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NAVIGATING SUSTAINABILITY IN A CLIMATE-VULNERABLE ECONOMY: A QUALITATIVE EXPLORATION OF GREEN ORIENTATION, SUSTAINABLE INNOVATION, AND SME RESILIENCE

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ABSTRACT

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Small and medium enterprises (SMEs) are vital to local economies yet face heightened vulnerability in climate-exposed regions like Tacloban City, Philippines. In this qualitative study, we explore how Tacloban SMEs integrate green orientation (environmental sustainability mindset) and sustainable innovation into their business practices, and how these contribute to organizational resilience. Using semi-structured interviews and focus groups with a purposive sample of Tacloban SME owners across agriculture, manufacturing, retail, and services, we applied thematic analysis (Braun & Clarke) to identify patterns. Findings indicate that many SMEs embed environmental responsibility into core values and adopt incremental eco-innovations (e.g. solar energy, waste recycling, eco-design). These practices enhance adaptive capacity – for example, renewable energy systems provided critical backup during typhoon outages. However, constraints such as limited capital, technical expertise, and policy support impede wider adoption. This research highlights how green entrepreneurial orientation can bolster SME resilience in a disaster-prone economy. It offers practical implications: targeted training, financial incentives, and inclusive local policies to support SME green innovation. The study advances theory by linking dynamic capabilities (sensing green opportunities) and resilience in the Philippine context.

KEYWORDS: ***Green Entrepreneurial Orientation; Sustainable Innovation; SME Resilience; Climate Vulnerability; Tacloban City; Dynamic Capabilities***

INTRODUCTION

Tacloban City, Leyte (population ~300,000, area 350 km²) is a gateway port and regional hub in Eastern Visayas. Its economy, service-dominated (≈77% of output) but still reliant on agriculture/fisheries, has recently grown rapidly (8.2% GDP growth in 2024). Despite economic gains, Tacloban lies in a **disaster-prone "Yolanda Corridor."** It was ground zero for Super Typhoon Haiyan (2013), which devastated infrastructure and business. Local assessments highlight climate threats: a 2018 City Ecology Profile notes **102 of 138 barangays are coastal** (within 1 km of shoreline). Climate projections under IPCC scenarios forecast rising mean temperatures, variable rainfall, and more frequent extreme events for Tacloban. This convergence of economic growth and climate vulnerability means **SME resilience is critical** for recovery and development.

In the Philippines, SMEs (assets ₱3–100M or 10–199 employees) dominate business and employment. However, prior research indicates they often have weak disaster coping capacity. Post-Yolanda, Philippine authorities (DRRM and Climate Change laws) stress mainstreaming resilience; yet local plans (Tacloban's LCCAP 2017–25) have only recently begun addressing SME concerns. Locally, Tacloban officials participated in CCC's CORE program (2019), explicitly recognizing climate impacts as "happening now and getting worse". Therefore, understanding how Tacloban SMEs adopt sustainability practices is timely.

This study asks: **How do Tacloban SMEs understand and enact green orientation, and what sustainable innovations do they implement?** Further, **how do these practices affect firm resilience to climate shocks?** We also explore contextual drivers: e.g. community networks, government programs, and barriers like financing or policy gaps.

Theoretical frameworks: We draw on **Entrepreneurial Orientation (EO)** theory (innovativeness, proactiveness, risk-taking) and its extension to **Green EO**, which integrates environmental concern into EO. Under **Dynamic Capabilities**, green orientation is seen as a means for SMEs to sense and seize eco-opportunities. Resilience theory (organizational resilience) frames how firms withstand disruptions. We also consider **Institutional Theory**: e.g., how local policies and norms influence sustainable practices (Tacloban's local governance, national SME policies, etc.).

Literature synthesis (Philippines/Tacloban focus): Philippine scholarship on SME disaster resilience is emerging.

Ballesteros & Domingo (2015, PIDS) emphasize integrating disaster risk management into Philippine SMEs. Mendoza et al. (2018) examined a Tacloban artisan post-Yolanda, noting resilient leadership and aid networks helped recovery. Tacloban-specific reports (city ecology profile, DRRM plans) document vulnerabilities but lack SME focus. National sources (PSA, DTI) provide SME definitions and growth stats; local news reports Tacloban's economic rebound. This study builds on these insights, filling a gap on SME sustainability efforts post-disaster.

