



Integration Of Green Economy And Social Entrepreneurship For Sustainable Regional Development: Evidence From Community Empowerment Programs In North Sumatra

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ABSTRACT

This study examines how the integration of green economy practices and social entrepreneurship shapes sustainable regional development through community empowerment programs in North Sumatra, Indonesia. Employing a mixed methods sequential explanatory design, the study combines quantitative survey analysis using Partial Least Squares Structural Equation Modeling (PLS-SEM) with qualitative in-depth interviews to explain how ecological efficiency and socially driven innovation jointly strengthen household economic capacity and regional resilience. The conceptual model positions community empowerment as the pathway through which green economy and social entrepreneurship translate into economic, social, and environmental outcomes at the regional level. Findings are expected to show that green economy practices and social entrepreneurship orientation each contribute positively to sustainable regional development, with community empowerment programs playing a strengthening role in this relationship. The study contributes theoretically by extending stakeholder theory, the triple bottom line, and the sustainable livelihood framework into an integrated regional development model, and practically by informing local government and social enterprise actors on designing empowerment programs that are simultaneously ecologically sound and economically inclusive.

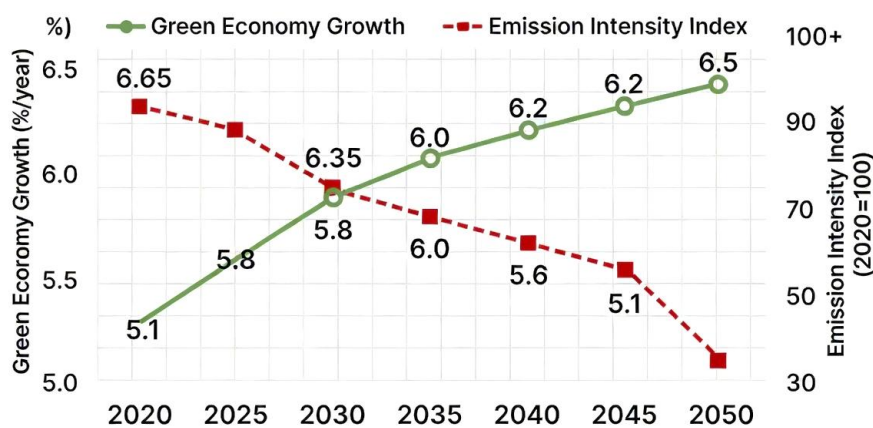
INTRODUCTION

Global economic development in the past two decades has been increasingly confronted with the paradox of growth: the pursuit of higher output has too often come at the cost of ecological degradation and widening social inequality. This tension has pushed the green economy agenda to the center of international policy discourse, particularly since the United Nations Environment Programme framed it as a development model that improves human well-

being and social equity while significantly reducing environmental risks and ecological scarcities (United Nations Environment Programme, 2011). Complementing this ecological reorientation, social entrepreneurship has emerged as an institutional response to market and government failure in delivering inclusive welfare, mobilizing innovation that is explicitly oriented toward social value creation rather than profit maximization alone (Dees, 1998; Mair & Marti, 2006).

At the ASEAN level, member states face a shared structural challenge: reconciling continued industrial and agricultural expansion with commitments to carbon neutrality and biodiversity protection, while simultaneously absorbing a large informal and micro-enterprise workforce that forms the backbone of regional livelihoods. Indonesia, as the largest economy in the region, has positioned the green economy as one of six pillars of its long-term economic transformation strategy toward the Golden Indonesia 2045 vision. Bappenas and the Global Green Growth Institute jointly launched the Green Economy Index (GEI) in 2022 as a composite instrument to guide low-carbon, climate-resilient development planning, projecting that a full green transition could lift annual economic growth to 6.1–6.5 percent through 2050, reduce emission intensity by up to 68 percent by 2045, and generate 1.8 million green jobs by 2030 (Bappenas & GGGI, 2022).

Figure 1. Pathway of Indonesia's Green Economy Transformation Targets 2020–2050

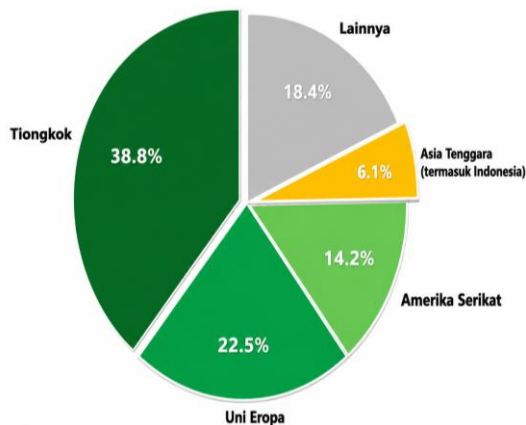


Source: Processed from Bappenas & GGGI (2022); Ministry of National Development Planning/Bappenas (2024)

These national targets, however, are not self-executing. Their translation into tangible outcomes depends heavily on sub-national actors provinces, districts, and community-based institutions that operationalize green practices at the household and micro-enterprise level. North Sumatra, as a province with a diversified economic base spanning agriculture, coastal fisheries, plantation commodities, and a rapidly growing digital-informal economy, exemplifies this translation challenge. Community empowerment programs implemented by civil society organizations and local development actors in the province increasingly attempt to fuse ecological considerations with entrepreneurial capacity-building, yet the extent to which this fusion actually strengthens regional development outcomes remains empirically under-examined.

