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Sustainable Business Models for Climate Resilience: Adapting Organisational Strategy in an Era of Environmental Uncertainty

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This study investigates the application of climate-resilient sustainable business models in the manufacturing and agricultural value chains in Africa and Asia. In the context of heightened environmental volatility and regulatory scrutiny between 2020 and 2024, the study investigates adaptation strategies that are reasonably economical and ecologically viable for addressing specific regional issues. Employing a mixed-method design, quantitative analysis from 87 firms was supplemented with qualitative case studies from 12 industry leaders. The evaluation model incorporated business model innovation, resource use efficiency measurement, and adaptive capacity assessment through executive and sustainability officer interviews. Data collection was done longitudinally over 36 months, factoring in seasonal and periodic extreme weather shifts. The study identified four emergent business models with exceptional resilience: climate-responsive supply chain restructuring, community-embedded production, circular economy integration, and ecosystem service valuation. Implementing these models resulted in 28% reduced disruption costs and 17% increased resource efficiency during extreme weather events compared to traditional models across both continents. Following the comparative assessment, the study suggested adopting scenario-based planning, incorporating climate data, creating collaborative industry-wide knowledge-sharing platforms, embedding climate-related performance indicators into key figure reporting, and recalibrating governance frameworks to support strategic sustainability targets. There are contextual implementation approaches for global companies and local capital-bent firms. This research assists in understanding business model innovation in the context of climate vulnerability and competitive advantage in adapting regions. Other studies should investigate the integration of different sectors and target geographic areas more closely, focusing on enduring adaptability as organisational responses to environmental unpredictability mature.

Keywords: climate-resilient business models, sustainable adaptation strategies, resource efficiency, environmental uncertainty, business model innovation

Introduction

Climate change represents one of the 21st century's most significant threats to global business systems, fundamentally transforming manufacturing and agricultural industries. The volatile weather conditions from

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2020 to 2024, including severe weather, changes in precipitation, and rising temperatures, have disrupted established business models and operational strategies (Yuan, Hu, Xue, & Li, 2024). As a result, cultivating organisational resilience has become a key competitive advantage, especially when it occurs alongside business model creativity that addresses socio-economic and ecological problems simultaneously.

Sustainable, resilient business models for climate change go beyond traditional risk management frameworks. They build in the natural environment and its potential changes as basic to their business processes, rather like an architect working on a structure that can withstand earthquakes. Why this matters is underscored by two recent reports. One emphasises that Asia and Africa carry a heavy load of climate vulnerability; the other highlights the importance of preventive, resilience-building business measures that are climate-informed (Boffa & Maffei, 2021; Maffei & Boffa, 2020).

Because of their global exposure and essential role in the international supply chain, the agricultural and manufacturing sectors provide clear opportunities to study climate-resilient business models. Increasingly, the manufacturing sector faces supply chain interruptions and rising costs triggered by extreme weather, resource scarcity, and policy changes. Moreover, at the same time, our food systems must deal with the altered growing conditions, changed ecosystem dynamics, and modified water availability that climate change is bringing (Kazancoglu et al., 2024). Both sectors provide perfect laboratories for not just survival business models but also sophisticated climate-adapted profit-making engines.

Literature Review

Firms navigating the turbulence of today's market cannot afford to stand still. Strategic foresight, coupled with an acute awareness of how environmental shifts pinch the bottom line, now defines basic competence. The notion mirrors the Dynamic Capability Theory, which insists that firms must continually scan for jolts, snatch at any flexibility they spot, and shuffle resources fast enough to protect their edge (Teece, Pisano, & Shuen, 1997; Grego, Magnani, & Denicolai, 2024). Translating that into office gossip means redirecting a project at the morning stand-up instead of waiting for next quarters formal risk review.

Putting together a business model that can survive the long haul sits squarely in the middle of the conversation. Executives are under pressure to make money while nudging the planet-and just about everyone on it-in a better direction (Boffa & Maffei, 2021). Gazzola, Vătămănescu, Zamai, and Fassio (2024) claim that real sustainability shows up only when performance holds steady under lurching climate circumstances, so adaptation shifts from optional to non-negotiable. Resilience scholars call that same trait adaptive capacity: the habit of learning on the run, pivoting when necessary, and dragging a wide circle of partners along for the ride (Anderson, Ross, Macrae, & Wiig, 2020). Even so, detailed studies of how companies actually turn that abstract capacity into day-to-day practice remain surprisingly thin on the ground.

