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From Roots to Resilience: Exploring the Drivers of Indigenous Entrepreneurship for Climate Adaptation

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Abstract: Our study investigates the drivers that foster the emergence of entrepreneurial responses to climate change among Indigenous communities. Indigenous peoples possess distinct worldviews and approaches to enterprise that prioritize community well-being and environmental stewardship over individual profit. Conventional entrepreneurship theories do not adequately capture Indigenous business approaches, leaving a limited understanding of how Indigenous communities merge traditional ecological knowledge with entrepreneurial activities to adapt to climate challenges. Through a systematic literature review (65 articles) and a case study of six Sri Lankan Vedda communities, we identified 15 key drivers that shape Indigenous climate-adaptive ventures and categorized them under five themes: (1) place-based relationships (resource stewardship, territorial connections, environmental risk factors); (2) intergenerational learning (traditional knowledge transfer, adaptation learning, collective experience); (3) community institutions (social networks, institutional support, overcoming the agency–structure paradox); (4) collective capacity (access to information, access to capital, community-oriented entrepreneurial traits); and (5) culturally aligned venture strategies (Indigenous business models, traditional products, local market relationships). Our study demonstrates how Vedda communities integrate entrepreneurship with cultural values to enhance climate resilience. Our research advances the field of Indigenous entrepreneurship while providing insights for policymakers and practitioners to support culturally appropriate climate adaptation strategies that enhance both community well-being and environmental sustainability.

Keywords: Indigenous entrepreneurship; climate-adaptive ventures; Sri Lankan Vedda; sustainable enterprising

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1. Introduction

Climate change has become the greatest threat to the world in the 21st century, creating future risks and uncertainties beyond current projections [1] (de Block et al., 2019). Indigenous communities are among the most affected populations, as their cultural and economic survival is deeply intertwined with their local environments [2]. These communities have historically relied on traditional ecological knowledge to sustain livelihoods and navigate environmental uncertainties [3]. Climatic variability has exacerbated the difficulties these communities already face due to political and economic marginalization, loss of land and resources, human rights violations, discrimination, and higher levels of food insecurity and unemployment [2,3].

In the face of intensifying climate shocks, Indigenous communities are increasingly turning to entrepreneurship as a means of adaptation [4,5]. As opposed to mainstream

entrepreneurship, which is primarily concerned with economic advancement and profit maximization, Indigenous entrepreneurship harmonizes business operations with cultural identity, environmental sustainability, and community well-being [6,7]. This form of entrepreneurship aligns closely with Indigenous worldviews that emphasize relational economies, intergenerational knowledge transfer, and collective governance [8]. Research highlights that for many Indigenous entrepreneurs, economic ventures serve a dual purpose—not only generating income but also preserving cultural traditions, reinforcing social cohesion, and protecting natural resources [9,10].

Despite the potential of Indigenous entrepreneurship as a climate adaptation strategy, it remains largely underexplored in both the scholarly literature and global policy discussions. While mainstream theories fail to capture its core values of collective well-being, ecological balance, and cultural continuity [4], Indigenous Entrepreneurship Theory positions these ventures as key to community resilience through environmental stewardship and collective governance [6,8,10]. This presents a significant theoretical and practical challenge, as Indigenous entrepreneurship is often evaluated through mainstream theories and inappropriate metrics that fail to recognize its sustainability-driven nature [10]. Additionally, climate adaptation strategies proposed by international organizations such as the Intergovernmental Panel on Climate Change (IPCC) prioritize technological solutions over Indigenous-led efforts [11]. Without adequate institutional support and recognition, Indigenous businesses struggle to scale, which limits their ability to contribute meaningfully to climate adaptation and sustainable development [5].

The failure to integrate Indigenous entrepreneurship into climate adaptation and sustainability policies raises several concerns. First, omitting Indigenous entrepreneurship from climate adaptation strategies marginalizes Indigenous-led solutions and undermines sustainability efforts [11]. Second, the loss of Indigenous knowledge systems poses a threat to long-term environmental stewardship since traditional land and resource management methods are under strain from land degradation and economic marginalization [4]. Third, Indigenous entrepreneurs are further challenged by structural obstacles, such as a lack of institutional and financial support, access to government funding, or venture capital [5,12,13]. Therefore, without targeted assistance, climate adaptation is overly dependent on external solutions that might not be appropriate for local conditions, which eventually diminishes its long-term viability and efficacy.

To address these challenges, our study employs a two-part research approach that integrates both theoretical synthesis and empirical validation. Our first objective is to explore the drivers that shape the emergence of Indigenous entrepreneurship as a climate adaptation strategy. In fulfilling the first objective, we conducted the first part of the research, a systematic literature review of 65 peer-reviewed articles, to identify key factors influencing the development of Indigenous climate-adaptive ventures. By systematically analyzing these drivers, our study offers new insights into how Indigenous entrepreneurship contributes to climate resilience while maintaining sustainable development. The second objective is to assess the identified drivers of Indigenous entrepreneurship through a case study of Indigenous communities in Sri Lanka. This objective is fulfilled by the second part of the research, which collects preliminary empirical data on the identified key drivers among Sri Lankan Indigenous communities and analyzes them through a case study. Rather than representing two separate studies, these components are interconnected and complementary, with the systematic review providing a theoretical foundation and the field study offering empirical insights and validation. This mixed-method approach enhances the depth and relevance of our findings, bridging the gap between theory and practice to advance both the scholarly understanding and policy applications of Indigenous entrepreneurship in climate adaptation. Therefore, our study validates whether the

existing literature on drivers promoting entrepreneurial emergence for climate adaptation adequately addresses Indigenous contexts while offering a solution-oriented approach to improve their living standards amidst climatic risks and uncertainties.

