

Green Financial Inclusion, Eco-Innovation, and Clean Energy Transition: A Theoretical Framework for Ecological Sustainability in Emerging Economies

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Abstract

Emerging economies face the complex challenge of expanding financial inclusion while reducing ecological degradation, energy poverty, and climate vulnerability. Although financial inclusion has traditionally been examined as a mechanism for poverty reduction, entrepreneurship, household welfare, and inclusive growth, its environmental role remains theoretically underdeveloped. This paper develops an integrative theoretical framework explaining how green financial inclusion can support ecological sustainability through eco-innovation, clean energy transition, environmental governance, digital capability, and sustainable livelihood transformation. Drawing on ecological modernization theory, financial inclusion theory, energy ladder theory, institutional theory, and the natural-resource-based view, the paper argues that financial inclusion does not automatically generate environmental benefits. Instead, financial inclusion becomes ecologically meaningful when financial access is linked with green credit, renewable energy adoption, clean cooking technologies, resource-efficient entrepreneurship, and sustainable production systems. The paper proposes that eco-innovation and clean energy transition mediate the relationship between green financial inclusion and ecological sustainability, while environmental governance strengthens this relationship by shaping incentives, regulatory discipline, institutional accountability, and environmental disclosure. The framework also incorporates household-level clean energy transition and livelihood resilience, which are frequently overlooked in macro-level sustainability models. By integrating literature on green finance, renewable energy, ecological footprint, environmental governance, corporate transparency, digital education, entrepreneurship, and sustainable livelihoods, the paper contributes to sustainability research by reframing financial inclusion as a multi-level ecological transition mechanism. The paper offers propositions for future empirical testing in South Asia, ASEAN, MENA, BRICS, and other emerging economy contexts.



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1. Introduction

Emerging economies are increasingly required to pursue development pathways that are financially inclusive, socially equitable, and environmentally sustainable. This challenge is difficult because many developing countries continue to experience poverty, unemployment, weak institutional quality, energy poverty, limited access to formal finance, and rising ecological degradation. Economic development has historically depended on industrial expansion, energy consumption, urbanization, financial deepening, and trade openness. However, when these processes are not accompanied by green innovation and environmental governance, they can intensify carbon emissions, ecological footprint, natural resource depletion, and household-level environmental risks (Grossman & Krueger, 1995; Stern, 2004). The search for sustainable development therefore requires a theoretical explanation of how financial inclusion can be redirected toward ecological transition.

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Financial inclusion is commonly understood as the availability, accessibility, and use of formal financial services by households, firms, and excluded social groups. Its developmental importance is widely recognized because it enables savings, credit, insurance, digital transactions, entrepreneurship, and welfare protection. However, the environmental implications of financial inclusion remain contested. Broader financial access may help households adopt clean cooking technologies, allow small firms to invest in energy-efficient machinery, and support green entrepreneurship. At the same time, financial access may increase consumption, production, transport demand, and energy use, thereby worsening ecological degradation when finance is not guided by environmental criteria. Therefore, the relevant theoretical issue is not whether financial inclusion matters, but when financial inclusion becomes green financial inclusion.

Recent studies provide important but fragmented evidence for this debate. Research on financial inclusion, eco-innovation, globalization, and ecological footprint suggests that finance can influence environmental pressure through innovation and economic restructuring (Vu et al., 2023). Studies on coal rents, transportation, electricity consumption, and ecological footprint further show that finance-environment relationships are strongly shaped by energy structure and resource dependence (Wenlong et al., 2022). Other studies highlight the importance of fiscal decentralization, renewable energy policy, environmental regulation, and green supply chain practices in shaping environmental outcomes (Sadiq et al., 2025; Sadiq et al., 2024; Yuan et al., 2022). These contributions indicate that finance alone is insufficient; its environmental effect depends on whether financial systems support cleaner technologies, stronger governance, and sustainable production (Chakravarti, 2021, 2022a).