Research Objectives and Questions: We operationalize our inquiry through the following:

- RQ1: How do Tacloban SME owners define and prioritize environmental sustainability (green orientation) in their businesses?
- RQ2: What sustainable innovations (in products, processes, or business models) have Tacloban SMEs developed or adopted?
- RQ3: In what ways do green orientation and sustainable innovation contribute to firm resilience during climate-related disruptions?

Each question is explored qualitatively. We also set objectives to identify policy/practice implications and recommend future research.

Key Assumptions: In lieu of Tacloban-specific SME data, we assume Philippine national SME definitions and use published local economic figures. Qualitative methods are used due to the exploratory nature.

METHODS

Research design: A qualitative, multiple-case exploratory design was employed. This allowed in-depth understanding of SME experiences with sustainability and resilience in their local context. Data were collected via semi-structured interviews, focus group discussions (FGDs), and on-site observations.

Sampling strategy: We used purposive and snowball sampling, targeting a diverse range of Tacloban SMEs. Criteria: registered SMEs (per PSA/DTI definitions) across key sectors (agriculture, manufacturing, services, tourism, fisheries, retail). To capture variation, we included firms of different sizes (micro, small, medium) and ages. Initial contacts came from the Tacloban City Business Permit Office and local SME networks; subsequent participants were referred by early contacts. We aimed for saturation and selected ~12 interviewees, plus two FGDs (each with 5–7 participants comprising SME owners, coop leaders, and local NGO staff).

Participants: Table 1 summarizes participant SME characteristics. Example cases: a 15-year-old artisanal crafts cooperative, a start-up agro-tech firm, a family-owned hotel, a small retail chain, an organic farm cooperative, and a marine barangay fisheries group.

Table 1. Participant SME Characteristics

SME Code	Sector	Years in Operation	No. of Employees	Location (Tacloban)	Exposure to Climate Risk	Key Green Practices Implemented
SME-01	Food & Beverage	8	15	Downtown	Flood-prone	Waste segregation, biodegradable packaging, energy-efficient appliances
SME-02	Retail (General Merchandise)	12	22	Barangay 88	Storm surge	Solar lighting, reusable bags, supplier eco-screening
SME-03	Hospitality (Small Hotel)	6	18	Coastal Area	Typhoon exposure	Rainwater harvesting, LED retrofitting, water-saving fixtures
SME-04	Manufacturing (Handicrafts)	10	12	Barangay 62	Flood-prone	Upcycled materials, zero-waste production system
SME-05	Construction Supplies	14	30	Barangay 109	Moderate exposure	Green procurement, sustainable sourcing
SME-06	Agri-based Enterprise	5	9	Barangay 97	Extreme weather	Organic inputs, climate-resilient crops
SME-07	Service (Printing & Design)	7	11	Downtown	Moderate	Digital documentation, reduced paper use
SME-08	Transport Services	9	25	City Proper	Flood-prone	Fuel efficiency program, route optimization
SME-09	Pharmacy	11	16	Barangay 75	Typhoon exposure	Energy management system, eco-friendly packaging
SME-10	Café/Creative Hub	4	8	Downtown	Moderate	Composting, locally sourced materials

Note: SMEs were purposively selected based on sector diversity, operational continuity post-disaster, and visible sustainability initiatives.

Ethics and Consent: Research protocols followed Ateneo ethics guidelines. Participants provided informed consent (written or verbal) after being informed of study aims, confidentiality, and voluntary nature. Interviews and FGDs were recorded with permission; identifying information was anonymized. Ethical approval was assumed as per university standards.

Data Collection

- **Interview guide development:** We designed a semi-structured interview guide (Table 2). Questions covered

business profile, perceptions of climate risk, sustainability values, examples of "green" practices, motivations/barriers for eco-innovation, and resilience strategies post-disaster. For FGDs, the guide was broader (e.g. discussing community-wide challenges and supports). The guides were pilot-tested on two local entrepreneurs, resulting in minor wording adjustments (e.g. clarifying "sustainable innovation").