Our research makes three significant contributions to Indigenous entrepreneurship, sustainability, and climate adaptation. First, it advances Indigenous Entrepreneurship Theory by demonstrating how Indigenous business ventures operate within a sustainability-driven framework that goes beyond the conventional profit-maximization models [6,7]. Additionally, our work expands the theoretical discourse on sustainability-oriented enterprises by highlighting how Indigenous entrepreneurs integrate traditional ecological knowledge with innovative business strategies. Second, it provides practical insights for policymakers and practitioners by identifying key drivers that influence the success of Indigenous climate-adaptive ventures. These insights can inform the development of more inclusive policy frameworks that recognize and support Indigenous entrepreneurship as a legitimate adaptation strategy. Third, our study offers empirical evidence on how Indigenous communities, particularly Sri Lankan Vedda entrepreneurs, navigate climate challenges through entrepreneurship. Our research contributes to the growing body of knowledge on localized climate adaptation strategies and their role in achieving global sustainability goals through reporting real-world examples of Indigenous-led entrepreneurial initiatives.

2. Methods

A mixed-method approach, combining secondary and primary data through a systematic literature review and case study analysis, was used to examine the drivers influencing Indigenous climate-adaptive ventures. The research followed a two-step process.

2.1. Step 1: Systematic Review

We conducted a systematic literature review to synthesize the existing global scientific literature on entrepreneurship as a climate change adaptation response. It is focused on the literature that finds answers to a specific research question using predefined eligibility criteria and explicitly outlined reproducible methods [14]. This approach enhances methodological transparency and provides a comprehensive overview of existing knowledge [14]. The systematic review serves as a dynamic process adaptable to various research questions and reviewer needs, helping to identify existing knowledge research gaps and informing future studies [15–17]. We followed several methodological steps in identifying and analyzing the literature in the systematic review process, including (1) defining the research question and scope of the study, (2) selecting documents and developing inclusion and exclusion criteria, (3) critically appraising the study quality, (4) analyzing and synthesizing quantitative and/or qualitative evidence, and (5) presenting the results [18,19]. The flow diagram of the systematic review is given in Figure 1.

Systematic review approaches have been criticized for several reasons. They are presumed to be biased toward the analysis of primarily quantitative data, while knowledge synthesis is restricted by predefined keywords and inclusion/exclusion criteria [14,20]. However, systematic approaches are considered the highest standard of evidence synthesis [21]. Despite the critiques, researchers are adopting systematic approaches to meet the needs of their review questions in adaptation research, combining quantitative and qualitative analyses and designing complex literature searches [22,23]. We also followed the systematic approach in our study since entrepreneurship among Indigenous communities is highly understudied, and scholarship is scattered. Therefore, through a systematic approach, we collected the scattered information in the literature to generate greater understanding.

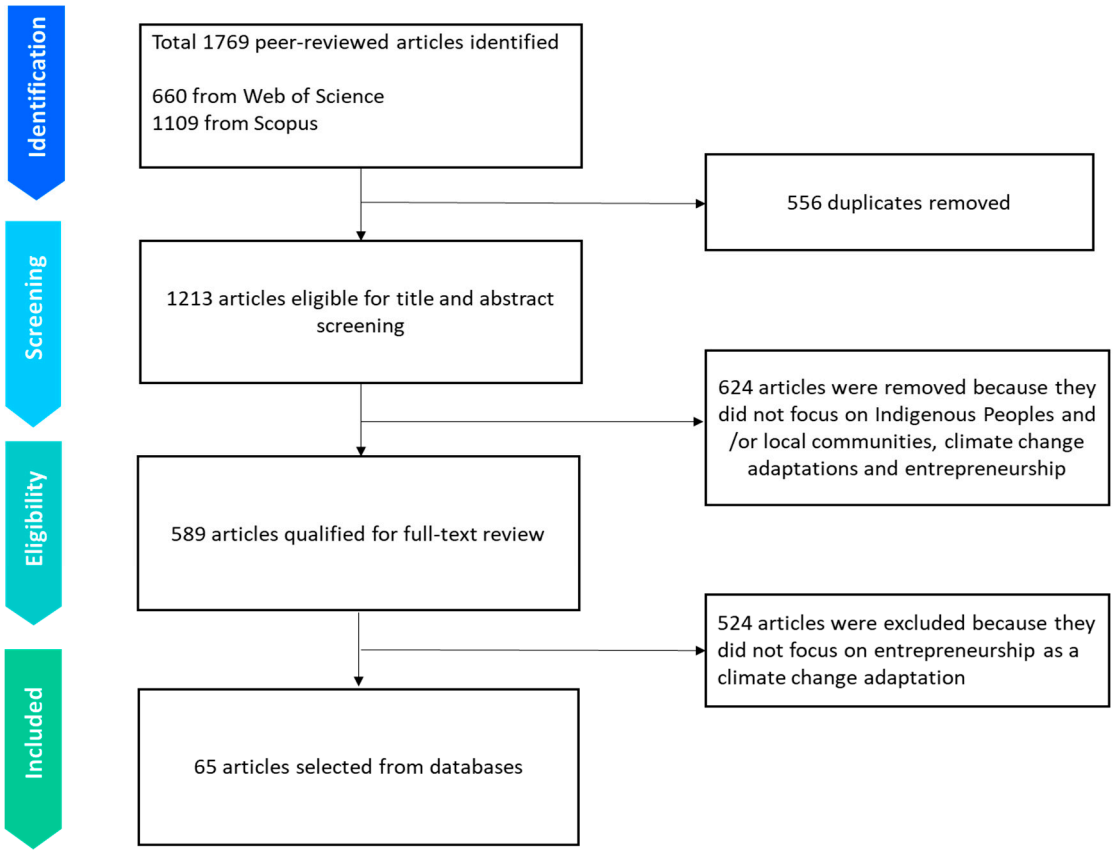

Figure 1. Flow diagram of the article selection process for the systematic literature review.