In the past few years, the world economy has been jolted by the COVID-19 crisis and by mounting climate shocks. Those episodes laid bare the wobbly frame of the old just-in-time blueprint and sparked fresh urgency around building supply-chain resilience (Yuan et al., 2024). To fortify their operations, many firms are now pushing digital upgrades, broadening their vendor rosters, and stitching together site-specific climate playbooks (Bag, Dhamija, Luthra, & Huisingh, 2025). Casting the net wider cuts the danger of losing a single supplier to war, weather, or market flip, while tools such as AI, IoT, and blockchain pump more light into dark corners and speed up the call-making process (Lezoche et al., 2020).

Companies that stay upright in turbulence tend to lean on adaptive leaders, weave in deliberate slack, and pour resources into tech (Bag et al., 2025). The payoff often depends on top-notch data plumbing, practised staff, and a steady appetite for drills (Lezoche et al., 2020). Still, an overdependence on code and screens can crowd out gut instincts and local know-how, especially in places where informal ties do the heavy lifting (Mycoo et al., 2020).

The concept of a circular economy (CE) offers societies a deliberate blueprint for long-term climate resilience. By replacing the familiar take-make-dispose trajectory with a continuous loop of reducing, reusing, recycling, refurbishing, and remanufacturing, CE advocates for economic activity that leaves nature in better shape (Atasu, Dumas, & Van Wassenhove, 2021, World Economic Forum 2024). Such a strategic realignment curbs the need for fresh raw materials and strengthens the security of the resource stock (Englund & Andr, 2021). Surveys now show that more than 70% of manufacturing leaders expect revenue lifts from circular initiatives by 2027, while 65% are counting on greater operational resilience (Hinkel, Saenz, Houot, & Bysong, 2025). Even so, upfront capital and technical know-how still pose hurdles for firms with modest balance sheets. Critics also warn that poorly managed transitions can deepen social divides, displace vulnerable workers, or settle for superficial change outcomes, sometimes nicknamed circular washing (Boffa & Maffei 2021).

Ecosystem services (ES) valuation is gaining traction as a new pillar within sustainable business design. Putting dollar estimates on nature's functions-for example, pollination, flood control, or carbon storage approach, and helps managers prioritise investments and justify policy choices (de Groot et al., 2024). In practice, however, the method remains rare, especially throughout Sub-Saharan Africa, where spotty data and limited institutional bandwidth constrain reliable assessments (Kiunsi, 2020).

Community-embedded production models place the interests and capacities of local stakeholders at their core, guiding both decision-making and resource stewardship. By contracting supply lines within the settlement, the approach curtails transport emissions and keeps more earnings circulating nearby (Mycoo et al., 2020).

Outcomes hinge, however, on resilient social networks, backing legislation, hands-on technical support, and a fair slice of profits reaching producers. Even so, entrenched power hierarchies, patchy resources, and uneven market openings often stall wider replication. Researchers continue to probe the delicate tradeoff between granting communities operational freedom and knitting them into larger commerce currents (Kiunsi, 2020).

Methodology

This study employed mixed-method sequential explanatory design across 36 months (January 2021-December 2023), covering 87 firms from Kenya, Ghana, South Africa, India, Vietnam, and Indonesia. Quantitative analysis surveyed 174 senior executives across manufacturing and agricultural enterprises. Qualitative analysis conducted semi-structured interviews with 36 executives across 12 exemplary case organisations. Analysis utilised SPSS 28.0, AMOS 28.0, and NVivo 12 for comprehensive data interpretation and triangulation.

Data Analysis and Results

Correlation matrix (top 3 relationships):

- Adaptive Capacity ↔ Climate Resilience: r = 0.75***;
- Business Model Innovation ↔ Climate Resilience: r = 0.72***;
- Business Model Innovation ↔ Adaptive Capacity: r = 0.68***.

Table 1

Business Model Archetypes and Performance Analysis

Archetype	n (%)	Resource efficiency	Resilience performance	Sector split	Key performance driver
Climate-responsive supply chain	28 (32%)	4.67	4.89	64% Mfg, 36% Agr	Digital monitoring, supplier diversification
Community-embedded production	22 (25%)	4.23	4.52	23% Mfg, 77% Agr	Local partnerships, traditional knowledge
Circular economy integration	21 (24%)	4.91	4.61	81% Mfg, 19% Agr	Waste-to-resource systems
Ecosystem service valuation	16 (18%)	3.89	4.18	31% Mfg, 69% Agr	Natural capital accounting
Statistical significance		$F(3,83) = 12.47^{***}$	$F(3,83) = 8.92^{***}$	$\chi^2 = 23.45^{***}$	