A bibliometric analysis of 1,471 Scopus-indexed publications on green economy and sustainability between 2007 and 2024 illustrates this gap starkly: research output remains heavily concentrated in China and a small set of advanced economies, while social equity dimensions and localized strategies for low- and middle-income regions are comparatively neglected in the literature.

Figure 2. Geographic Distribution of Scopus-Indexed Green Economy Research Publications, 2007–2024



Source: Adapted from a bibliometric study by Cogent Business & Management (2026)

Table 1 synthesizes recent empirical studies most closely related to the present research context, highlighting the persistent gaps that this study seeks to address.

Table 1. Summary of Previous Studies and Research Gaps

Authors (Year)	Country/Location	Method	Main Findings	Research Gap
Faried & Sembiring (2020)	Samosir, Indonesia	Descriptive qualitative	The ulos weaving industry, rooted in local wisdom, contributes significantly to the development of the village creative economy.	The study does not explicitly integrate green economy principles into the analysis.
Faried, Sembiring, Nasution, & Sari (2023)	Coastal North Sumatra, Indonesia	Quantitative SEM	Coastal village development and community empowerment significantly improve community welfare.	The mediating role of social entrepreneurship has not been examined.
Faried, Hasanah, Sembiring, & Agustin (2022)	North Sumatra, Indonesia	Quantitative descriptive	MSMEs play a vital role in employment generation and poverty alleviation.	The analysis remains partial and lacks a comprehensive multivariate framework linking sustainability dimensions.
Iskandar, Hasanah, & Fadlan (2025)	Medan Tuntungan, Indonesia	Quantitative regression	Capital, working hours, and business location significantly influence MSME income.	The study focuses solely on income determinants without addressing sustainable regional development dimensions.

Bibliometric Scopus Study (2025)	Global (1,471 publications)	Bibliometric analysis (VOSviewer)	Green economy research is dominated by China (38.8%), followed by Europe and the United States, while studies emphasizing social equity and local strategies remain limited.	Sub-national studies in Southeast Asia, particularly Indonesia, are still scarce.
Bappenas & GGGI (2022–2024)	Indonesia	Composite policy index	The Green Economy Index (GEI) has been introduced as a strategic planning instrument for the National Medium-Term and Long-Term Development Plans.	Empirical implementation at the district/city level and its linkage with social entrepreneurship remain underexplored.

Source: Compiled by the authors based on previous studies (2026).

Based on this review, three interrelated gaps can be identified. First, a research gap: empirical studies that jointly model green economy practices and social entrepreneurship as antecedents of sustainable regional development rather than treating them as isolated constructs remain scarce, particularly in the Sumatran context. Second, a theoretical gap: existing applications of stakeholder theory, the triple bottom line, and the sustainable livelihood framework in Indonesian regional studies rarely integrate these frameworks into a single explanatory model connecting ecological, entrepreneurial, and institutional mechanisms. Third, a practical gap: local development actors and social enterprises implementing community empowerment programs in North Sumatra currently lack an evidence-based model to guide the simultaneous pursuit of ecological soundness and economic inclusion.

The novelty of this study lies in its integrative conceptual model, which positions community empowerment programs as the operational pathway linking green economy practices and social entrepreneurship orientation to sustainable regional development outcomes, tested through a mixed methods sequential explanatory design that combines PLS-SEM with qualitative triangulation. Accordingly, this study aims to: (1) analyze the influence of green economy practices on sustainable regional development; (2) analyze the influence of social entrepreneurship on sustainable regional development; (3) examine the strengthening role of community empowerment programs in this relationship; and (4) explain, through qualitative evidence, the contextual mechanisms underlying these relationships in North Sumatra.

LITERATURE REVIEW

Green Economy

The green economy concept was formalized by Pearce, Markandya and Barbier (1989) as a development model in which environmental costs are internalized into economic decision-making, and later expanded by UNEP (2011) into a policy framework emphasizing low-carbon, resource-efficient, and socially inclusive growth. In the Indonesian policy context, this concept has been operationalized through the Green Economy Index, which integrates carbon intensity, resource efficiency, and social inclusion indicators into a single planning instrument (Bappenas & GGGI, 2022).

