthens investment attractiveness, and how strong institutions amplify the influence of environmental performance on FDI.

This study contributes to literature in several ways. First, it reconceptualizes environmental information disclosure as a central determinant of investment attractiveness rather than a complementary reporting mechanism. Second, it demonstrates how environmental and macroeconomic variables jointly influence investor perceptions in developing countries. Third, it offers a theoretical foundation for future empirical analysis and AI-based predictive modelling, as complex interactions between environmental and economic indicators increasingly benefit from machine learning approaches (Huang and Zhao, 2023; Li et al.,

2023). Finally, the framework provides actionable insights for policymakers seeking to strengthen environmental governance, improve transparency, and attract sustainable and responsible FDI aligned with long-term development goals.

2. LITERATURE REVIEW

Foreign direct investment (FDI) has long been recognized as a central engine of economic growth, technological diffusion and industrial upgrading, especially in developing countries seeking to strengthen their productive capacities and integrate global markets (Dunning, 1993; Borensztein et al., 1998). While early research primarily focused on the economic determinants of FDI, such as market size, labor costs, infrastructure, and political stability, the sustainability paradigm has gradually transformed the analytical landscape. Over the past two decades, scholars have increasingly examined how environmental conditions shape investment decisions, revealing the dual environmental impact of FDI. On one hand, the Pollution Haven Hypothesis argues that multinational firms tend to relocate polluting industries to countries with weak environmental regulations, thereby exacerbating local environmental degradation (Copeland and Taylor, 2004). On the other hand, the Pollution Halo Hypothesis posits that FDI can promote the dissemination of cleaner technologies and advanced environmental practices, producing positive environmental spillovers in host economies (Dean, Lovely, & Wang, 2009; Balsalobre-Lorente et al., 2019). These contrasting findings underscore the complexity of the environmental–FDI nexus and highlight the importance of contextual factors such as institutional quality, regulatory enforcement, and technological absorptive capacity (Alvarado et al., 2021; Hunjra et al., 2023).

Within this evolving scholarly conversation, environmental information has emerged as an increasingly influential dimension in investment analysis. Environmental information disclosure (EID) refers to the systematic communication of data on emissions, environmental performance, sustainability policies, and compliance with environmental regulations. Theoretical perspectives rooted in signaling theory and information asymmetry suggest that environmental disclosure reduces uncertainty, enhances transparency, and signals the credibility of a country's regulatory system (Ioannou and Serafeim, 2019). As global investors face intensifying stakeholder pressure and regulatory obligations, many prioritize ESG-aligned markets that provide reliable environmental data (Friede et al., 2015). Empirical studies confirm that transparent disclosure systems can attract greater volumes of sustainable and responsible investment by improving the predictability of environmental risks and reducing the perception of regulatory volatility (Clarkson et al., 2008; Wang and Li, 2022). In contrast, countries characterized by weak disclosure practices frequently struggle to attract long-term international capital due to concerns regarding hidden environmental liabilities, policy uncertainty, and reputational risks (Kolk et al., 2017).

Beyond transparency, environmental performance constitutes another critical determinant of investment attractiveness. Countries that demonstrate improvements in renewable energy adoption, pollution reduction, environmental regulation enforcement, and

resource efficiency tend to attract sustainability-driven investors and multinational firms seeking environmentally competitive locations (Lee, 2020). Conversely, poor environmental quality increases operational and compliance risks, raises uncertainty for foreign investors and potentially discouraging long-term investment commitments (Copeland and Taylor, 2004). Emerging evidence suggests that environmental performance can serve as a competitive advantage for developing economies that successfully combine sustainability and industrial strategy, especially in the context of global climate agreements and the transition to low-carbon development pathways (UNCTAD, 2024).

Energy performance has also emerged as a core dimension of environmental quality, particularly in developing countries engaged in low-carbon transition. Improvements in renewable energy deployment, energy efficiency and reductions in CO_2 emissions directly strengthen environmental performance and create favorable conditions for attracting sustainable FDI. Prior studies show that countries with higher renewable energy penetration and lower carbon intensity tend to appeal more to international investors, especially those seeking stable, low-risk and environmentally responsible locations (Apergis and Payne, 2010; Sadorsky, 2010). Clean energy policies reduce long-term operational uncertainty by ensuring stable energy supply, supporting cost efficiency, and signaling a credible commitment to sustainable development (Saidi and Hammami, 2015). These dynamics are particularly relevant for developing economies, where energy systems significantly shape both environmental outcomes and investment risk profiles. Therefore, energy performance constitutes an essential component of the broader environmental performance construct and reinforces its influence on FDI flows.