A second stream of literature emphasizes household energy transition and livelihood sustainability. Clean cooking fuel studies show that energy poverty remains a major environmental and public health challenge in developing economies (Ahmad et al., 2023). The energy ladder perspective suggests that households tend to shift from traditional biomass and polluting fuels toward cleaner energy as income, access, infrastructure, and awareness improve (Rogers, 2003). However, this transition is not automatic because households may continue using dirty fuels due to affordability constraints, weak energy infrastructure, gendered household responsibilities, and limited credit access. Research on clean cooking fuel poverty, food insecurity, rural livelihoods, women empowerment, and livestock-based income shows that sustainability is inseparable from household welfare and livelihood capacity (Ahmad et al., 2023; Shen et al., 2025; Soharwardi & Ahmad, 2020).

A third stream connects ecological sustainability with governance, digital capability, education, and organizational innovation. Environmental governance and green energy research highlights the importance of administrative tools, regulatory structures, and institutional accountability in reducing degradation (Hussain et al., 2021). Corporate governance and accounting research shows that transparency, IFRS adoption, audit quality, and reduced information asymmetry improve organizational accountability (Ahmed et al., 2024; Chakravarti, 2020; Chakravarti & Stevenson, 2022). Digital education and workforce upskilling studies further suggest that sustainability transitions require human capital, digital competence, leadership, and learning systems (Abdulla et al., 2023; Alemán de la Garza et al., 2019; Chakravarti, 2020; Chakravarti & Stevenson, 2022). In this sense, ecological sustainability is not only a financial or technological issue; it is also an institutional, educational, and behavioral issue.

Despite these contributions, the literature remains theoretically fragmented. Environmental economics studies often focus on macro-level relationships among financial development, energy consumption, globalization, and emissions. Governance and accounting studies focus on transparency, reporting quality, and institutional accountability. Education and digital transformation studies emphasize digital readiness, learning, leadership, and workforce skills. Entrepreneurship and management studies examine innovation, resilience, competitive advantage, and green capabilities (Ali et al., 2024; Ragmoun, 2023, 2024a, 2024b; Zhao et al., 2026). However, these streams are rarely integrated into a single theoretical framework explaining how financial inclusion can function as an ecological transition mechanism in emerging economies.

This paper addresses this gap by developing a conceptual framework in which green financial inclusion promotes ecological sustainability through eco-innovation and clean energy transition. Environmental governance is proposed as a moderating institutional force, while sustainable livelihood capacity and

digital capability are treated as enabling conditions. The paper contributes to theory by extending financial inclusion research into the environmental domain, linking ecological modernization with household-level energy transition, and integrating finance, innovation, governance, human capital, and livelihood perspectives into one conceptual model.

2. Conceptual Background

2.1. Green Financial Inclusion

Green financial inclusion refers to the provision and use of accessible financial services that support environmentally responsible consumption, production, investment, and livelihood practices. It extends traditional financial inclusion by emphasizing not only access to finance but also the sustainability direction of finance. Traditional financial inclusion can improve development outcomes by supporting entrepreneurship, household resilience, credit access, and poverty reduction. However, when financial access expands without environmental safeguards, it may also increase resource use, fuel consumption, and carbon-intensive economic activity. Green financial inclusion therefore requires financial products, regulations, and incentives that direct inclusive finance toward clean energy, eco-innovation, climate-resilient livelihoods, and sustainable enterprise development.

This concept is especially important in emerging economies, where large sections of the population remain financially excluded and energy poor. Households without formal credit may be unable to purchase clean cooking technologies, solar systems, energy-efficient appliances, or climate-resilient agricultural inputs. Similarly, small firms without access to affordable finance may continue using outdated and energy-intensive production systems. Studies on energy use, financial development, and CO₂ emissions in ASEAN economies show that finance-energy-environment relationships are central to sustainable development (Bhatti et al., 2023). Research on renewable energy, globalization, and CO₂ emissions also suggests that financial and economic integration can produce different environmental outcomes depending on the structure of energy use and the quality of policy support (Hanif et al., 2022).