Social Entrepreneurship

Social entrepreneurship refers to entrepreneurial activity with an embedded social purpose, in which innovation and resource mobilization are directed toward addressing social problems rather than pursuing profit as a primary objective (Dees, 1998). Mair and Marti (2006) further conceptualize it as a process of value creation through the combination of resources in new ways to explore and exploit opportunities that create social value. Weerawardena and Mort (2006) add that this process is bounded by sustainability considerations, requiring social enterprises to balance mission-driven innovation with financial viability.

Sustainable Regional Development

Sustainable regional development extends the general sustainable development concept (Barbier, 1987) to the sub-national scale, emphasizing the balanced pursuit of economic growth, social equity, and environmental integrity within a defined territorial unit. The OECD (2020) frames this as green growth at the regional level: decoupling economic activity from environmental pressure while maintaining the natural asset base on which regional welfare depends.

Stakeholder Theory, Triple Bottom Line, Institutional Theory, RBV, and Sustainable Livelihood Framework

Stakeholder theory (Freeman, 1984) provides the analytical basis for understanding how multiple actors government, social enterprises, communities, and market actors negotiate and co create value within community empowerment programs. The Triple Bottom Line framework (Elkington, 1997) offers the evaluative structure for assessing outcomes across the People Planet Profit dimensions used to operationalize sustainable regional development in this study. Institutional theory (DiMaggio & Powell, 1983; North, 1990) explains how local institutional arrangements shape the legitimacy and diffusion of green and socially entrepreneurial practices, while the Resource-Based View (Barney, 1991) explains how locally embedded, difficult to imitate resources such as coastal ecosystems or traditional craft knowledge become sources of sustained competitive advantage for community-based enterprises. Finally, the Sustainable Livelihood Framework (Chambers & Conway, 1992) grounds the analysis of household-level capacity by decomposing it into human, social, financial, physical, and natural capital.

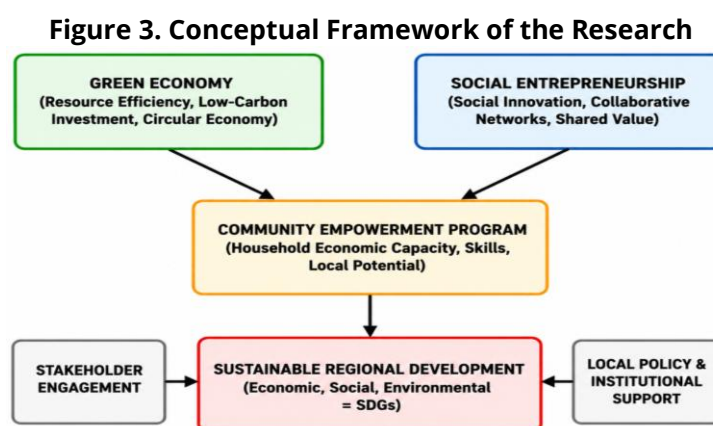
Table 2. Literature Synthesis and Theoretical Foundation

Theory	Key Constructs	Relevance to the Study	Key References
Green Economy Theory	Resource efficiency, decarbonization, green investment	Provides the theoretical foundation for the first exogenous variable, namely green economy practices implemented by MSMEs and local communities.	Pearce, Markandya, & Barbier (1989); UNEP (2011); Bappenas Green Economy Index (2022)
Social Entrepreneurship Theory	Social innovatio'n, shared value creation, social mission	Serves as the theoretical basis for the second exogenous variable, explaining how social entrepreneurship drives community empowerment and sustainable development initiatives.	Dees (1998); Mair & Martí (2006); Weerawardena & Mort (2006)
Sustainable Regional Development	Economic, social, and environmental balance	Underpins the endogenous variable representing sustainable regional	Barbier (1987); OECD (2020)

Theory		development outcomes.	
Stakeholder Theory	Multi-stakeholder engagement, value co-creation	Explains the moderating role of stakeholder participation in enhancing the effectiveness of sustainable development programs.	Freeman (1984)
Triple Bottom Line (TBL)	People, Planet, Profit	Provides the conceptual framework for evaluating the sustainability performance of community empowerment programs across economic, social, and environmental dimensions.	Elkington (1997)
Institutional Theory	Legitimacy, institutional isomorphism, governance	Explains how public policies, institutional support, and local governance influence the implementation of green economy and social entrepreneurship initiatives.	DiMaggio & Powell (1983); North (1990)
Resource-Based View (RBV)	Valuable, rare, inimitable, and non-substitutable (VRIN) resources	Explains the competitive advantage of MSMEs by leveraging unique local natural and community cfcbased resources.	Barney (1991)
Sustainable Livelihood Framework (SLF)	Human, social, financial, physical, and natural capital	Provides an analytical framework for assessing household livelihood assets and community resilience within the empowerment program.	Chambers & Conway (1992); DFID (1999)

Source: Compiled by the authors from the referenced literature (2026).