However, environmental factors do not operate in isolation. Macroeconomic fundamentals continue to play a central role in shaping investment decisions, particularly in developing countries where economic vulnerability remains high. Numerous studies identify GDP growth, inflation stability, market openness, infrastructure quality, and trade integration as key determinants of FDI inflows (Asiedu, 2002; Chakrabarti, 2001). These economic variables influence investor expectations concerning returns, market expansion and long-term risk. Yet, recent scholarship emphasizes that macroeconomic and environmental determinants are interdependent rather than independent. Strong macroeconomic performance can amplify the attractiveness of good environmental governance, while economic instability can undermine the benefits of environmental reforms even when environmental indicators improve. This interdependence highlights the need for integrated analytical approaches that combine environmental, economic, and institutional variables within a unified framework, rather than examining them in isolation.

Institutional quality constitutes the final pillar that structures the literature on sustainable investment. Institutional Theory suggests that clear, predictable, and enforceable rules reduce transaction costs and uncertainty, thereby shaping investor perceptions and behavior (North, 1990). In the environmental domain, institutions play a crucial role in ensuring the credibility of environmental information, enforcing environmental regulations, and establishing consistent sustainability policies. Strong institutions enhance the effectiveness of environmental policies, mitigate corruption, reinforce accountability, and increase investor confidence in the long-term stability of the regulatory system (Dkhili and Jarboui, 2024). Conversely, weak institutional governance can undermine environmental performance, distort disclosure practices, and create substantial uncertainty, thereby reducing the attractiveness of developing countries to foreign investors.

Despite the richness of existing research, several gaps persist. Most studies explore the determinants of FDI through a fragmented lens, focusing either on macroeconomic indicators or environmental variables without examining their interaction. Studies that include environmental information disclosure often treat it as a secondary variable rather than a central mechanism shaping investment decisions. Similarly, few analyses investigate the joint influence of environmental performance, information transparency, macroeconomic stability, and institutional governance on FDI. Even fewer studies conceptualize environmental disclosure as a mediating mechanism or institutional quality as a moderating factor affecting the environmental FDI link, despite strong theoretical justification. As global economic systems transition toward sustainable development models, the absence of integrated conceptual frameworks limits scholarly understanding and weakens the evidence base for policymaking in developing countries.

To respond to these gaps, recent research increasingly calls for multidimensional models that integrate environmental and macroeconomic indicators using advanced analytical techniques, including machine learning and nonlinear predictive models (Huang and Zhao, 2023; Li et al., 2023). These approaches are particularly relevant for developing economies, where dynamic interactions between environmental performance, institutional quality and economic stability create complex investment environments. By capturing nonlinearities and multidimensional interactions, AI-based predictive models offer promising avenues for improving the accuracy and relevance of FDI forecasting, especially in the context of sustainability transitions and green industrial strategies.

To summarize the main strands of the literature discussed above, Table 1 offers a consolidated overview of the core constructions, their definitions, and their theoretical importance. This summary facilitates a clearer transition toward the development of the conceptual framework presented in the next section.

3. CONCEPTUAL FRAMEWORK AND HYPOTHESES DEVELOPMENT

Foreign direct investment (FDI) attraction in developing countries results from the combined influence of environmental conditions, information transparency, macroeconomic fundamentals and institutional governance. This section presents a structured conceptual framework explaining how these variables interact to shape investor perceptions and decisions. The model is grounded in Institutional Theory, Information Asymmetry Theory, and the Sustainable Development Framework and integrates direct, mediating, and moderating mechanisms.