The systematic review was conducted between August 2022 and April 2023. Two databases, Web of Science (n = 660) and Scopus (n = 1109), were used to search the literature based on keywords related to entrepreneurship, climate change adaptation, and Indigenous communities. Local communities, such as farming and fishing communities, were also added to the literature search due to the lack of Indigenous studies, and some studies have not documented the names of Indigenous communities they studied or the context. The scientific articles were searched (the search keyword string is available in Table 1), screened, read, sorted, abstracted, coded, and analyzed to develop the review [24,25]. The inclusion and exclusion criteria used in the screening process [25] are given below in Table 2.

Table 1. Search string developed to identify peer-reviewed literature.

Database	Search String	Number of Articles
Web of Science	((TS = ((climat*)AND(Chang*)AND(Adapt*)))AND TS = ((Entrepreneur*)OR(Intrapreneur*)OR(Enterprise*)OR(start-up*)OR(business*)OR(ventur*))) AND TS = ((Indigenous)OR(communit*)OR(local)OR(village))	660
Scopus	(TITLE-ABS KEY ((climat*)AND(chang*)AND(adapt*))AND TITLE-ABS-KEY ((entrepreneur*)OR(intrapreneur *)OR(enterprise *)OR(start-up *)OR(business*)OR(ventur*))AND TITLE-ABS-KEY((Indigenous)OR(communit*)OR(local)OR(village)))	1109

Searched on: 26 May 2022. Note: The asterisk (*) is a wildcard character used in database searches to include all word variants (e.g., "entrepreneur*" retrieves "entrepreneur", "entrepreneurship").

Table 2. Inclusion and exclusion criteria.

Criteria	Inclusion	Exclusion
Language	Written only in English	Other languages (n = 24)
Type of literature	Peer-reviewed journal articles, including original research, editorials, commentaries, essays, and reports Review articles, meta-analyses, thesis, book chapters	Newspaper articles, blogs, protocols (studies that are not yet conducted) (n = 66)
Population	Studies that refer explicitly to Indigenous populations and local communities	Studies that refer to only non-Indigenous people or people with high social privilege (n = 556)
Who adapts	People (individuals or groups)	Any other non-human systems (n = 119)
Focus	Practical/empirical	Conceptual and theoretical models (n = 108)
Time	Present or past decades (after 2010)	Prehistoric, past (n = 18)
Responses	Adaptation responses associated with entrepreneurship	Responses not related to entrepreneurship (n = 257)

Figure 1 provides the step-by-step process of conducting a systematic review. After removing duplicates from a total of 1769 papers from the two databases, we ended up with 1213 papers for title and abstract screening. Again, we removed 624 papers after this screening stage, since they did not focus on Indigenous peoples and local communities, climate change adaptation, and entrepreneurship. Out of the 589 articles selected for the full-text review, we removed 524 articles, since they did not focus on entrepreneurship as a climate change adaptation. Therefore, only 65 articles were included in the analysis (Table S4 in the Supplementary Materials). All of them were peer-reviewed articles. The articles (1148) that did not meet the inclusion criteria were excluded [25].

We used an MS Excel sheet to code selected papers manually, employing a coding scheme with mutually exclusive and exhaustive themes (Table S1 in the Supplementary Materials). We performed a content analysis of the extracted data, combining quantitative analysis, focusing on category frequency, with qualitative analysis, interpreting meaning and context. Through the content analysis, we identified fifteen drivers that shaped the emergence of entrepreneurship in the face of climate change and categorized them into five high-level key themes to interpret the results. The resilience-based framework introduced by Galappaththi et al. [26] and the model of community factors introduced by Seelos et al. [27] guided the categorization of key themes. Finally, we conducted quality checking of the systematic review using the AMSTAR (Assessment of Multiple Systematic Reviews) method, which resulted in a high score, indicating methodological rigor. AMSTAR, consisting of 11 items, serves as a valid tool for assessing the methodological quality of systematic reviews.

2.2. Step 2: Case Study Assessment

We conducted an in-depth case study analysis by applying the factors identified through a systematic literature review. Field data were collected among Indigenous households (n = 90) in six Indigenous communities in Sri Lanka between May and June 2023 (Figure S1 in the Supplementary Materials). We selected these six communities because their leaders are integral members of the administrative circle of 'Wariga Sabawa' (a tribal society), whose main goal is to provide solutions for the challenges and issues that Sri Lankan Indigenous communities face. The leaders had direct contact with the national Vedda leader,

'Uru Warige Wannila-etto', who is endorsing this research. This endorsement facilitated convenient access to these six communities for the study, considering factors like resource availability, the absence of language barriers, and established research relationships.

Sri Lankan Indigenous peoples, known as Vedda, trace their ancestry back to the original neolithic community from the 6th century BC [3,28]. Although they mostly grow paddy and practice slash-and-burn agriculture today, they were originally hunter-gatherers. Some collect bee honey, yams, fruits, and wood. Vedda live in coastal areas and heavily depend on fisheries-related activities [2]. Despite the existence of various Vedda populations across the country, their total population as of 2011 constituted 0.0044% of the country's total population [29]. For our study, six Vedda communities were identified and named based on their geographical locations, namely Dambana, Henanigala, Rathugala, Dalukana, Pollebadda, and Wakarei (Figure 2). Vedda communities belong to two major ethnic groups: Sinhalese and Tamils. Dambana, Henanigala, Rathugala, Dalukana, and Pollebadda communities are Sinhalese Vedda, while the Wakarei community is a Tamil Vedda community.