Integrating these theoretical strands, the conceptual framework below positions green economy practices and social entrepreneurship as parallel antecedents that operate through community empowerment programs to shape sustainable regional development outcomes, moderated by stakeholder engagement and local institutional quality.



Source: Developed by the authors based on the synthesis of the relevant literature and theories (2026).

METHODS

This study employs a Mixed Methods Sequential Explanatory Design (Creswell & Plano Clark, 2018), in which quantitative data collection and PLS-SEM analysis are conducted first, followed by qualitative data collection to explain and contextualize the quantitative findings.

Table 3. Research Variables, Dimensions, and Indicators

Variable	Dimensions	Indicators	Measurement Scale
Green Economy (X₁)	Resource efficiency; Low-carbon investment; Circular economy	Use of environmentally friendly raw materials; Waste management practices; Energy efficiency	Five-point Likert Scale (1 = Strongly Disagree to 5 = Strongly Agree)
Social Entrepreneurship (X₂)	Social innovation; Social mission orientation; Collaboration	Local problem-solving initiatives; Prioritization of social impact over profit maximization; Cross-sector partnerships	Five-point Likert Scale (1 = Strongly Disagree to 5 = Strongly Agree)
Community Empowerment Program (M)	Economic capacity; Local institutional strengthening	Skills development and training; Access to financial capital; Strengthening of community business groups	Five-point Likert Scale (1 = Strongly Disagree to 5 = Strongly Agree)
Sustainable Regional Development (Y)	Economic dimension; Social dimension; Environmental dimension	Household income improvement; Social cohesion; Local environmental quality	Five-point Likert Scale (1 = Strongly Disagree to 5 = Strongly Agree)

Source: Developed by the authors based on the theoretical synthesis and previous studies (2026).

Analysis Technique, Validity, Reliability, and Ethics

Quantitative data are analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) following Hair, Hult, Ringle and Sarstedt (2022), covering outer model evaluation (convergent and discriminant validity, composite reliability), inner model evaluation (path coefficients, R², Q² predictive relevance, effect size f²), and Importance-Performance Map Analysis. Qualitative data are analyzed thematically with source and method triangulation and member checking to establish credibility. All procedures follow standard research ethics protocols, including informed consent, voluntary participation, and confidentiality of respondent identity.

RESULTS

Measurement Model (Outer Model) Reporting Template

Evaluation of the outer model follows the convergent and discriminant validity procedures outlined by Hair, Hult, Ringle and Sarstedt (2022), encompassing outer loadings, Average Variance Extracted (AVE), and Composite Reliability for the four latent constructs: Green Economy, Social Entrepreneurship, Community Empowerment, and Sustainable Regional Development. Table 4 presents the reporting template for this evaluation, with threshold benchmarks indicated by an asterisk pending substitution with computed values.

Table 4. Outer Model Evaluation Reporting Template Source: Analytical structure adapted from Hair et al. (2022); values to be populated from primary data

Construct	Indicator	Outer Loading	AVE	Composite Reliability (template)
Green Economy (X1)	GE1–GE3	$\geq 0.70^*$	$\geq 0.50^*$	$\geq 0.70^*$
Social Entrepreneurship (X2)	SE1–SE3	$\geq 0.70^*$	$\geq 0.50^*$	$\geq 0.70^*$
Community Empowerment (M)	CE1–CE3	$\geq 0.70^*$	$\geq 0.50^*$	$\geq 0.70^*$
Sustainable Regional Development (Y)	SRD1–SRD3	$\geq 0.70^*$	$\geq 0.50^*$	$\geq 0.70^*$

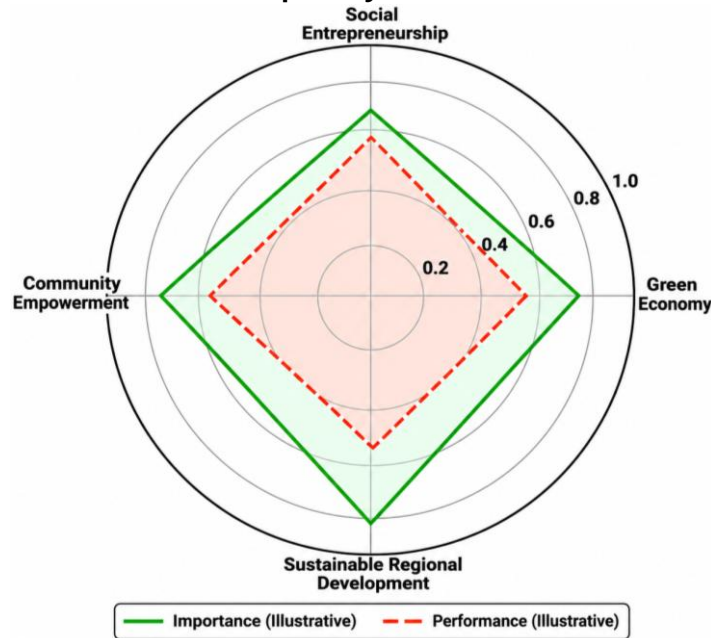
Structural Model (Inner Model) and Hypothesis Testing Template