Table 1: Summary of key constructs and their theoretical roles

Construct	Definition	Key references	Role in the model
Environmental performance	Overall ecological quality measured through pollution reduction, renewable energy adoption, and environmental efficiency	Lee (2020); Alvarado et al. (2021)	Direct determinant of FDI
Environmental information disclosure	Transparency and availability of environmental data reported by institutions and governments	Clarkson et al. (2008); Ioannou and Serafeim (2019)	Mediator
Macroeconomic Fundamentals	Core economic conditions such as GDP growth, inflation, openness, and infrastructure	Asiedu (2002); Chakrabarti (2001)	Direct determinant of FDI
Institutional quality foreign direct investment (FDI)	Governance capacity, rule of law, regulatory effectiveness, and corruption control	North (1990); Dkhili and Jarboui (2024)	Moderator
Foreign direct investment (FDI)	Capital inflows from foreign investors seeking economic and strategic opportunities.	UNCTAD (2024)	Outcome variable

3.1. Environmental Performance and FDI Attraction

Environmental performance constitutes the foundation of the model. It reflects a country's ability to reduce pollution, enhance renewable energy adoption, and improve ecological sustainability. Countries that demonstrate stronger environmental performance tend to attract environmentally responsible multinational firms, as better environmental conditions reduce operational risks and align with corporate sustainability strategies (Lee, 2020; Alvarado et al., 2021). This relationship is consistent with the pollution halo hypothesis, which suggests that foreign investors increasingly prefer countries with better environmental standards because these environments facilitate long-term operational efficiency and regulatory predictability (Balsalobre-Lorente et al., 2019). Conversely, weak environmental performance increases regulatory uncertainty and compliance costs, discouraging long-term investment (Copeland and Taylor, 2004). Thus, literature clearly supports a direct positive effect of environmental performance on FDI flows.

Energy performance reinforces the effect of environmental performance within the conceptual model. Improvements in renewable energy deployment, reductions in carbon intensity and better energy efficiency directly strengthen the environmental profile of developing countries and reduce operational and regulatory risks faced by multinational firms. Because the energy sector is a major source of pollution, clean energy transition enhances a country's credibility in sustainability commitments and amplifies the positive effect of environmental performance on FDI attractiveness. Energy indicators such as renewable energy penetration or CO_2 reduction are increasingly used by international investors as a proxy for long-term stability and environmental responsibility. Therefore, energy performance constitutes a critical sub-dimension that strengthens the positive influence of environmental performance on FDI within the proposed conceptual framework.

3.2. The Mediating Role of Environmental Information Disclosure

While environmental performance constitutes an objective condition, the extent to which investors perceive and respond to these improvements depends on the transparency with which environmental information is disclosed. Environmental information disclosure (EID) acts as a mediating mechanism that reduces information asymmetry by providing investors with reliable, comparable and verifiable data regarding environmental policies, regulatory enforcement and sustainability indicators (Clarkson et al., 2008; Hahn and Kühnen, 2013).

Research shows that strong disclosure mechanisms strengthen credibility, signal regulatory commitment, and enhance investor confidence (Ioannou and Serafeim, 2019). Investors often use environmental transparency as a proxy for institutional quality, policy stability and governance effectiveness (Kolk et al., 2017; Wang and Li, 2022).

Thus, even when environmental performance improves, its effect on FDI may be limited if disclosure systems are weak or inconsistent. By making environmental improvements visible and interpretable, EID transmits the effect of environmental performance toward investment outcomes.

3.3. The Influence of Macroeconomic Fundamentals

Macroeconomic fundamentals create the economic environment in which environmental and informational signals are interpreted. Traditional determinants such as GDP growth, inflation, market openness and infrastructure quality remain among the strongest predictors of FDI inflows, as confirmed by decades of empirical research (Chakrabarti, 2001; Asiedu, 2002).

Stable macroeconomic conditions enhance investor confidence and reinforce positive environmental signals, while economic instability may overshadow environmental improvements and deter investment. In recent research, scholars emphasize the complementary role of environmental and macroeconomic factors, arguing that sustainability-oriented investment decisions require the coexistence of ecological and economic stability (Doytch, 2022; Sarkodie and Strezov, 2019).

Ainsi, le modèle retient un effet direct des fondamentaux macroéconomiques sur les IDE, mais aussi leur rôle de contexte structurant. This integrated perspective highlights that environmental factors alone are insufficient to attract sustainable FDI in the absence of solid macroeconomic foundations.