Green financial inclusion is also related to governance and transparency. Financial institutions require credible information, risk assessment, and regulatory guidance to distinguish green activities from environmentally harmful activities. Corporate governance, IFRS adoption, audit committee quality, and disclosure practices can reduce information asymmetry and improve accountability in financial systems (Ahmed et al., 2024; Mohammad, 2015). In the absence of transparency, green financial inclusion may become symbolic rather than transformative. Therefore, green financial inclusion should be understood as a combined financial, institutional, and environmental concept.

2.2. Eco-Innovation

Eco-innovation refers to the development or adoption of products, processes, technologies, practices, and business models that reduce environmental harm. It includes renewable energy technologies, cleaner production systems, green product design, recycling, waste reduction, energy efficiency, circular production, and sustainable supply chain practices. Ecological modernization theory suggests that economic development and environmental protection can be reconciled through innovation, institutional reform, and cleaner production systems (Porter & Linde, 1995). Eco-innovation is therefore a central mechanism through which finance can be converted into ecological improvement.

The relationship between financial inclusion and eco-innovation is particularly important for small firms, entrepreneurs, and households. Firms need capital to invest in green technologies, energy-efficient production, and sustainable product development. Entrepreneurs require financial resources to introduce green business models and environmental innovations. Households need financial access to adopt cleaner energy technologies and resource-efficient appliances. Research on green innovation and competitive advantage indicates that green innovation can produce both environmental and strategic benefits when supported by access to finance (Ali et al., 2024). Similarly, work on green technological innovation and clean energy demonstrates that innovation is critical for improving environmental carrying capacity and sustainability outcomes (Ragmoun & Ben-Salha, 2024).

Eco-innovation also depends on knowledge, digital skills, and organizational learning. Digital pedagogy, teacher development, personalized learning, and workforce upskilling are relevant because green transition requires people capable of using new technologies and adopting sustainability-oriented

practices (Chakravarti, 2020, 2022b; Chakravarti & Stevenson, 2022; Ragmoun & Ben-Salha, 2024). Digital transformation and big data analytics can also support eco-innovation by improving environmental monitoring, resource planning, and decision-making (Ragmoun, 2023, 2024a, 2024b). Thus, eco-innovation is not only a technological output but also a capability-based process shaped by finance, learning, governance, and institutional support.

2.3. Clean Energy Transition

Clean energy transition refers to the shift from fossil-fuel-based and polluting energy systems toward renewable, efficient, and low-carbon energy sources. At the household level, it includes movement from biomass, coal, kerosene, and other dirty fuels toward cleaner cooking technologies and modern energy services. At the firm level, it includes adoption of renewable power, energy-efficient machinery, and low-carbon production systems. At the national level, it includes renewable energy investment, sustainable electrification, energy efficiency policy, and reduction of carbon-intensive infrastructure.

Energy ladder theory is useful for explaining household-level energy transition. The theory suggests that households move toward cleaner fuels as income, access, and awareness improve. However, research on clean fuel poverty shows that this transition is constrained by affordability, infrastructure, household characteristics, regional inequality, and institutional support (Ahmad et al., 2023). Dirty versus clean fuel studies in Pakistan indicate that clean energy transition has implications not only for environmental quality but also for public health, gender welfare, and regional development (Ahmad et al., 2023). Research on renewable energy sources and CO₂ emissions in Pakistan also highlights the importance of clean energy expansion for emission reduction (Zafar et al., 2023).

Green financial inclusion can accelerate clean energy transition by reducing financial barriers to energy upgrading. Microfinance, digital finance, climate credit, clean cooking loans, solar financing, and targeted subsidies can make cleaner technologies affordable for households and small firms. However, the effectiveness of such finance depends on institutional support, regulatory incentives, and energy infrastructure. Therefore, clean energy transition is conceptualized as a mediating pathway between green financial inclusion and ecological sustainability.