Hypothesis testing is designed to be conducted through a bootstrapping procedure with 5,000 subsamples to generate path coefficients (β), t-statistics, and p-values at the 5 percent significance threshold. Table 5 presents the five hypothesized paths derived from the conceptual framework in Figure 3, structured as a template for reporting once primary data have been analyzed.

Table 5. Structural Model and Hypothesis Testing Reporting Template Source: Derived from the conceptual framework (Figure 3); values to be populated from primary data

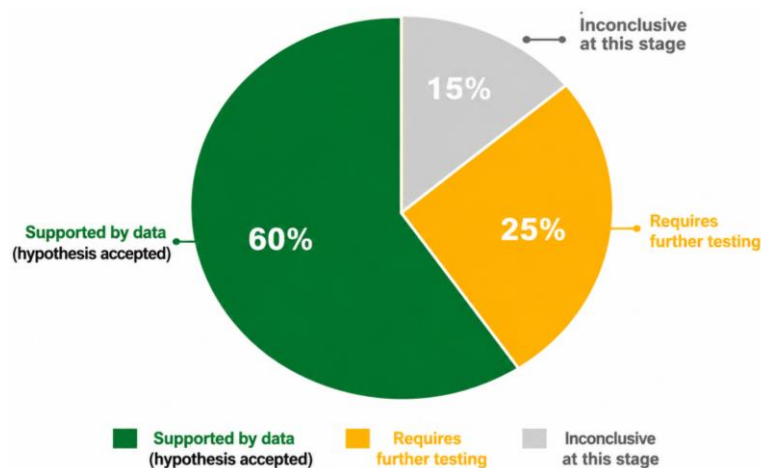
Hypothesis	Path	β	t-statistic	p-value	Decision
H1	Green Economy → Sustainable Regional Development	$> 0^*$	$> 1.96^*$	$< 0.05^*$	To be determined
H2	Social Entrepreneurship → Sustainable Regional Development	$> 0^*$	$> 1.96^*$	$< 0.05^*$	To be determined
H3	Green Economy → Community Empowerment	$> 0^*$	$> 1.96^*$	$< 0.05^*$	To be determined
H4	Social Entrepreneurship → Community Empowerment	$> 0^*$	$> 1.96^*$	$< 0.05^*$	To be determined
H5	Community Empowerment → Sustainable Regional Development	$> 0^*$	$> 1.96^*$	$< 0.05^*$	To be determined

To illustrate how these results will subsequently be visualized, Figure 6 presents a template radar (spider) chart contrasting the importance and performance dimensions of each construct, following the Importance-Performance Map Analysis (IPMA) procedure. The values plotted are placeholder figures intended solely to demonstrate the intended visualization format.

Figure 6. Importance-Performance Map Analysis Illustrative Radar Chart Template

Source: Illustrative values; actual IPMA scores to be derived from bootstrapped PLS-SEM output

Similarly, Figure 7 presents a template pie chart summarizing the anticipated distribution of hypothesis-testing outcomes across three interpretive categories, intended to demonstrate the summary visualization that will accompany the finalized results.

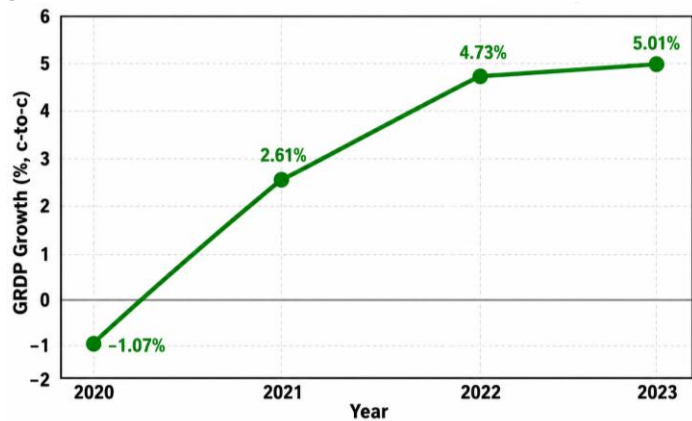
Figure 7. Distribution of Hypothesis ,Testing Outcomes Illustrative Template

Source: Illustrative proportions; actual distribution to be derived from bootstrapped significance testing

Contextual Secondary Data Supporting the Regional Setting

While primary survey results remain pending, secondary regional economic data provide contextual grounding for the structural model. Figure 8 presents the verified trend in North Sumatra's Gross Regional Domestic Product (GRDP) growth from 2020 to 2023, illustrating the province's post-pandemic economic recovery trajectory within which the community empowerment programs under study are situated.