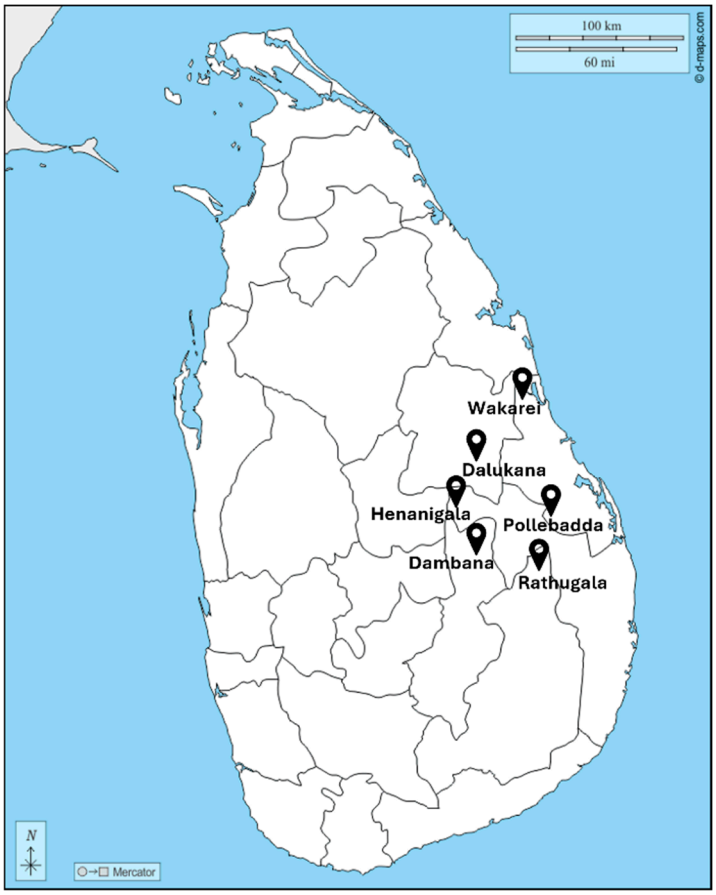

Figure 2. Study locations in Sri Lanka.

A total of 90 semi-structured interviews were conducted across six Vedda communities to gather comprehensive insights into the socio-economic conditions, community perceptions, and challenges faced by Indigenous households. This broader data collection was essential for capturing the diversity of experiences within the communities and understanding the context in which entrepreneurship emerges. Furthermore, these interviews provided a basis for identifying households actively engaged in entrepreneurial activities, from which seven cases were purposively selected for in-depth case study analysis and were chosen based on their direct involvement in various small-scale entrepreneurial practices, such as agriculture, traditional crafts, and eco-tourism. Focusing on these seven cases

allowed us to apply and examine the drivers of Indigenous entrepreneurship identified in the systematic review, providing a rich, context-specific analysis of how these drivers manifest in real-life settings. Throughout the study, we utilized a broader working definition of entrepreneurial behavior to identify the individuals who engaged in entrepreneurial activities. Apart from capturing demographic data, the impact of climate change, food systems and governance data, and health data, the interviews specifically focused on factors influencing the emergence of entrepreneurship in the face of climate change, addressing aspects such as initial idea generation, external stresses, and gaps in realizing entrepreneurial opportunities (Table S2 in the Supplementary Materials provides the questionnaire).

We used semi-structured interviews in data collection since they allowed for close interaction with respondents, enabling them to express ideas with limited guidance [30]. Semi-structured interviews are cost-effective, time-efficient, and provide opportunities for participant observation [30,31]. Although weaknesses include limited access, low response rates, and potential miscommunication [32,33], these were mitigated by building trust with the community, ensuring participant comfort, and revisiting answers for accuracy [32]. The study employed a snowball sampling method, seeking assistance from respondents to identify additional participants [34].

We developed and tested the questionnaire before the field visit during the first community visit. Indigenous people's consent was obtained before the interviews, and a culturally appropriate approach was employed by collaborating with the Sri Lankan national Indigenous Vedda chiefs. We obtained the Institutional Review Board (IRB) approval from Virginia Tech (23-388). Three research assistants familiar with the local languages and cultures were hired and trained for data collection. Interviewers maintained an attentive and non-judgmental approach, creating a comfortable environment for respondents. Participants were assured of anonymity, and feedback was provided at the end of the interpretive process. Interviewers made audio recordings of interviews with informed consent. Throughout the data collection, interviewers carefully addressed the ethical considerations for research with Indigenous communities, including privacy, confidentiality, anonymity, reflexivity, gender relations, and power dynamics [35–37]. Additionally, the community members who participated in the interviews received a compensation of USD 10 (5000 LKR).

After data collection, we transcribed the responses into Microsoft Excel [32]. We developed a coding scheme with mutually exclusive and exhaustive themes to analyze respondents' content. We manually coded the content and analyzed data through content analysis to interpret and code textual materials to find out the inner meaning and probable effects of the data [32]. Both inductive and deductive coding were completed. The inductive coding allowed us to identify themes and patterns emerging directly from the data, while the deductive coding was guided by the key drivers identified through our systematic literature review, ensuring that our analysis was grounded in both empirical evidence and theoretical frameworks. This dual approach enabled us to capture both expected and novel insights from participants' narratives. Since multiple coders were involved, we maintained consistency in coding by measuring the inter-coder reliability through regular meetings and discussions to resolve discrepancies. Further, we categorized the analyzed data to identify patterns and themes [36,38].

We identified the key drivers that support emerging entrepreneurship in Indigenous contexts through content analysis. We described examples for each identified driver. Data representation utilized descriptive statistics, figures, and case studies to explore their application in the Sri Lankan Indigenous context. In analyzing the case studies, instead of quantifying the frequency of certain viewpoints across all interviewees, we chose to rely on direct quotes to represent Indigenous voices authentically. Such an approach ensures

that participants speak for themselves without altering the integrity of their words and meanings through external interpretation, which is in line with ethical research practice that prioritizes the agency of the community. Given that Indigenous knowledge is traditionally shared through oral histories, stories, myths, and lived experiences, using direct quotes helps preserve cultural nuances, metaphors, and idiomatic speech that would be lost in paraphrasing. Furthermore, verbatim quotes ensure that Indigenous perspectives do not become filtered through the researcher's assumption or bias, and as such, they become an integral step in decolonizing methodological approaches. Finally, the use of direct quotations enhances the qualitative analysis as it offers credible, transparent evidence to back up emerging interpretations and themes.