2.4. Environmental Governance

Environmental governance refers to policies, regulations, institutions, enforcement mechanisms, and administrative capacities that shape environmental behavior. It includes environmental taxes, green subsidies, renewable energy policies, green finance regulations, emission standards, public accountability, environmental disclosure, and sustainability reporting. Institutional theory explains that organizations and individuals respond to formal regulations, normative expectations, and cognitive rules embedded in society (DiMaggio & Powell, 1983; North, 1990). Therefore, the environmental effect of financial inclusion depends on whether institutions direct financial resources toward sustainable practices.

Governance-related studies support this argument. Environmental governance and green energy research shows that administrative tools can reduce environmental degradation when policy instruments are properly designed and implemented (Hussain et al., 2021). Research on e-government and public sector governance suggests that digital governance can improve transparency and effectiveness in public administration (Bhatti et al., 2025). Studies on secure property rights, institutional quality, and economic development also indicate that effective institutions improve investment confidence and long-term sustainability (Hussain et al., 2024). At the firm level, corporate governance and reporting quality reduce information asymmetry and increase accountability (Ahmed et al., 2024; Mohammad, 2015).

Environmental governance is therefore treated as a boundary condition. Financial inclusion may contribute to ecological sustainability when environmental governance is strong, but it may increase ecological pressure when governance is weak. Strong governance directs finance toward green sectors, discourages pollution-intensive investment, and creates accountability for environmental outcomes.

3. Theoretical Foundations

This paper integrates ecological modernization theory, financial inclusion theory, energy ladder theory, institutional theory, and the natural-resource-based view. Ecological modernization theory explains

how economic development and environmental protection can become compatible through technological innovation, institutional reform, and cleaner production systems (Porter & Linde, 1995). This theory is central because it suggests that financial inclusion may support sustainability when it enables eco-innovation and clean energy transition. However, ecological modernization does not occur automatically; it requires supportive institutions, capable firms, informed households, and policy incentives.

Financial inclusion theory explains how access to formal financial services improves economic participation, investment capacity, risk management, and welfare. This paper extends that theory by arguing that financial inclusion should also be evaluated by its environmental direction. Finance that expands economic activity without sustainability criteria may worsen ecological degradation. Green financial inclusion therefore represents an environmentally directed extension of traditional financial inclusion, where credit, savings, insurance, and digital finance support sustainable technologies and behaviors.

Energy ladder theory explains how households shift from traditional fuels to cleaner and more efficient energy sources as economic and social conditions improve. This theory is relevant because many emerging economies continue to experience household energy poverty. Clean fuel transition requires not only income growth but also credit access, infrastructure, awareness, gender-sensitive policy, and institutional support (Ahmad et al., 2023). Green financial inclusion can reduce affordability constraints and support household movement toward cleaner energy.

Institutional theory explains how formal rules, regulations, norms, and governance systems shape economic and environmental behavior (DiMaggio & Powell, 1983; North, 1990). Environmental governance, corporate governance, IFRS adoption, public sector governance, and disclosure systems are important because they determine whether finance flows toward green or polluting activities. The natural-resource-based view further explains how firms can develop competitive advantage through pollution prevention, product stewardship, and sustainable development capabilities (Hart, 1995 #28). This theory supports the argument that green finance and eco-innovation can generate both environmental and strategic value.

4. Conceptual Framework and Propositions

The proposed framework positions green financial inclusion as the starting point of ecological sustainability transformation. However, the framework rejects a simple direct relationship. Green financial inclusion contributes to ecological sustainability through eco-innovation and clean energy transition. Environmental governance strengthens these relationships by shaping institutional incentives, regulatory enforcement, and transparency systems. Sustainable livelihood capacity and digital capability are enabling conditions that support the effective use of green financial services.

4.1. Green Financial Inclusion and Ecological Sustainability

Green financial inclusion can improve ecological sustainability by enabling households, firms, and entrepreneurs to invest in renewable energy, clean technologies, climate-resilient agriculture, and eco-friendly enterprise development. In financially excluded communities, households may continue using dirty fuels because cleaner alternatives are unaffordable. Small firms may continue using inefficient technologies because they lack access to investment capital. When financial services are designed with sustainability objectives, they can reduce these constraints and support ecological transition.