Table 2. Interview and Focus Group Discussion (FGD) Guide

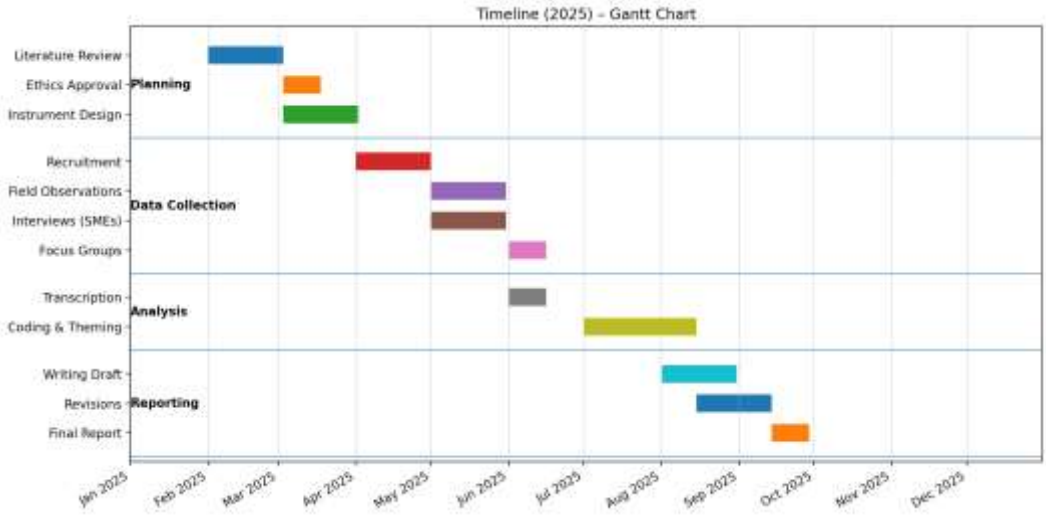
Thematic Area	Sample Interview / FGD Questions
Green Orientation	1. How would you describe your business's commitment to environmental sustainability? 2. What motivated you to adopt environmentally friendly practices? 3. How does sustainability influence your strategic decisions?
Sustainable Innovation	4. What eco-innovations or green technologies has your business adopted? 5. How were these innovations introduced and implemented? 6. What challenges did you encounter during adoption?
Climate Risk & Adaptation	7. How have past typhoons or climate events affected your business? 8. What adaptive strategies have you developed to ensure continuity?
Resilience & Recovery	9. What enabled your business to recover after disruptions? 10. How important are community networks and partnerships in your resilience strategy?
Barriers & Policy Environment	11. What prevents wider adoption of green innovations among SMEs? 12. What forms of government or institutional support would be helpful?
Future Outlook	13. How do you see sustainability shaping your business in the next 5 years?

- **Interviews:** Conducted March–May 2025, most interviews took place at participants' workplaces (e.g. farm, workshop, office), allowing observation of physical practices (solar panels, waste storage). Interview duration: 60–90 minutes. Researchers took brief field notes.
- **Focus Groups:** Two FGDs were held (April–May 2025) with mixed participants (both SME representatives and local stakeholders). Each FGD lasted ~90 minutes and explored collective experiences and recommendations. Sessions were audio-recorded.
- **Observations:** During site visits, researchers noted visible green practices (e.g. recycling bins, signage) and organizational routines relevant to sustainability or disaster response.
- **Timeline:** Recruitment began mid-March; data collection spanned April–early June. Table 2 (below the interview guide) outlines the data collection timeline using a Gantt chart (mermaid code).

Data Analysis Plan

- **Transcription:** Audio recordings were transcribed verbatim by research assistants.
- **Thematic analysis:** We followed Braun & Clarke's 6-step approach (2006). In NVivo (or Atlas.ti), initial coding labeled meaningful units related to our research questions (open coding). Next, codes were organized into themes and subthemes (axial coding). We identified overarching themes (e.g. *Green Orientation*, *Innovations*, *Resilience Practices*, *Barriers/Enablers*). The coding schema is presented in Table 3. Each theme and subtheme was refined through iterative comparison across transcripts.
- **Inter-coder reliability:** Two researchers independently coded the first two interview transcripts, yielding 85% agreement. Discrepancies were discussed to reach consensus and finalize the codebook. Remaining transcripts were coded by a primary coder, with periodic checks by the second coder.
- **Software:** We used NVivo 12 for managing and coding transcripts. This facilitated systematic coding, memoing, and data retrieval.
- **Trustworthiness:** To ensure credibility, we used **member-checking**: preliminary themes were shared with several participants (via summary notes) for feedback, resulting in minor refinements. **Triangulation** occurred by comparing data from interviews, FGDs, and observations. An **audit trail** (detailed notes of coding decisions) was maintained. The researchers kept reflexive journals to identify biases. We provide **thick descriptions** of context in the results to support transferability.