3. Results

3.1. Descriptive Results

The systematic literature review highlights a predominant focus on local rural populations (44 articles), such as farming and fishing communities, with additional emphasis on local urban (17 articles) and Indigenous communities (4 articles). Regional scale studies constituted 12% (8 articles), while global scale studies were minimal (~2%, two articles). Geographically, articles were concentrated in Australia (8), USA (6), UK (5), and Nigeria (5). The majority of the first authors (55) were affiliated with universities, mainly from the UK (10), USA (9), and Australia (8). Most of the studies (80%) focused on economic adaptation (n = 52), while the least number of studies (~5%) focused on cultural adaptation (n = 3).

3.2. Drivers of Indigenous Entrepreneurship

Table 3 below shows the key drivers that supported the emergence of entrepreneurship identified through the content analysis, five high-level key themes, and the direction of impact of each driver on the adaptive capacity of communities to climate change. This section provides detailed evidence on how each driver, identified through the systematic review, led to the emergence of entrepreneurship and created a foundation for climate adaptation.

Table 3. Drivers of Indigenous entrepreneurship, key themes, and their impact on the adaptive capacity of the communities.

Themes	Drivers of Indigenous Entrepreneurship	Direction of Impact		References
		Decrease Adaptive Capacity	Increase Adaptive Capacity	
Place-based relationships	Resource stewardship	1	10	[11,39–43]
	Territorial connections	1	5	[11,44,45]
	Environmental risk factors	1	6	[45–49]
Intergenerational learning	Traditional knowledge transfer	2	2	[11,50,51]
	Adaptation learning	1	7	[52–55]
	Collective experience	0	5	[11,42,52,56]
Community institutions	Social networks	0	9	[52,55,57–59]
	Institutional support	1	8	[60–63]
	Overcoming the agency–structure paradox	3	4	[11,52,64–66]
Collective capacity	Access to information	0	3	[11,51,58,67]
	Access to capital	2	6	[44,68–70]
	Community-oriented entrepreneurial traits	0	7	[11,45,61,67]
Culturally aligned venture strategies	Indigenous business models	0	3	[55,67,70]
	Traditional products	1	2	[11,45,51]
	Local market relationships	1	3	[48,55,65]

Note: The direction of impact in both columns is graphed based on the number of articles that discuss each driver.

Place-based relationships: This theme includes drivers of resource stewardship, territorial connections, and environmental risk factors. The availability or unavailability of resources plays a crucial role in identifying entrepreneurial opportunities. The Resource-Based View (RBV) emphasizes that entrepreneurial success relies on valuable, rare, and non-substitutable resources effectively utilized to meet customer demands [40]. Thoughtful resource stewardship enhances the feasibility and sustainability of entrepreneurial ideas [71]. Moreover, entrepreneurial activities can serve as adaptive strategies in resource-constrained environments, emphasizing the importance of community-driven resource management [71]. For example, the Canadian First Nations community practices 'bricolage', an entrepreneurial approach that embodies resource stewardship by creatively repurposing and maximizing available resources [39]. Bricolage supports growth, innovation, and resilience in areas with limited resource access [72]. Integrating traditional ecological knowledge with sustainable entrepreneurship demonstrates how resource stewardship fosters long-term adaptation and economic sustainability, particularly in addressing climate change impacts [39].

Furthermore, territorial connections, characterized by the overlap of social and economic relationships in a specific geographical location, are particularly influential in rural contexts. Local embeddedness can create opportunities for businesses to overcome certain constraints of the rural environment [70]. For instance, the local embeddedness of Sri Lanka is highlighted as conducive to sustainable agrotourism due to diverse agro-climatic conditions, cultural attractions, and strong community ties [44]. Maintaining robust relationships with local suppliers, grounded in social networks, proves vital for businesses adapting to rural climatic conditions by avoiding the need to source supplies from distant markets, influencing entrepreneurial behavior.

The third factor in this theme is environmental risk factors, encompassing climate change-induced uncertainties such as extreme temperatures, high rainfall variability, rising sea levels, and global warming [73]. Entrepreneurial activity is recognized for addressing climate change impacts through innovation [45,49]. Entrepreneurship, characterized by destructive and creative processes, thrives in risky and uncertain environments [48,74]. Climatic and non-climatic shocks provide fertile ground for emerging entrepreneurship, offering income sources for vulnerable communities facing climate-related impacts [39,75]. For instance, Indigenous farming communities in Niger's Augie district enhance food security through entrepreneurial behavior, such as by diversifying crop production in extreme weather conditions [39].

Intergenerational learning: This theme includes the following drivers: traditional knowledge transfer, adaptation learning, and collective experience. Traditional knowledge transfer is identified as a supportive factor for the emergence of entrepreneurship, with failure seen as a catalyst for growth in entrepreneurial endeavors [76]. A study conducted with small-scale fishers in Lake Malawi found that fishers adapted to declining fish catches by leveraging traditional knowledge to expand agricultural farming, engage in small businesses, and participate in casual labor within farming and fishing communities, ultimately enhancing their adaptive capacity [50]. The intergenerational transfer of knowledge on resource use and livelihood diversification plays a crucial role in shaping entrepreneurship, as fishers draw on inherited skills and community practices to sustain their livelihoods. However, in the coastal communities of Ghana, the erosion of traditional fishing knowledge and declining fish stocks have weakened adaptive capacities, limiting opportunities for entrepreneurial responses to climatic risks [77].