Figure 1: Integrated conceptual model of environmental, institutional and macroeconomic drivers of foreign direct investment inflows
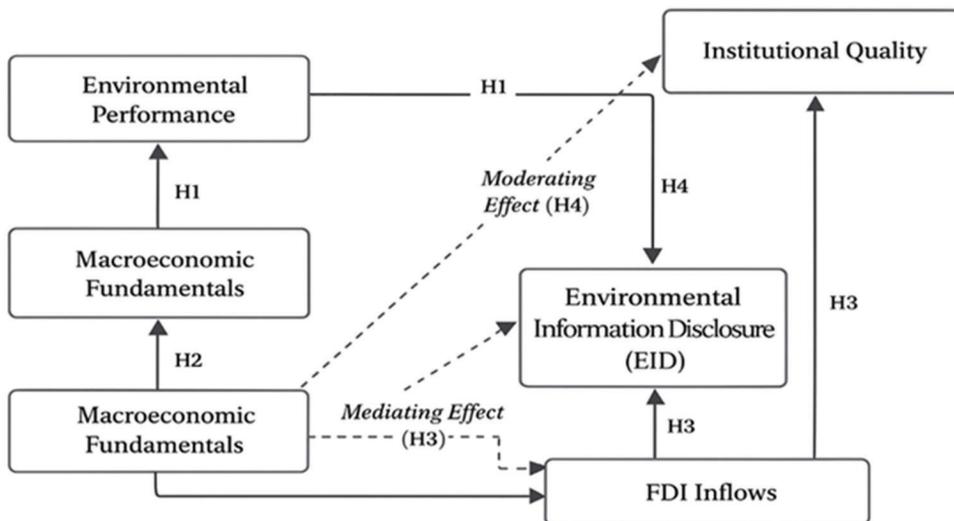
3.4. The Moderating Role of Institutional Quality

Institutional quality represents a crucial moderate factor in the environmental FDI relationship. According to Institutional Theory (North, 1990), strong institutions reduce uncertainty, enhance regulatory enforcement, and ensure continuity of policy. In the environmental domain, institutional quality determines whether environmental regulations are effectively implemented, whether disclosure systems are credible, and whether sustainability commitments are consistently upheld.

Empirical research shows that countries with better governance attract higher levels of FDI because investors perceive lower political and regulatory risks (Dkhili and Jarboui, 2024; Hunjra et al., 2023). Strong institutions amplify the positive effect of environmental performance and environmental transparency by improving the credibility and enforceability of environmental policies (Ioannou and Serafeim, 2019).

In contrast, weak institutions may neutralize the benefits of strong environmental performance or disclosure, generate uncertainty and reduce investors' willingness to commit capital.

Thus, institutional quality moderates the impact of environmental performance on FDI inflows by strengthening or weakening the effect.

3.5. Integrated Mechanisms of the Conceptual Model

Bringing these dimensions together, the conceptual model posits that FDI inflows in developing countries emerge from a multilayered mechanism in which environmental performance provides the substantive foundation for sustainability-oriented investment, environmental information disclosure serves as the mediating channel through which environmental conditions are communicated to investors, macroeconomic fundamentals constitute the structural conditions that reinforce or constrain investor responses, and institutional quality moderates the credibility and effectiveness of environmental reforms.

This integrated view advances beyond fragmented approaches in literature and provides a coherent pathway for understanding how developing countries can enhance their attractiveness to sustainable FDI, as illustrated in Figure 1.

4. HYPOTHESES DEVELOPMENT

The conceptual framework developed in this study offers a multidimensional explanation of how environmental, informational, macroeconomic and institutional variables shape foreign direct investment (FDI) inflows in developing countries. Building on insights from Institutional Theory, Information Asymmetry Theory, the Sustainable Development Framework, and the existing empirical literature, this section formulates the hypotheses derived from the proposed model.

The first dimension concerns the direct effect of environmental performance on FDI. The literature suggests that countries with stronger environmental outcomes tend to offer lower environmental compliance risks, higher regulatory predictability, and more attractive conditions for sustainability-oriented multinational firms. Studies aligned with the Pollution Halo Hypothesis demonstrate that improvements in renewable energy adoption, pollution control, and ecological efficiency can increase a country's attractiveness by reducing operational uncertainty and signaling long-term environmental stability (Lee, 2020; Alvarado et al., 2021; Balsalobre-Lorente et al., 2019). Because multinational enterprises increasingly integrate environmental considerations into investment decisions, a positive link between environmental performance and FDI is expected.

- H_1: Environmental and energy performance positively influence FDI inflows in developing countries.

The second dimension reflects the role of macroeconomic fundamentals, which remain central determinants of FDI. A stable macroeconomic environment characterized by sustained GDP growth, stable inflation, adequate infrastructure, and open trade regimes increases investor confidence and supports long-term investment prospects. Prior empirical studies consistently confirm that macroeconomic stability fosters FDI by reducing economic

risk and improving expected returns (Chakrabarti, 2001; Asiedu, 2002). In the context of developing economies, where volatility may be high, macroeconomic conditions are likely to exert a direct influence on the volume and stability of FDI inflows.