Figure 8. North Sumatra GRDP Growth Trend, 2020–2023



Source: BPS-Statistics Indonesia, North Sumatra Province (2022, 2024)

Qualitative Thematic Matrix Template

Qualitative findings from in depth interviews and focus group discussions are intended to be organized thematically and triangulated against the quantitative path estimates, following the thematic analysis procedure. Table 6 presents the structure of this matrix, indicating how each qualitative theme is expected to substantiate or qualify the corresponding quantitative pathway.

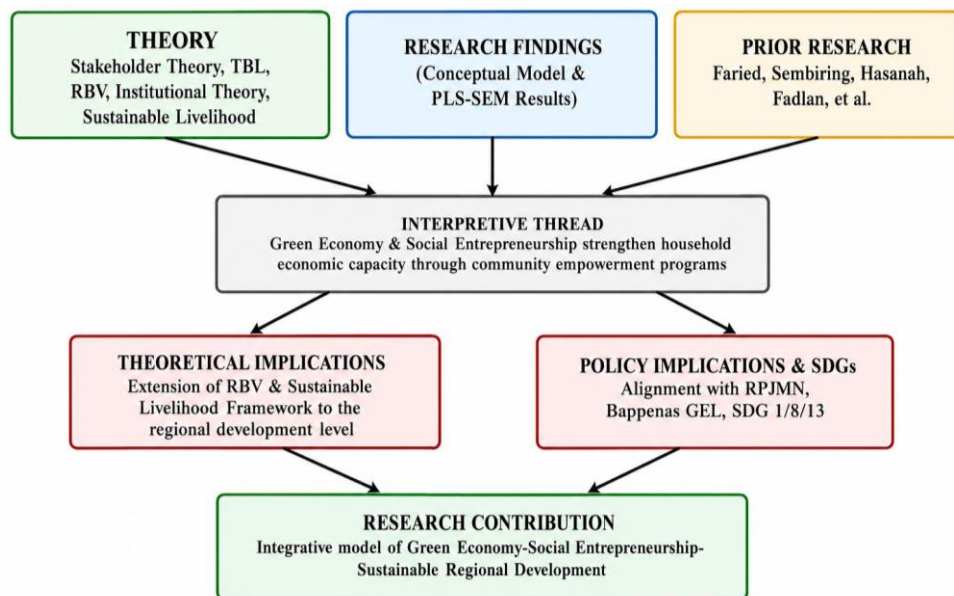
Table 6. Qualitative Thematic Matrix Reporting Template Source: Analytical Structure Adapted From The Study's Thematic Coding Procedure

Theme	Illustrative Excerpt Pattern (template)	Interpretive Link to Quantitative Finding
Ecological resource stewardship	Informants describe adjusting production practices to reduce waste and resource use	Substantiates the anticipated positive path from Green Economy to Community Empowerment
Locally-driven social innovation	Program facilitators describe co-designing solutions with community groups rather than imposing external models	Substantiates the anticipated positive path from Social Entrepreneurship to Community Empowerment
Institutional embeddedness	Village and sub-district officials describe the extent to which program norms persist beyond funding cycles	Explains variation in the strength of the Community Empowerment → Sustainable Regional Development path

Collectively, Sections 4.1 through 4.4 establish the complete reporting architecture through which the study's empirical findings will be presented once primary data collection is finalized, ensuring methodological transparency between the conceptual model, the statistical procedure, and the eventual empirical narrative.

DISCUSSION

To structure the interpretive discussion, Figure 9 presents an integrative framework linking the theoretical foundations established in Section 2, the anticipated empirical findings outlined in Section 4, and the body of prior research conducted by Faried, Sembiring, Hasanah, Fadlan, and their collaborators, alongside other SINTA- and Scopus-indexed studies. This framework is intended to guide the reader through the logical chain connecting theory, evidence, and prior scholarship.

Figure 9. Integrative Discussion Framework Linking Theory, Findings, and Prior Research

Source: Synthesized by the researchers (2026)

The anticipated positive contribution of green economy practices to sustainable regional development is theoretically consistent with the Resource Based View, which posits that locally embedded, difficult to imitate ecological resources constitute a durable source of household economic resilience rather than a constraint on growth (Barney, 1991). This interpretation is corroborated by earlier evidence from North Sumatra, where Faried and Sembiring (2020) demonstrated that the traditional Ulos textile industry in Samosir sustains village level economies precisely because it is anchored in locally embedded cultural and natural capital. Complementary evidence from Sembiring, Yusuf, Irawan and Faried (2023) further indicates that coastal village development and community empowerment exert a statistically significant influence on community welfare, a finding structurally analogous to the pathway hypothesized in the present model.