Findings emphasize how adaptive learning has supported communities facing adverse climatic risks. In South Africa, farmers leverage entrepreneurial learning as a livelihood diversification strategy to mitigate poor productivity challenges, access additional re-

sources, and reduce crop failure risks [53]. In East Africa, public–private partnerships foster adaptation learning through entrepreneurship incubation programs, enhancing competitiveness and market access [58]. Social learning, facilitated through social networks, plays a critical role in transferring adaptive strategies and acquiring essential social capital [43]. Marshall [78] highlights the significance of collaborative learning—an iterative process involving monitoring, feedback, and adaptation—and proposes it as a means to increase climate change vulnerability awareness and flexible resource management. Resilient rural communities prioritize quality of life through participatory learning, open networks, and self-organized initiatives, which drive knowledge co-creation, entrepreneurial behavior, and long-term adaptation [54].

Collective experience is another factor that shapes the emergence of new businesses, especially among small and medium-scale enterprises (SMEs). SMEs are defined based on the number of employees, turnover levels, capital base, and fixed asset values. These levels differ based on the country. SMEs become 'experts by experience' in creating business resilience. This process caused enthusiasm among the SME community to further share and enhance their adaptive capacities [56]. Collective experience in entrepreneurial activities leads to the development of new entrepreneurial ideas and ventures [1,79]. For example, micro and small enterprises around China's Pearl River Estuary built community resilience by exchanging local knowledge, forming informal support networks, and jointly adopting flood-preparedness innovations. These collective efforts not only reduced disaster-related disruptions but also fostered entrepreneurial adaptation and recovery strategies across the region.

Community institutions: This theme includes social networks, institutional support, and overcoming the agency–structure paradox. We found that social networks act as a factor in shaping entrepreneurial ideation and action. Schäfer et al. [80] note the importance of supportive local and regional networks in emerging entrepreneurship in communities. For instance, in Tanzania, the social networks of the rural fishers provided microloans, particularly during bad weather and when fishing activities failed. These microloans not only helped households meet immediate needs (i.e., purchasing food and basic supplies) but also supported the continuation or re-initiation of small-scale business activities, demonstrating how embedded social ties can buffer economic shocks and stimulate grassroots entrepreneurship [59].

Schäfer et al. [80] emphasize the importance of institutional support in providing grounds for the emergence of entrepreneurship. According to Schäfer et al. [80], provisioning accommodation and material resources through institutional support and the critical role of supportive intermediaries on different governance levels are crucial for developing start-ups. Australian studies suggest that interactions with local stakeholders are necessary for businesses to adapt to climate change, since it is hard for businesses to adapt in isolation. Instead, they develop contextual interactions in their environment [57].

Overcoming the agency–structure paradox is a factor that can shape entrepreneurial action. It is a dilemma where individuals choose between acting as free agents or conforming to the social structures [64]. A study on the 'Tsimane', an Indigenous community of hunter-horticulturalists in Bolivian Amazonia, highlights how addressing this paradox opens entrepreneurial opportunities amidst climate change [11]. This 'Tsimane' community relied on household labor in agriculture in a rigid social structure. They adapted by hiring external labor for short-term gains and investing in motorbikes for long-term market access, thus overcoming limitations imposed by distance [11]. These strategies have empowered individuals within the 'Tsimane' community by challenging the prevailing agency–structure paradox. Additionally, Dwyer [52], suggests that rural European Indigenous farming communities can enhance their adaptive capacity to climate change through territorial

sovereignty, recognized land rights, and improved access to formal education and financial resources (e.g., subsidies).

Collective capacity: This theme includes the following factors: access to information, access to capital, and community-oriented entrepreneurial traits. Access to information remains one of the most important factors for entrepreneurship because entrepreneurial behavior relies strongly on access to information [74]. These communities can exchange information via informal channels [58]. For example, important but less tangible elements, values, and cultural practices, potentially influencing scaling, are expressed more through informal networks [58]. Information can help expand one's market scope, product diversification, and knowledge about farming techniques [51]. Information about cultivation and market opportunities are the most important types of information that farmers need [58]. According to Iqbal et al. [67], farmers in Southern Punjab, Pakistan, opted for non-farm income diversification based on their access to market information.

Access to capital is another factor critical to initiating and developing any entrepreneurial venture. Studies have demonstrated that in contexts where access to capital is high, there is scope for entrepreneurial initiatives, taking advantage of financial market offerings to finance their businesses, even at the basic stage of venture development [69]. Describing Sri Lankan shrimp farmers, Harkes et al. [65] highlight the importance of mechanisms that could enable subsidies, insurance, and bank loans to firms, which can facilitate investment by foreign private enterprises and lead to subsequent exports.

According to Korber and McNaughton [43], an entrepreneur's engagement with their community and social capital plays a crucial role in the survival and growth of their ventures. Beyond individual psychological traits, community-oriented entrepreneurs demonstrate a strong commitment to collective well-being, resource-sharing, and social cohesion, which enhances their ability to navigate challenges and sustain their businesses [81]. Traits such as collaborative decision-making, social responsibility, adaptability to communal needs, and commitment to mutual support are essential in fostering community resilience [82]. A study conducted in Uganda on grocery store owners located in a flood plain highlights the importance of entrepreneurs' ability to leverage community networks, mobilize collective action, and integrate local knowledge in identifying and implementing new start-ups, thereby strengthening community-based economic activities [66].

Culturally aligned venture strategies: This theme includes the following factors: Indigenous business models, traditional products, and local market relationships. Business models play a crucial role in shaping entrepreneurial capacity as they determine how ventures structure their operations, revenue streams, and market positioning [44]. For example, Iqbal et al. [67] highlight that diversified business models incorporating both farm and non-farm income sources positively influenced the living standards of farming households. The effectiveness of these models depended on key structural elements such as land-use strategies, labor allocation, and household resource distribution, which shaped their ability to integrate self-employment and other non-farm activities [83]. By adopting hybrid business models that combine traditional agricultural production with alternative income-generating ventures, households could enhance their resilience and long-term economic stability.