- H_2: Macroeconomic fundamentals positively influence FDI inflows in developing countries.

Although environmental performance and macroeconomic fundamentals influence FDI directly, their effects depend on the availability and reliability of environmental information disclosure (EID). As suggested by Information Asymmetry Theory (Akerlof, 1970), the absence of credible information creates uncertainty and may undermine the attractiveness of a host country. EID reduces this asymmetry by providing transparent, standardized and verifiable environmental data to investors (Clarkson et al., 2008; Ioannou and Serafeim, 2019). The literature indicates that the credibility and visibility of environmental performance increase when mediated through robust disclosure mechanisms (Wang and Li, 2022).

Therefore, environmental information disclosure is expected to act as a transmission mechanism through which improvements in environmental conditions translate into investor confidence.

- H_3: Environmental information disclosure mediates the relationship between environmental performance and FDI inflows.

The fourth pillar of the framework concerns institutional quality, which shapes the credibility and enforcement of environmental regulations. According to Institutional Theory (North, 1990), strong governance systems enhance regulatory stability, reduce political and economic uncertainty, and strengthen investor trust. Empirical evidence shows that good governance amplifies the positive effect of environmental policies by ensuring their transparency, continuity and enforcement (Hunjra et al., 2023; Dkhili and Jarboui, 2024). When institutional quality is high, environmental performance becomes more credible and more likely to influence investment decisions. Conversely, in contexts of weak institutions, even significant environmental improvements may fail to attract FDI because investors doubt regulatory effectiveness or policy consistency.

- H_4: Institutional quality positively moderates the relationship between environmental performance and FDI inflows, such that the relationship is stronger in countries with higher institutional quality.

Together, these hypotheses reflect the multidimensional nature of sustainable FDI attraction, where environmental performance, transparency, economic stability and institutional capacity interact to shape investor behavior. The mediating and moderating mechanisms reflect the increasingly complex environment in which sustainability-oriented investment decisions are made.

Drawing on the conceptual arguments developed in this section; the study proposes four testable hypotheses. Table 2 provides a consolidated overview of these hypotheses, outlining their

theoretical rationale and expected effects within the proposed model.

To further contextualize the conceptual model, Figure 2 maps the theoretical foundations underpinning the hypothesized relationships. This framework situates the study at the intersection of environmental economics, institutional theory, sustainability disclosure, and FDI determinants.

5. DISCUSSION AND IMPLICATIONS

The conceptual model developed in this article offers an integrated understanding of how environmental performance, information transparency, macroeconomic fundamentals and institutional quality interact to shape FDI decisions in developing countries. The discussion highlights several theoretical and practical implications that advance current knowledge and provide guidance for policymakers, international investors and institutional actors.

From a theoretical perspective, this model contributes to the literature by bridging environmental and economic frameworks in explaining FDI dynamics. While previous research often examines environmental determinants of FDI in isolation, our model demonstrates that environmental performance alone is insufficient to influence investment decisions unless it is accompanied by credible informational and institutional mechanisms. This insight refines the Pollution Halo perspective by emphasizing that foreign

Table 2: Summary of the proposed hypotheses

Hypothesis	Statement	Expected effect
H1	Environmental and energy performance positively influences FDI inflows	Positive
H2	Macroeconomic fundamentals positively influence FDI inflows	Positive
H3	Environmental disclosure mediates the effect of environmental performance on FDI inflows	Mediation
H4	Institutional quality moderates the link between environmental performance and FDI inflows.	Positive moderation