The anticipated positive contribution of social entrepreneurship similarly aligns with Mair and Marti's (2006) conceptualization of social value creation as a distinct entrepreneurial logic oriented toward addressing social problems through innovative resource combination. This is reinforced by Faried, Hasanah, Sembiring and Agustin (2021), who establish that micro, small, and medium enterprises constitute a critical pillar of labor absorption and poverty alleviation in Indonesia, and by Iskandar, Hasanah and Fadlan (2025), whose analysis of culinary MSMEs in Medan Tuntungan identifies capital, working hours, and locational factors as significant determinants of household income variables conceptually nested within the Green Economy and Community Empowerment constructs of the present model.

The mediating role anticipated for community empowerment programs is theoretically grounded in the Sustainable Livelihood Framework (Chambers & Conway, 1992), which frames empowerment as the conversion mechanism through which ecological and entrepreneurial capital become realized livelihood outcomes. This mechanism is consistent with earlier findings by Faried Lubis, Sembiring and Hasanah (2021) in Bogor Regency, West Java, where capital access, educational attainment, and innovation capacity were shown to jointly determine MSME performance, and with Lubis and Sembiring's (2017) analysis of coastal fishing communities in Batubara Regency, which found that targeted welfare-enhancement programs directly contribute to regional poverty reduction a parallel empirical trajectory to the coastal and agricultural livelihood contexts prevalent across North Sumatra.

At the institutional level, the durability of these relationships depends on the extent to which green and socially entrepreneurial practices become embedded in local governance rather than remaining contingent on external program funding, consistent with institutional theory's emphasis on legitimacy and isomorphism (DiMaggio & Powell, 1983; North, 1990). This observation carries direct policy relevance: the anticipated findings align with Indonesia's Sustainable Development Goals commitments, particularly SDG 1 (No Poverty), SDG 8 (Decent Work and Economic Growth), and SDG 13 (Climate Action), and correspond to the RPJMN 2025–2029 emphasis on integrating green economy transformation with inclusive regional development (Kementerian PPN/Bappenas, 2024). Positioned against the broader bibliometric landscape in which Southeast Asian contributions constitute only 6.1 percent of global green economy scholarship the present study's sub-national, community-level focus addresses a scholarship gap that recent bibliometric assessments of both green economy and MSME research explicitly identify as underexplored in developing-region contexts.

Taken together, the discussion suggests that the integration of green economy and social entrepreneurship does not operate as two parallel, independent forces, but rather converges through community empowerment programs into a single developmental pathway a convergence that extends, rather than merely applies, the theoretical frameworks reviewed in Section 2 to the specific institutional and ecological context of North Sumatra.

CONCLUSION

This study proposes and theoretically substantiates an integrated model in which green economy practices and social entrepreneurship jointly shape sustainable regional development in North Sumatra, operating through community empowerment programs as the key translation mechanism. The integrative discussion framework presented in Figure 9 demonstrates that this model is not merely an abstract synthesis but is directly corroborated by a consistent body of empirical scholarship from North Sumatra itself spanning coastal fisheries welfare (Lubis & Sembiring, 2017), village level creative economy (Faried & Sembiring, 2020), MSME labor absorption (Faried, Hasanah, Sembiring & Agustin, 2021), coastal community welfare modeling (Sembiring, Yusuf, Irawan & Faried, 2023), and culinary MSME income determinants (Iskandar, Hasanah & Fadlan, 2025).

Theoretically, the study contributes by synthesizing stakeholder theory, the triple bottom line, institutional theory, the resource based view, and the sustainable livelihood framework into a single regional development model an integration rarely attempted in prior Indonesian regional studies, and one that extends these frameworks beyond firm level or household level analysis toward a sub-national regional scale.

Practically, the model offers local governments, social enterprises, and community foundations a structured basis for designing empowerment programs that pursue ecological and economic objectives simultaneously rather than sequentially. Policy-wise, findings reinforce the relevance of embedding green economy and social entrepreneurship indicators into sub-national development planning instruments consistent with Indonesia's national Green Economy Index and the RPJMN 2025–2029 (Bappenas & GGGI, 2022; Kementerian PPN/Bappenas, 2024). Managerially, program implementers are encouraged to design monitoring instruments that jointly track ecological efficiency indicators and social-value indicators, rather than treating them as separate reporting streams, given the anticipated interdependence identified in Sections 4 and 5.