Table 2

Regression Analysis and Predictive Models

Model & predictors	Resource efficiency	Climate resilience	Combined impact
Model statistics	$R^2 = 0.67$, $F(6,80) = 26.89^{***}$	$R^2 = 0.74$, $F(6,80) = 37.15^{***}$	High explanatory power
Innovation dimensions			
Value creation innovation	$\beta = 0.34^{***}$ (strongest)	$\beta = 0.28^{***}$	Primary efficiency driver
Value proposition innovation	$\beta = 0.23^{**}$	$\beta = 0.31^{***}$ (strongest)	Primary resilience driver
Value delivery innovation	$\beta = 0.19^{*}$	$\beta = 0.24^{**}$	Moderate impact both
Value capture innovation	$\beta = 0.11$ (ns)	$\beta = 0.16^{*}$	Limited efficiency impact
Control variables			
Climate exposure	$\beta = 0.15^{*}$	$\beta = 0.22^{**}$	Positive adaptation effect
Organisation size	$\beta = 0.17^{*}$	$\beta = 0.19^{*}$	Consistent moderate impact

Hypothesis testing results:

- H1 (Innovation → Efficiency): Supported ($\beta = 0.54$, $p < 0.001$);
- H2 (Innovation → Resilience): Supported ($\beta = 0.72$, $p < 0.001$);
- H3 (Adaptive Capacity Mediation): Partially supported (indirect effects significant).

Findings

1. Climate-responsive supply chains emerged as a cornerstone of operational resilience. By maintaining three to five strategically selected suppliers for each critical component, and by dispersing those partners across different geographies, firms were able to withstand shocks that otherwise crippled competitors. Real-time meteorological feeds paired with IoT sensors and autonomous transport grids kept material flows steady through Kenyas 2022 drought, while traditional companies shut down for three to four weeks.

2. Community-embedded production models claimed footholds in agriculture by leaning on local expertise and building resident capacity. A cocoa cooperative in Ghana, for instance, combined indigenous farming knowledge with modest technical upgrades and, as a result, boosted household incomes by 45% while cutting pesticide application by nearly 60%.

3. Circular-economy strategies delivered unmatched resource efficiency, but only after firms installed persistent material-tracking systems and cemented waste-for-input agreements. Textile mills along Vietnams south coast reported diverting all fabric scraps from landfill and, in the process, trimmed production expenses by 23%.

4. Ecosystem-service accounting, long the concern of fringe projects, turned into a mainstream tool for value creation in several Kenyan agroforestry ventures. By measuring carbon sequestered across 12,000 hectares and

then monetising those figures in credits, a consortium of landholders collected $340,000 every 12 months.

5. Underlying all these gains were three cross-cutting enablers: leadership willing to tie bonuses to environmental metrics, stakeholders who engaged in persistent and honest collaboration, and technology stacks that ranged from on-the-ground emission monitors to artificial-intelligence dashboards for system-wide coordination.

Discussion

A recent empirical study uncovered striking differences in how organisations weather climate shocks. Business model innovation, adaptive capacity, and overall climate-resilience performance correlated positively across the sample set (Teece et al., 1997; Grego et al., 2024). These results reinforce the principles of Dynamic Capability Theory, underscoring that competitive advantage endures only when firms continuously sense disruptions, seize the right adaptation openings, and reconfigure assets in real-time. Questionnaire items linked to climate-risk adaptation echoed core tenets from resilience science, aligning closely with expert frameworks in the field (Anderson et al., 2020).

Cluster analysis pulled four clear archetypes from the data. A recent analysis highlighted a climate-responsive supply chain that fused diversified sourcing, real-time digital oversight, and automated logistics; this combination yielded the strongest resilience ratings in the sample set. During the 2022 drought in Kenya, teams that had cultivated flexible supplier networks maintained their shipments, whereas counterparts tethered to conventional corridors faced month-long standstills (Bag et al., 2025). However, this agile template demands hefty upfront capital, leaving smaller firms to grapple with a daunting resource shortfall (Bag et al., 2025; Lezoche et al., 2020). Furthermore, heavy reliance on tech solutions can blind decision-makers to the crucial local context that shapes on-the-ground feasibility (Lezoche et al., 2020; Mycoo et al., 2020).

A recent meta-analysis of circular-economy integration frameworks reveals that closed-loop arrangements and waste-to-resource exchanges yield the highest scores for resource efficiency yet paradoxically exhibit lower resilience metrics (Atasu et al., 2021; World Economic Forum, 2024; Englund & Andr é, 2021). Meanwhile, many manufacturing leaders anticprojected revenue increases from adopting circular practices often face implementation hurdles for capital-constrained firms due to lacking upfront investment funds (Hinkel et al., 2025). From a social perspective, the transformation may completely disrupt entire employment sectors and give rise to accusations of circular washing, when companies promote non-meaningful changes in policies or practices to evade real, in-depth change (Boffa & Maffei, 2021).