Figure 2: Theoretical positioning of the conceptual model
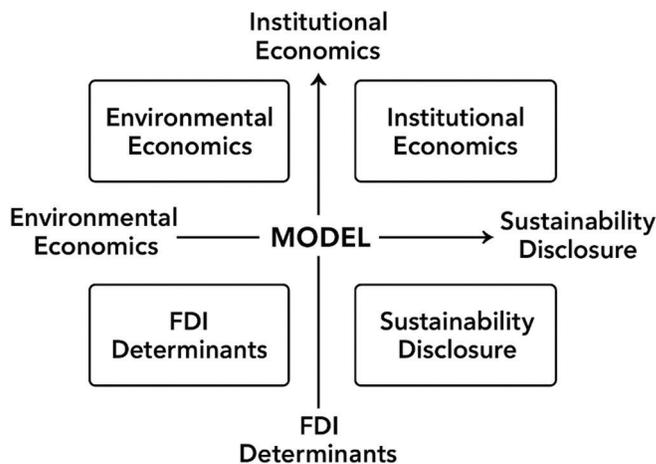
investors may prefer environmentally responsible host countries, but such preference materializes only when environmental improvements are transparent and institutionally supported (Balsalobre-Lorente et al., 2019; Lee, 2020). In this regard, the mediating role of environmental information disclosure extends Information Asymmetry Theory by showing that the visibility of environmental progress is as important as the progress itself: investors respond to credible signals rather than to unobserved or poorly communicated improvements (Akerlof, 1970; Clarkson et al., 2008; Ioannou and Serafeim, 2019).

The model also integrates macroeconomic fundamentals, reaffirming their enduring relevance in FDI attraction. Classical determinants GDP growth, inflation stability, market openness and infrastructure remain central to investor assessments and have been shown repeatedly to influence FDI flows (Asiedu, 2002; Chakrabarti, 2001). Recent studies emphasizing sustainability do not remove this requirement: Environmental reforms are more likely to attract sustained investment in contexts of macroeconomic stability (Doytch, 2022; Sarkodie and Strezov, 2019). Thus, our framework underscores the complementarity between economic stability and environmental governance: neither dimension alone is sufficient to guarantee attraction of quality, long-term FDI.

Institutional quality emerges as a critical moderating factor. Consistent with Institutional Theory (North, 1990), strong governance reduces uncertainty and enhances regulatory enforcement, which makes environmental commitments credible and investment-relevant (Dkhili and Jarboui, 2024; Hunjra et al., 2023). Empirical evidence shows that governance quality conditions the extent to which environmental performance translates into actual investment inflows (Ioannou and Serafeim, 2019). In weak institutional contexts, environmental improvements and disclosure efforts risk being perceived as cosmetic or unenforceable, thereby limiting their capacity to attract sustainability-oriented investors (Kolk et al., 2017; Copeland and Taylor, 2004).

The integration of energy performance into the conceptual framework underscores the pivotal role of the energy sector in shaping sustainable investment decisions. Developing countries that invest in renewable energy capacity, energy-efficient infrastructure, and low-carbon technologies strengthen both their environmental performance and their international investment profile. Clean energy development reduces long-term energy costs, enhances supply stability, and signals regulatory commitment factors that contribute to higher investor confidence (Apergis and Payne, 2010; Saidi and Hammami, 2015).

For policymakers, this implies that strategies to attract sustainable FDI should not be limited to environmental regulation and disclosure systems but must also incorporate energy transition policies. Clear renewable energy targets, transparent incentive mechanisms (e.g., feed-in tariffs, tax credits), and strong regulatory enforcement increase the credibility of environmental commitments and foster green investment flows. Strengthening institutional capacity in the energy sector such as improving regulatory independence, reducing corruption in energy markets,

and simplifying project approval processes further enhances FDI attractiveness and supports long-term economic resilience.

From a policy perspective, the model yields several actionable implications. First, governments should invest in tangible environmental improvements pollution control technologies, renewable energy deployment and resource-efficient infrastructure as these enhance the substantive attractiveness of the country (Lee, 2020; Alvarado et al., 2021). Second, and critically, these improvements must be accompanied by robust disclosure systems: transparent, standardized and verifiable environmental information reduces information asymmetry and signals regulatory commitment (Clarkson et al., 2008; Hahn and Kühnen, 2013; Wang and Li, 2022). Aligning national reporting systems with international frameworks (e.g., GRI, TCFD, SDG reporting) can substantially increase the credibility of environmental signals to foreign investors (UNCTAD, 2024).

Third, institutional reforms are necessary to convert environmental and informational gains into investment outcomes. Measures that strengthen rule of law, reduce corruption, and enhance administrative capacity increase the enforceability of environmental policy and the trustworthiness of disclosure (Dkhili and Jarboui, 2024; Hunjra et al., 2023). These governance improvements not only attract FDI but also improve the quality and durability of investments by lowering political and regulatory risks (North, 1990; Transparency International data referenced in Dkhili and Jarboui, 2024).