The use of traditional products plays a crucial role in the survival and growth of businesses, particularly in Indigenous and rural communities [84]. Successful entrepreneurial activities often build upon locally available resources, traditional craftsmanship, and cultural heritage, ensuring both economic sustainability and the preservation of traditional knowledge [85]. For example, the 'Tsimane' community initially focused on selling native products such as latex and traditional medicines, which were deeply rooted in their cultural and ecological knowledge. These traditional products not only provided economic opportu-

nities but also reinforced heritage-based entrepreneurship. As demand grew, their business evolved, integrating other locally derived products like meat, leather, and sugarcane while maintaining a strong foundation in traditional production methods [85].

Lastly, local market characteristics such as competition, entry and exit barriers to markets, and pricing can foster resilience and sustainability of Indigenous entrepreneurial ventures [86]. These factors determine the extent to which entrepreneurs can benefit from local and regional markets, ultimately shaping their business survival [86]. For many Indigenous entrepreneurs, accessing formal markets is constrained by logistical, infrastructural, and regulatory barriers. However, culturally aligned strategies can offer alternative pathways to access markets. For instance, Sri Lankan Indigenous communities have leveraged agritourism to market traditional agricultural products and eco-cultural experiences. These communities integrate organic farming, traditional processing methods, and heritage-based storytelling to attract visitors and access new markets [44]. This model reduces the dependence on formal value chains while preserving traditional knowledge systems and promoting environmental stewardship. These communities have overcome some of the limitations of conventional market access by embedding cultural identity within tourism-based ventures.

3.3. Case Study Assessment

We applied the insights from the systematic literature review to the Sri Lankan Indigenous Vedda communities compared against the case study findings (Table S3 in Supplementary Materials). Related to climate change, Sri Lanka has experienced significant weather changes, resulting in notable fluctuations in rainfall patterns [44]. Indigenous Vedda communities struggle with midyear heat waves, prolonged droughts, and recurrent floods as predominant climatic challenges [44]. Key non-climatic issues include poverty, limited access to healthcare, and food insecurity. The proximity of Indigenous settlements to forests and coastal areas, integral to cultural practices, poses challenges due to government restrictions on land rights and forest access.

Place-based relationships: Sri Lankan Indigenous Peoples, notably the Vedda, were historically isolated due to geographical remoteness and a lack of transportation and infrastructure facilities until the late 1990s. Even today, limited access to cities hampers their market reach, hindering their entrepreneurial potential. However, in the 1990s, community-led resource stewardship played a vital role in sustaining livelihoods, particularly for coastal Vedda communities reliant on fishing and forest resources. Traditionally, these communities practiced sustainable resource management, utilizing forests for food, medicine, and materials while maintaining ecological balance. However, government-led relocation efforts restricted forest access, disrupting long-established stewardship practices and diminishing livelihood opportunities. As resource availability in these communities was closely tied to their geographical location and customary management systems, displacement led to the gradual loss of both access to essential resources and the ability to steward them sustainably.

> *We [Vedda] only have 1.2 acres here [Henanigala]. However, when we [Vedda] used to live in 'Dambana,' we [Vedda] had 2 acres/household. When the government settled us [Vedda] down here [Henanigala], they [government officials] promised to give us [Vedda] land rights and access to the forest. But we [Vedda] got nothing (Respondent 04).*

Environmental risk factors can act as a significant catalyst for entrepreneurship, even amidst the emergence of other entrepreneurship-based factors. Sri Lankan Indigenous communities have been acutely aware of the shifts in weather patterns over the past three decades. The Vedda note delays in the onset of monsoon rains and the occurrence of 'fake rains' where it appears that the monsoon season has begun, but only lasts for a day or two,

followed by drought. The Vedda adapt by exploring alternative livelihood options during prolonged droughts or delayed rains to mitigate the risk of low harvests or crop failure.

> *We [Vedda] start planting seeds around August and September. However, during that time, we [Vedda] do not get rain nowadays. So, we [Vedda] intentionally pass that dry period and then plant the seeds. We [Vedda] go for alternatives during that period, like collecting honey and timber, fishing, and home gardening (Respondent 05).*

Intergenerational learning: Unpredictable fluctuations in rainfall patterns, delays in monsoon seasons, and persistent droughts pose significant challenges for Indigenous communities in Sri Lanka. The cessation of government fertilizer subsidies and restrictions on synthetic fertilizer imports have further strained agricultural productivity. However, in response to these challenges, traditional knowledge transfer has played a crucial role in preserving Indigenous agricultural practices and fostering adaptation. To sustain their agricultural livelihoods, the Vedda have long relied on knowledge passed down through generations, including organic soil enrichment techniques, seed preservation methods, and rainwater harvesting strategies. As access to modern fertilizers and conventional inputs declines, they are turning to ancestral knowledge systems, experimenting with traditional composting, crop rotation, and natural pest control to maintain food security. This transmission of knowledge supports adaptation through entrepreneurial behavior as communities innovate within their cultural and ecological heritage to develop alternative, sustainable farming methods.

Indigenous communities rely on adaptation learning and collective experience to navigate environmental and economic challenges, shaping their entrepreneurial activities. The intergenerational transfer of knowledge allows them to refine their understanding of environmental patterns, resource management, and sustainable livelihoods. The continued use of traditional farming techniques, rooted in past experiences and community learning, reflects their commitment to environmentally friendly, 'poison-free' agriculture. Their ancestral wisdom, developed through centuries of observation and adaptation, helps them identify environmental shifts and anticipate seasonal changes. However, climate change has introduced new uncertainties that require ongoing collective learning. By integrating shared knowledge and adaptive strategies, Indigenous communities develop entrepreneurial initiatives that sustain their livelihoods, such as honey and medicinal plant collection, fishing, small-scale tourism, and home gardening. These ventures exemplify how learning from past experiences, collective adaptation, and knowledge co-creation contribute to economic resilience and sustainability.