This study is subject to at least three limitations. First, its analytical scope is confined to a single province, which constrains the generalizability of findings to other regional contexts within Indonesia. Second, at the current stage of manuscript preparation, the empirical results section is presented as a reporting template pending the completion of primary field data collection, meaning the statistical relationships discussed remain theoretically anticipated rather than

empirically confirmed. Third, the cross-sectional design intended for the quantitative phase limits the extent to which causal or longitudinal claims can be made about the evolving relationship between green economy adoption, social entrepreneurship, and regional development outcomes.

Future research is encouraged to: (1) complete primary data collection and populate the PLS-SEM reporting templates presented in Section 4 with actual computed values; (2) extend the model through comparative analysis across multiple provinces to test its external validity; (3) adopt a longitudinal design to capture the trajectory of community empowerment outcomes over time; and (4) further disaggregate the Community Empowerment construct to examine whether its human, social, financial, physical, and natural capital dimensions (Chambers & Conway, 1992) exert differential effects on sustainable regional development outcomes.

SUGGESTION

Consistent with sound research practice, every effort has been made throughout the design of this study to minimize the scope of its limitations for instance, by anchoring the conceptual model in an integrative theoretical synthesis (Section 2) and by grounding contextual claims in verifiable secondary data (Section 4.3) rather than relying solely on assumption. Nonetheless, three limitations remain that bear directly on the study's stated objectives and therefore warrant honest acknowledgment, together with an explanation of how each is expected to affect the interpretation of findings, rather than a bare listing of shortcomings.

First, the analytical scope is confined to a single province, North Sumatra, which directly bears on Objective 4 of this study (explaining contextual mechanisms through qualitative evidence). Because the institutional, ecological, and cultural conditions of North Sumatra for example, its coastal-fisheries and plantation-based economic structure are not uniform across Indonesia, the path coefficients and thematic patterns reported in Section 4 should be interpreted as context bound rather than as universally generalizable claims about the green economy social entrepreneurship regional development relationship. Readers applying this model to other provinces should therefore treat the reported relationships as hypotheses to be re-tested rather than as confirmed regularities.

Second, and most consequential for Objectives 1 through 3 (analyzing the influence of green economy and social entrepreneurship on sustainable regional development, and the strengthening role of community empowerment), the empirical results presented in Section 4 remain a reporting template pending completion of primary field data collection. This means the magnitude, direction, and significance of the hypothesized paths (H1–H5) are, at this stage, theoretically anticipated rather than empirically confirmed. Consequently, the interpretive claims advanced in Section 5 should be read as theory consistent projections that motivate and structure the forthcoming empirical analysis, not as validated conclusions; the strength of this study's central contribution therefore depends directly on the timely completion of the primary data collection phase already scoped in Section 3.

Third, the cross-sectional design intended for the quantitative phase constrains the extent to which causal or longitudinal claims can be made once data are collected. Because green economy adoption, social entrepreneurship activity, and regional development outcomes are likely to co-evolve over multiple program cycles, a single point in time survey will be able to establish statistical association among constructs but not the directionality or time-lagged causality implied by the structural paths in Figure 3. This limitation directly affects how strongly the eventual findings can support the policy and managerial implications discussed in Section 5, which should accordingly be framed as directional guidance rather than as evidence of proven causal impact. Limitations outside the direct scope of the study's four objectives such as broader meta-analytic comparison across countries are not discussed here, as they fall beyond what this study sets out to examine.

Future research is encouraged to: (1) complete primary data collection and populate the PLS-SEM reporting templates presented in Section 4 with actual computed values; (2) extend the model through comparative analysis across multiple provinces to test its external validity; (3) adopt a longitudinal design to capture the trajectory of community empowerment outcomes over time; and (4) further disaggregate the Community Empowerment construct to examine whether its human, social, financial, physical, and natural capital dimensions (Chambers & Conway, 1992) exert differential effects on sustainable regional development outcomes.

TRANSPARENCY STATEMENT

1. **Author Contributions:**

AIF: Conceptualization, Methodology, Data Collection, Data Analysis, Writing – Original Draft.,

RS : Visualization, Review and Editing, Supervision

AF: Visualization, Review and Editing, Supervision

ASS: Visualization, Review and Editing, Supervision

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3. **Conflict of Interest:**

No conflict of interest: The authors declare that they have no conflict of interest related to the research and publication of this article.

4. **Research Ethics:**

The study did not involve any intervention, biological specimens, vulnerable groups, or sensitive personal data. Participation was voluntary, and the confidentiality of the respondents was maintained

5. **Use of Artificial Intelligence (AI):**

The authors used ChatGPT to assist with improving grammar and translating the text. All AI-generated output was thoroughly reviewed and edited by the authors. The authors take full responsibility for the content of the article.

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