For international investors, the model provides an operational framework to assess destinations beyond superficial indicators. Investors can combine environmental performance metrics (e.g., EPI, CO_2 trends), disclosure quality (e.g., GRI adoption, ESG reporting coverage), macroeconomic fundamentals and governance indicators to form a multidimensional risk–reward profile (Friede et al., 2015; Krueger et al., 2020). This holistic approach is increasingly relevant given the rise of ESG mandates and stakeholder pressures that favor investments in jurisdictions demonstrating both environmental commitment and institutional reliability.

At the firm and industry level, the framework suggests that domestic companies and potential joint-venture partners can enhance their attractiveness by improving corporate environmental performance and disclosure practices. Adoption of rigorous ESG reporting and third-party verification reduces asymmetric information and facilitates partnerships with multinational firms that are themselves subject to ESG constraints (Ioannou and Serafeim, 2019; Kolk et al., 2017).

Finally, the conceptual framework has methodological implications for future empirical work. It recommends mixed empirical strategies combining panel data econometrics (to exploit cross-country and temporal variation) with machine learning approaches (to capture nonlinearities and complex interactions). Recent advances in AI and predictive analytics have proven effective in modeling complex, multidimensional phenomena such as FDI flows when environmental and macroeconomic indicators interact (Huang and Zhao, 2023; Li et al., 2023). Structural equation

modeling (SEM) or PLS-SEM can be used to test mediation (EID) and moderation (institutional quality) effects simultaneously, while random forests or gradient boosting may uncover nonlinear thresholds in how environmental signals translate into investment (Sarkodie and Strezov, 2019; Doytch, 2022).

In sum, this study underscores that attracting sustainable FDI requires coordinated policy packages that combine environmental improvements, transparent disclosure, macroeconomic stability and institutional strengthening. Only by acting across these interlinked domains can develop countries credibly position themselves as destinations for high-quality, sustainability-oriented foreign investment.

6. CONCLUSION AND IMPLICATIONS

This article develops an integrated conceptual framework that explains how environmental performance, environmental information disclosure, macroeconomic fundamentals and institutional quality jointly shape foreign direct investment (FDI) inflows in developing countries. Building Institutional Theory (North, 1990), information asymmetry theory (Akerlof, 1970) and contemporary sustainability literature, the model highlights the multidimensional nature of sustainable investment decisions and underscores the importance of coherence across environmental, informational and institutional systems.

The proposed framework argues that improving environmental performance is a necessary but not sufficient condition to attract sustainability-oriented FDI. While better environmental outcomes may reduce operational risks and align with global standards (Lee, 2020; Alvarado et al., 2021), their impact on investment depends on the transparency with which these improvements are communicated. Environmental information disclosure plays a central mediating role by reducing information asymmetry, strengthening the credibility of environmental commitments and enabling investors to assess long-term risks more accurately (Clarkson et al., 2008; Ioannou and Serafeim, 2019). The framework also reaffirms the continued importance of macroeconomic stability as a foundational determinant of investment attractiveness (Asiedu, 2002; Chakrabarti, 2001), showing that environmental reforms must be embedded within a stable economic environment to translate into sustainable FDI.

Institutional quality emerges as a pivotal moderating factor shaping the effectiveness of environmental and informational mechanisms. Strong institutions enhance policy credibility, regulatory enforcement and governance consistency, which are essential conditions for translating environmental improvements into real investment (Dkhili and Jarboui, 2024; Hunjra et al., 2023). Weak institutions, by contrast, risk undermining environmental progress by creating uncertainty, reducing policy stability and weakening trust among foreign investors.

By bringing these dimensions together, the conceptual model contributes to literature in several ways. It synthesizes fragmented research streams, offers a coherent analytical structure for understanding sustainable FDI, and provides a roadmap for policymakers seeking to strengthen their investment attractiveness. It also addresses a critical gap by positioning information disclosure—not only environmental quality as a central mechanism linking sustainability to investment outcomes. The model's multidimensional structure further enables a richer understanding of how governance and macroeconomic conditions shape investor responses to environmental signals.

6.1. Policy Implications
For policymakers, the findings imply that reforms should be comprehensive and coordinated across environmental, informational and institutional domains. Strengthening disclosure systems, improving environmental performance, ensuring macroeconomic stability and reinforcing governance mechanisms are collectively necessary to attract high-quality, sustainability-oriented FDI. For researchers, the model opens several empirical avenues, including mediation and moderation testing, sector-specific analyses and the integration of advanced machine learning techniques to capture nonlinear patterns in FDI behavior.