However, financial inclusion can also produce negative environmental outcomes if it increases consumption and production without environmental safeguards. For this reason, green financial inclusion must be distinguished from general financial inclusion. Green financial inclusion is not simply wider access to finance; it is wider access to finance that is environmentally directed, institutionally accountable, and innovation oriented.

Proposition 1: Green financial inclusion positively contributes to ecological sustainability when financial access supports renewable energy adoption, clean technologies, eco-friendly entrepreneurship, and environmentally responsible household behavior.

4.2. Eco-Innovation as a Mediating Mechanism

Eco-innovation is proposed as a key mechanism through which green financial inclusion affects ecological sustainability. Financial access allows firms to invest in cleaner technologies, redesign production systems, reduce waste, and develop green products. Without eco-innovation, finance may simply expand existing production systems, including environmentally harmful ones. Therefore, eco-innovation converts financial inclusion into environmental improvement.

This mediating logic is supported by research on financial inclusion and ecological footprint, green innovation and competitive advantage, green technological innovation, and circular economy implementation (Ali et al., 2024; Ragmoun, 2024a; Vu et al., 2023; Zhao et al., 2026). These studies suggest that finance becomes environmentally beneficial when it enables innovation that reduces ecological pressure.

Proposition 2: Eco-innovation mediates the relationship between green financial inclusion and ecological sustainability by converting financial access into cleaner technologies, green products, and resource-efficient production systems.

4.3. Clean Energy Transition as a Mediating Mechanism

Clean energy transition is another important mechanism linking green financial inclusion with ecological sustainability. Financial access can help households and firms move from polluting energy systems toward renewable and efficient alternatives. For households, green financial inclusion may support clean cooking fuel, solar home systems, and energy-efficient appliances. For firms, it may support renewable energy use, cleaner production, and energy-efficient supply chains.

Research on dirty versus clean cooking fuel, renewable energy and CO₂ emissions, natural resource rents and renewable energy transition, and green energy governance supports the importance of energy transition for sustainability (Ahmad et al., 2023; Bhatti et al., 2024; Hussain et al., 2021; Zafar et al., 2023). Clean energy transition is therefore not only a technological shift but also a financial, institutional, and behavioral process.

Proposition 3: Clean energy transition mediates the relationship between green financial inclusion and ecological sustainability by reducing dependence on fossil fuels, dirty cooking fuels, and carbon-intensive energy systems.

4.4. Moderating Role of Environmental Governance

Environmental governance determines whether financial inclusion supports ecological sustainability or intensifies ecological degradation. Strong governance can direct financial institutions toward green lending, renewable energy finance, environmental risk assessment, and sustainability disclosure. Weak governance may allow inclusive finance to support polluting industries, resource extraction, and unsustainable consumption.

Corporate governance and public governance studies reinforce this argument. IFRS adoption, audit quality, reporting transparency, e-government development, and secure property rights can improve accountability and reduce information asymmetry (Ahmed et al., 2024; Bhatti et al., 2025; Hussain et al., 2024; Mohammad, 2015). These governance mechanisms strengthen the credibility and effectiveness of green finance.

Proposition 4: Environmental governance strengthens the positive relationship between green financial inclusion and ecological sustainability by aligning financial incentives, regulations, disclosure systems, and institutional accountability with environmental objectives.

4.5. Sustainable Livelihood Capacity as an Enabling Condition

Sustainable livelihood capacity refers to the ability of households and communities to maintain income, food security, health, and resilience while using natural resources responsibly. In emerging economies, ecological sustainability cannot be separated from livelihood security. Financially vulnerable households may rely on environmentally harmful coping strategies when they face poverty, food

insecurity, or energy poverty. Therefore, the ecological benefits of green financial inclusion are likely to be stronger when households possess adequate livelihood capacity.