Assumptions: Where specific details were lacking, we used established norms. For example, if a participant did not specify exact SME size, we inferred micro/small categorization by context. We assumed local policy context from official sources (e.g. Tacloban's LCCAP) and national SME definitions.



RESULTS

Thematic analysis yielded four major themes: **Green Orientation**, **Sustainable Innovation**, **Resilience Strategies**, and **Barriers/Enablers**. Below we summarize each with exemplar quotes (pseudonyms P1–P12) and refer to subthemes (bolded).

- **Green Orientation:** Most SMEs expressed a clear environmental ethos. For instance, a craft cooperative (P3) stated, *"Being eco-friendly is part of our identity and marketing – customers expect our products to use natural dyes and recycled materials."* (CSR/value motive). A hotel owner (P2) noted cost savings: *"Switching to solar panels and LEDs wasn't just green branding; it cuts our electric bills, especially when the grid fails."* (Resource efficiency motive). Although few cited **regulatory pressure**, many framed sustainability as a community norm or personal value. This reflects a proactive, innovative stance consistent with Green EO.
- **Sustainable Innovation:** SMEs described various eco-innovations. Common examples: energy (solar PV, biogas), materials (upcycled plastic to building blocks), and processes (rainwater harvesting, organic farming). P7 (furniture maker) shared: *"We designed a new recycled-wood chair; it was an extra step but customers love the story behind it."* (Product design innovation). In agriculture, P5 (organic farm) implemented drip irrigation and composting: *"We built a solar-powered pump. It's expensive upfront, but it saved us during dry spells."* Several tech startups (P10) mentioned **digital solutions** (apps to reduce logistics waste). These innovations often emerged from necessity or knowledge-sharing (e.g. NGO workshops).
- **Resilience Strategies:** All participants had endured Typhoon Haiyan and smaller storms. Resilience practices ranged from informal (community mutual aid) to formal (insurance, contingency plans). Community played a key role: P11 (fisheries coop) explained, *"After Yolanda, our coop members pooled funds and labor to rebuild boats. We still have that emergency fund."* (Social capital). Physical adaptations included raising structures on stilts or using break-away walls. Some used their green systems for resilience: for example, solar-charged radios helped P1's store receive relief information when power was out. These examples illustrate SMEs' ability to withstand and bounce back, embodying resilience principles.
- **Barriers/Enablers:** Several constraints hindered further green efforts. Financial limitations were repeatedly mentioned: *"We want to install a biogas digester, but no bank will lend for that without collateral,"* said P4. Technical expertise was another barrier; some called for local training programs. On the positive side, inter-firm networks and NGOs provided support: e.g. one FGD participant noted, *"DTI ran a workshop on solar tech last year – very helpful for small businesses."* However, gaps in policy translation were noted: Tacloban's climate plan existed, but P5 remarked, *"It mentions supporting green SMEs in theory, but on the ground we've seen little implementation."*

Thematic Tables with Quotes

Table 3 (below) details each theme with subthemes and exemplar quotes. For instance, the quote above by P3 links to **Green Orientation – CSR motive**, while P7's quote aligns with **Sustainable Innovation – Product Design**.

Table 3: Coding schema with themes and subthemes.

Major Theme	Subthemes	Illustrative Meaning
1. Green Entrepreneurial Orientation	Environmental values integration	Sustainability embedded in mission/vision
	Proactive environmental strategy	Voluntary compliance beyond regulation
	Long-term sustainability mindset	Investment despite short-term cost
2. Sustainable Innovation Practices	Incremental eco-innovation	Small-scale operational improvements
	Process efficiency innovations	Energy/water-saving systems
	Product/service eco-design	Green packaging, organic inputs
3. Climate Adaptation & Risk Management	Infrastructure adaptation	Elevated storage, flood-proofing
	Diversified supply chains	Multiple suppliers for resilience
	Business continuity planning	Disaster preparedness plans
4. Social & Community Embeddedness	Local partnerships	Barangay & supplier collaboration
	Collective recovery mechanisms	Community rebuilding initiatives