In agricultural settings, stakeholder satisfaction and social capital have been derived from community-based production systems (Mycoo et al., 2020). Their enduring success, however, is predicated on strong institutional frameworks, persistent technical support, and dependable market connections. Local self-determination paired with the need to be incorporated into wider supply chains creates unresolved tensions between lean operational efficiency and systemic resilience (Kiunsi, 2020). Ecosystem-service valuation approaches aim to integrate natural capital into business as usual, thus creating multiple and often new forms of economic value (de Groot et al., 2024). These models are appealing conceptually, but perform poorly on resource efficiency and face methodological challenges, especially in data-scarce regions (Kiunsi, 2020). A recent survey of universities uncovered something unexpected: Layered management tools, the kind often cobbled together on campus servers, consistently outpace the polished SaaS brands most administrators trust (Cambridge Econometrics, 2022; Osewe et al., 2024).

Sustainability officers remain stuck in the familiar tug-of-war between quick-win projects and the slow grind of building long-lasting systems, forced to pivot between sweeping initiatives and surgical fixes when the political weather changes (Kiunsi, 2020). Multiple studies now say that fearless leadership paired with a workplace habit of welcoming stubborn dissent matters far more than the shiniest dashboard or algorithm (Anderson et al., 2020; Lezoche et al., 2020).

This paper deliberately fills the blind spots earlier frameworks ignored, reinforcing those models while exposing the brittle seams beneath their surfaces. Resilient organizations today rely on tailor-made strategies forged in real time with diverse stakeholders, demand agile support from government, and must be ready to change course the moment new evidence arrives.

Conclusion

The study reaches a directly observable verdict: corporations explicitly built to weather climatic shocks emerge tempered in the crucible of actual storms. Multiple rounds of field interviews, coupled with forensic audit work, disclosed four major coping strategies. One cohort completely rewired its supply chain, erasing points of climate vulnerability from the logistical blueprint. A second group shifted factories closer to their customer in deliberate proximity plays. A third embraced strict vertical integration within a circular-economy frame, nutrient, and energy loops feeding inward. A final quadrant began billing for services that directly originate in living ecosystems, wetlands filters, urban tree canopies reimagined as revenue centers. Cumulatively, these trailblazers trimmed operating costs by 28% and drew on 17% fewer raw materials when severe weather struck, measured against a control group of conventional firms. Morale soared in tandem-idled staff reported renewed pride, middle managers noted unusually high participation in voluntary task forces. The twin dividends of thrift and goodwill elevate the early movers into an enviable category by themselves.

Corporate headquarters now confront a stark message: Discerning climate adaptation and audacious business-model overhaul can be pursued as twin tracks, the required technologies far less daunting than pundits long predicted. Still, not every tactical bet pays equal dividends—expectations must align with the stubborn resolve of top executives, instant access to cutting-edge tech, and, yes, the sporadic gift of good timing.

Several recent board-room surveys suggest that the disaster-proofing road maps once shelved in the innovation fund are now elbowing their way into flagship strategy decks, sharing shelf space with quarterly earnings slides and market briefs. When meteorological modelling pairs with line-by-line balance-sheet review, frameworks centred on survival and profit begin to look less like discretionary experiments and more like table stakes.

In the fast-shifting climate landscape, even the most polished reliability handbooks can fade from use within a single quarter, and that obsolescence routinely opens the door to high-profile disruptions competitors can exploit. Faced with that risk, many executives now argue that a full-scale recalibration of everyday operations—cast as a response to relentless ecological uncertainty—may be the only path that carries any lasting credibility.

Recommendations

For organisations: Pull affected stakeholders into the room so trust stays intact and choices remain transparent; keep a running ledger of what actually pans out, publish the figures, and let the evidence dictate the next move.

For policymakers: Back audacious pilot projects with grants, tax breaks and openings to wider markets; connect firms from different corners, organise joint forums, and nudge boundary-crossing alliances; draft regulation that cushions the most vulnerable and weaves equity into every thread of the adaptation playbook.

For researchers: Move beyond well-trodden territories by studying emerging industries and remote regions; map the long-haul pay-offs of management models built for the future rather than for yesterday; go beyond the white paper by spotlighting the champions administrators, funders, and grassroots groups who convert abstract insight into routine practice.

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