In conclusion, this study provides a theoretically grounded and policy-relevant framework for understanding how developing countries can enhance their attractiveness to sustainable FDI. By articulating the interdependencies between environmental quality, transparency, economic stability and institutional credibility, the model offers valuable insights for academics, policymakers and investors seeking to promote sustainable development in a rapidly evolving global economy.

6.2. Future Research Directions
This conceptual study opens several avenues for future empirical research aimed at validating, extending, and refining the proposed model. Because the framework integrates environmental, informational, macroeconomic and institutional dimensions, future studies could adopt multidimensional and methodologically diverse approaches to better capture the complexity of FDI dynamics in developing countries.

The first direction concerns the empirical validation of hypothesized relationships. Researchers could test the direct effect of environmental performance on FDI inflows using longitudinal datasets such as the environmental performance index (EPI), CO_2 emissions, renewable energy penetration, or ecological footprint indicators (Lee, 2020; Alvarado et al., 2021). Panel data econometrics—including fixed effects, system GMM, or dynamic regression models—could be employed to assess the temporal consistency of this relationship and identify potential threshold effects, as suggested by the literature on environmental and economic interactions (Balsalobre-Lorente et al., 2019; Sarkodie and Strezov, 2019).

A second promising direction involves empirically testing the mediating role of environmental information disclosure. Because information disclosure varies widely across countries, researchers could rely on ESG disclosure scores, GRI adoption rates, transparency indices, or sustainability reporting frequency to operationalize this mediator (Clarkson et al., 2008; Ioannou and Serafeim, 2019). Structural equation modeling (SEM) or partial least squares path modeling (PLS-SEM) would allow

for the simultaneous assessment of mediation mechanisms and provide deeper insight into how transparency channels the effect of environmental performance on FDI flows.

Future research could also examine the moderating role of institutional quality through advanced econometric techniques or nonlinear modeling approaches. Institutional quality may not only strengthen or weaken the relationship between environmental performance and FDI but may also produce asymmetric effects depending on regime changes, political stability, or governance transitions (North, 1990; Dkhili and Jarboui, 2024; Hunjra et al., 2023). Techniques such as panel threshold regression, quantile regression, or interaction-based SEM could be used to identify governance thresholds beyond which environmental signals become credible and investment-relevant.

Additionally, researchers could explore the dynamic interplay between environmental disclosure and institutional quality. While this article conceptualizes them as separate mechanisms, future work could investigate whether disclosure effects depend on governance quality, or whether strong institutions encourage firms and governments to disclose more reliable environmental information (Kolk et al., 2017; Wang and Li, 2022). Understanding these interactions could refine the conceptual model and offer deeper insights into the co-evolution of transparency and governance in shaping FDI flows.

Another promising research direction involves the integration of artificial intelligence and machine learning to analyze large, complex datasets on environmental quality, ESG disclosure, institutional indicators and investment flows. Recent advances in predictive modeling Random Forests, Gradient Boosting, Neural Networks, or hybrid econometric-ML approaches can capture nonlinearities, hidden patterns and interactions that traditional econometric models may overlook (Huang and Zhao, 2023; Li et al., 2023). Incorporating AI-based forecasting models could lead to more accurate predictions of FDI inflows under alternative environmental and institutional scenarios.

Future studies may also broaden the scope by examining sector-specific FDI responses. The effects of environmental performance and disclosure may differ across industries such as energy, manufacturing, mining, or green technologies, where environmental sensitivity and regulatory exposure vary considerably (Friede et al., 2015). Such sectoral analyses would provide more nuanced insights into how environmental and institutional signals influence investment decisions in different segments of the global economy.

Finally, comparative research between developing and developed economies could help determine whether the mechanisms identified in this conceptual framework exhibit universal patterns or context-specific variations. Cross-regional comparative studies Africa, Latin America, Asia could reveal differences in environmental governance capacity, disclosure systems and institutional constraints, enriching theoretical understanding and supporting evidence-based policymaking (UNCTAD, 2024).

Overall, this conceptual model opens multiple research avenues that can deepen the empirical understanding of sustainable FDI attraction. By combining econometric techniques, institutional analysis, sustainability metrics and advanced predictive tools, future studies can validate the model, uncover its boundary conditions, and provide even stronger guidance for policymakers and investors interested in sustainable development.

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