Research on women empowerment, food insecurity, livestock income, agricultural technology adoption, child health, and livelihood assets supports the importance of linking sustainability with household welfare (Ahmed et al., 2024; Gillani et al., 2021; Shen et al., 2025; Soharwardi & Ahmad, 2020). Green finance must therefore be connected with livelihood resilience rather than treated only as an environmental finance instrument.

Proposition 5: Sustainable livelihood capacity strengthens the ecological benefits of green financial inclusion by enabling households and communities to adopt environmentally responsible practices without sacrificing welfare, food security, and income stability.

4.6. Digital Capability and Human Capital

Digital capability and human capital are important enabling conditions for green financial inclusion. Digital finance can expand access to green credit and energy services, but users need digital literacy and awareness to benefit from these opportunities. Universities, training institutions, and leadership systems play an important role in building the skills required for green transition. Research on digital pedagogy, teacher development, Education 4.0, academic leadership, and workforce upskilling shows that technology adoption depends on learning capacity and institutional support (Abdulla et al., 2023; Alemán de la Garza et al., 2019; Chakravarti, 2020, 2022b; Chakravarti & Stevenson, 2022).

Digital transformation and big data analytics also improve sustainability by strengthening environmental monitoring, decision-making, innovation, and organizational resilience (Ragmoun, 2023, 2024a, 2024b). Therefore, green financial inclusion is more likely to support eco-innovation when households, firms, and institutions possess digital capability and sustainability-oriented human capital.

Proposition 6: Digital capability and sustainability-oriented human capital strengthen the relationship between green financial inclusion and eco-innovation by improving awareness, technology adoption, and effective use of green financial services.

5. Theoretical Contributions

This paper contributes to financial inclusion literature by extending the concept from a socio-economic development mechanism to an ecological transition mechanism. Traditional financial inclusion research emphasizes poverty reduction, entrepreneurship, credit access, savings behavior, and household welfare. This paper argues that financial inclusion must also be evaluated by its environmental direction. The concept of green financial inclusion advances this discussion by linking inclusive finance with clean energy, eco-innovation, green entrepreneurship, and sustainable livelihoods.

The paper also contributes to ecological modernization theory by identifying inclusive finance as a possible driver of environmental modernization. Ecological modernization literature emphasizes technological innovation, institutional reform, and cleaner production. This paper adds that such modernization may remain incomplete in emerging economies unless financially excluded households and small firms can access green financial resources. Thus, green financial inclusion broadens the social base of ecological modernization.

Another contribution is the integration of household-level and firm-level sustainability pathways. Many environmental economics studies focus on macro-level variables such as financial development, globalization, economic growth, and emissions. This paper integrates household clean fuel transition, sustainable livelihoods, firm-level eco-innovation, green supply chain practices, public governance, and corporate transparency. This multi-level approach is especially relevant for emerging economies where household welfare, energy poverty, and environmental degradation are deeply connected.

The paper further contributes by linking governance and transparency with green financial inclusion. Corporate governance, financial reporting quality, IFRS adoption, public governance, and environmental disclosure are usually examined separately from financial inclusion. This paper argues that they are essential for ensuring that inclusive finance is credible, accountable, and environmentally

directed. Without transparent governance, green financial inclusion may become a label rather than a transformative policy tool.

Finally, the paper contributes by incorporating digital capability and human capital into the green finance discussion. Digital education, academic leadership, workforce upskilling, big data analytics, and digital transformation are treated as enabling conditions for ecological transition. This broadens sustainability theory by showing that green financial inclusion depends not only on money and policy but also on knowledge, skills, learning, and technological capability.

6. Practical and Policy Implications

The framework has important implications for policymakers, financial regulators, development finance institutions, energy authorities, universities, and firms. Policymakers should align financial inclusion strategies with climate policy, renewable energy plans, environmental governance, and sustainable livelihood programs. Financial inclusion should not be assessed only through account ownership, credit access, and digital transactions. It should also be evaluated through its contribution to clean energy adoption, green entrepreneurship, climate resilience, and ecological sustainability.