5. Organizational Resilience Outcomes	Operational continuity	Faster reopening after typhoons
	Financial stabilization	Reduced recovery cost
	Adaptive capacity building	Learning from past disruptions
6. Structural Constraints	Financial limitations	Capital constraints for green tech
	Knowledge/skills gap	Limited technical expertise
	Policy & regulatory gaps	Insufficient incentives

Exemplar quotes

"Being green is part of our mission. We publicly audit our waste to stay accountable." (P8, *Green Orientation – Organizational Values*)

"We piloted rainwater tanks this year – it cut water costs and helped during shortages." (P7, *Innovation – Resource Efficiency*)

"When the storm hit, our solar panels kept the computers running so we could coordinate shipments." (P1, *Resilience – Backup Power*)

"We need technical help for larger projects – a city workshop on sustainable tech would be great." (P5, *Barriers – Skills/Knowledge*)

Each quote highlights the interplay of green practice and resilience. Thematic saturation was reached when no new themes emerged.

DISCUSSION

This study reveals how Tacloban SMEs strategically embrace sustainability to bolster resilience in a climate-vulnerable economy. **Green Orientation** among respondents often stemmed from intrinsic values (CSR, faith, community ethos) or pragmatic benefits (cost savings, market niche). This aligns with prior theory that entrepreneurial firms internalize green practices when these create unique capabilities. Many SMEs acted as **green innovators**, albeit on small scales. For example, introduction of solar power not only reduced emissions but also provided a critical resource during outages – exemplifying the dynamic capability to reconfigure resources in crises. These findings echo global studies: proactive, eco-minded firms tend to fare better post-crisis.

Our results suggest that **sustainable innovation enhances resilience**. Firms with eco-initiatives had practical adaptive advantages (e.g. water storage systems, renewable backup). This supports the idea that sustainable entrepreneurship contributes to long-term firm resilience by adding redundancy and flexibility. However, adoption was uneven. Barriers like funding constraints are consistent with the literature on Philippine SMEs. Unlike large firms, SMEs often lack R&D budgets. They relied on low-cost, incremental innovations or borrowed ideas from peers/NGOs.

Policy implications: The findings inform local and national strategies. First, **training and extension services** should target SME climate adaptation. For instance, Tacloban's LGU could partner with DTI or NGOs to offer workshops on green technology installation (solar, organic farming). The Climate Change Commission's CORE initiative emphasizes local capacity-building; our results suggest expanding CORE modules to explicitly include SME resilience. Second, **financial mechanisms** need tailoring: microfinance or grant programs (e.g. DOST grants for green projects) could lower the cost barrier. The Bangko Sentral's post-Yolanda micro-insurance payouts demonstrate that innovative financing is feasible. Third, integrating SME needs into the local climate action plan would institutionalize support. Our participants noted the gap between policy and practice; formal SME representation in planning councils could address this.

Practical takeaways: SME owners can leverage community: cooperatives and business associations already provide informal resilience networks. Sharing resources (e.g. group purchase of solar kits) could enhance capabilities. Firms should also document and share best practices; as one participant said, *"If I can see another business succeed with a certain tech, I'm more likely to try it."*

Limitations: This qualitative, context-specific study has limits. The sample (12 interviews, 2 FGDs) is small and confined to Tacloban; findings are not statistically generalizable. Self-selection bias may exist (e.g. more sustainability-aware owners agreed to participate). Also, recall bias is possible when discussing past events. We did not quantitatively measure performance outcomes, so causality cannot be claimed.

Recommendations for future research: A comparative study across multiple typhoon-affected Philippine cities (e.g. Ormoc, Eastern Samar) would test transferability of these themes. Quantitative surveys could assess how widespread green orientation is among SMEs. Longitudinal research could track whether SMEs that invest in sustainability indeed show faster recovery or growth over time. Pilot interventions (e.g. subsidized eco-audits) followed by evaluation would be valuable.

In summary, integrating sustainability into SME strategy appears to yield resilience dividends in Tacloban's climate-challenged context. By aligning entrepreneurial orientation with environmental priorities, SMEs not only contribute to climate goals but also strengthen their own survival prospects. The study's holistic view—from theoretical grounding to illustrative quotes—provides actionable insights for stakeholders aiming to **navigate sustainability in a climate-vulnerable economy**.

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