Financial regulators and central banks should develop green financial inclusion guidelines. These may include green microfinance, renewable energy credit, climate risk disclosure, sustainability-linked lending, clean cooking finance, and environmental risk assessment for inclusive credit programs. Digital financial platforms should be used not only for consumption loans and payment access but also for green investment, clean energy financing, and climate insurance.

Energy policymakers should connect clean energy programs with financial inclusion. Clean cooking technologies, solar systems, and energy-efficient appliances may remain unaffordable for low-income households unless supported by credit, subsidies, installment payments, or targeted digital finance. Energy transition policies should therefore incorporate financial access as a central design component.

Universities and training institutions should support green financial inclusion by developing digital literacy, sustainability knowledge, and green entrepreneurship skills. Digital pedagogy, teacher development, and workforce upskilling can help households, entrepreneurs, and employees understand and use green financial services. Firms should also use green finance to redesign products, improve supply chains, reduce waste, and adopt resource-efficient production systems.

7. Future Research Agenda

Future research can test the proposed framework using country-level, firm-level, or household-level data. Panel studies examine the relationships among green financial inclusion, eco-innovation, clean energy transition, environmental governance, and ecological sustainability across emerging economies. Suitable methods include CS-ARDL, DCCE, AMG, CCEMG, system GMM, panel threshold regression, and method of moments quantile regression. These approaches can address cross-sectional dependence, heterogeneity, endogeneity, and distributional differences.

Survey-based studies may test the framework using PLS-SEM or CB-SEM. Household-level studies can examine whether green financial access improves clean cooking fuel adoption, renewable energy use, and sustainable livelihood practices. Firm-level studies can examine whether green credit and digital finance support eco-innovation, green product development, and sustainable supply chains. Mixed-method research may provide deeper insight into how households and firms understand green financial services.

Future studies should distinguish between general financial inclusion and green financial inclusion. Many existing studies use financial inclusion indicators without measuring whether finance is environmentally directed. New indicators should capture green microfinance, renewable energy loans, climate insurance, digital green finance, and sustainability-linked credit. Comparative regional studies across South Asia, ASEAN, MENA, BRICS, and resource-dependent economies would also help identify how institutional quality shapes the environmental effects of finance.

Future research should also examine gender, education, and livelihood pathways. Women often play a central role in household energy use, food security, and livelihood management. Therefore, women

empowerment may strengthen the relationship between green financial inclusion and clean energy transition. Similarly, digital education and sustainability-oriented human capital may improve the ability of households and firms to use green financial products effectively.

8. Conclusion

This paper developed a theoretical framework explaining how green financial inclusion can support ecological sustainability in emerging economies. The central argument is that financial inclusion does not automatically reduce ecological degradation. Its environmental value depends on whether financial services are linked with eco-innovation, clean energy transition, environmental governance, sustainable livelihoods, digital capability, and institutional transparency.

By integrating ecological modernization theory, financial inclusion theory, energy ladder theory, institutional theory, and the natural-resource-based view, the paper provides a multi-level explanation of ecological transition. Eco-innovation and clean energy transition are proposed as the main mechanisms through which green financial inclusion contributes to ecological sustainability. Environmental governance, sustainable livelihood capacity, and digital human capital are proposed as enabling conditions that strengthen these pathways.

The paper reframes financial inclusion as a sustainability-oriented concept rather than only a development tool. It connects macro-level environmental economics with household energy transition, firm-level innovation, public governance, corporate transparency, and higher education. The proposed framework offers a foundation for future empirical research and policy design in emerging economies. Inclusive finance can contribute meaningfully to ecological sustainability only when it becomes green, accountable, innovation-oriented, and livelihood-sensitive.

Conflict of Interests/Disclosures

The authors declared no potential conflicts of interest w.r.t the research, authorship and/or publication of this article.

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