> *Cultivation is now seasonal due to weather changes. We [Vedda] cultivate for six months and rely on the harvest for the subsequent six months. In case of late rain, we [Vedda] hunt and collect honey until the rainfall allows us to resume cultivation (Respondent 01).*

Community institutions: Social networks are pivotal in fostering social growth and well-being among communities. The partnerships and friendships Vedda community members form with each other in the community can help identify, develop, and implement new business ideas, leading to livelihood diversification. These partnerships are vital to Indigenous peoples' day-to-day operations by providing labor, monetary, or moral support. Such collaborative efforts contribute to the resilience and adaptive capacity of these communities amidst challenging circumstances.

> *We [Vedda] all get together during the cultivation season and help each other in weed control since not all of us [Vedda] can afford to buy pesticides (Respondent 02).*

Sri Lankan Indigenous groups benefit from diverse community-based institutions. The institutional support they receive is crucial in facilitating their livelihood activities.

For instance, farmers' societies in all six communities distribute government-provided seeds and fertilizers. Death Benevolence Societies in the communities provide support during family deaths. 'Kuweni Samithi' ('Kuweni' society) in several communities oversees multiple small Indigenous villages and helps solve their day-to-day problems. Most coastal Vedda communities have fishing societies to regulate fishing activities. A tribal society, 'Wariga Sabawa', brings together representatives from all Indigenous communities nationwide to express their concerns to the Indigenous Vedda leader. A respondent from the 'Dalukana' community explained one such occasion.

> *We [Vedda] have a 'Wariga Sabahawa' (a tribal society), where seven Indigenous communities get together. Nearly ten representatives from each village go to 'Dambana' and present their community requirements to the leader. Last time, we [Vedda] informed him [Vedda leader] that we [Vedda] have restrictions on accessing the forest. Our leader agreed to provide us with an identity card mentioning that we [Vedda] are members of an Indigenous Community (Respondent 03).*

Respondents highlighted how community-based organizations sustain Vedda in their livelihoods, fostering entrepreneurial ideas and action by creating new business opportunities. However, continuous support from the UN or non-governmental organizations (NGOs) is lacking. Governmental support from agencies like the Department of Agriculture, Department of Wildlife Conservation, Mahaweli Authority—an authority supporting agricultural activities in the dry zone of Sri Lanka—National Aquatic Development Authority, and the 'Samurdhi' program—a Sri Lankan government-sponsored national poverty alleviation program—is also inadequate. Vedda noted that 'Sirasa', a private media station, was the only group that had visited Indigenous communities recently.

In Sri Lankan Indigenous communities, the structural agency is shaped by resource scarcity, limited access to finance and education, and the loss of land rights. Here, structure is a recurring system that can constrain opportunities, while agency represents the capacity for independent action. Overcoming this agency—structure paradox is challenging. The government, NGOs, and private organizations play a vital role in transforming this paradox by providing access to capital and education and securing land rights. Capacity building within the communities will enhance their ability to navigate the agency—structure paradox by utilizing resources through 'entrepreneurial making do'. Individual efforts with agentic abilities can reshape the existing rigid structure, opening opportunities for the emergence of entrepreneurship.

Collective capacity: Access to information is one of the major issues Indigenous communities face. According to the Dambana community leader, internet access is absent, and TV ownership is minimal (only four or five families out of nearly 400). Illiteracy in the national language, Sinhala, is common. They rely primarily on radios for news and updates. Word of mouth of the people who travel outside the village plays a greater role in information exchange, increasing the risk of inaccuracy. Few visits from government departments like Agriculture, Wildlife Conservation, and Health exacerbate the information gap. During COVID-19, the lack of healthcare officers' presence heightened the spread due to insufficient access to accurate information, leading to uncertainty about illnesses within the communities.

> *I [Vedda] did not stay home during COVID; I [Vedda] roamed the village and the forest. I am [Vedda] not afraid because I [Vedda] chant and pray to the ghosts for a cure. Besides, staying home is not an option; I [Vedda] must earn a living. No one will feed my family otherwise (Respondent 06).*

Similar to other disadvantaged groups, access to capital is a major constraint faced by these Indigenous communities in Sri Lanka. Local banks are reluctant to extend financial

support due to perceived high-risk profiles, occasional scarcity of reliable information, inadequate skills, and limited regulatory support for lending. Only two representatives from the 'Dambana' and 'Henanigala' communities confirmed that Vedda received loans for farming, fishing, or other livelihood activities through a state bank. Despite shared environmental challenges, some individuals exhibit entrepreneurial traits, like one from 'Dambana', who saves and invests, displaying a need for power, achievement, calculated risks, and autonomy.

> *It was my idea to start the shop. I [Vedda] saved LKR 5000 (~USD 17) monthly as a daily wager and started the shop. Additionally, I [Vedda] secured a bank loan of LKR 100,000 (~USD 350) to support my business (Respondent 07).*

Culturally aligned venture strategies: While many market-driven businesses focus on product diversification for income generation, most Indigenous communities, including the Vedda, continue to rely on traditional products that reflect their cultural heritage and ecological knowledge. These communities predominantly sell raw agricultural and fisheries products, maintaining practices that have been passed down through generations. While large-scale processing and packaging are uncommon, some Vedda engage in traditional methods such as stone-ground maize flour production and sun-dried fish preservation, both of which align with their customary ways of sustaining livelihoods. These heritage-based products not only provide economic benefits but also preserve cultural identity, Indigenous craftsmanship, and environmentally sustainable production methods. Households that engage in these traditional processing techniques often earn higher incomes than those selling raw products, demonstrating the potential of revitalizing and promoting traditional products as a means of economic sustainability.

Indigenous communities engage in local market relationships that shape how they sell their products and sustain their livelihoods. Rather than operating within a fully developed market system, they primarily rely on village retail shops owned by community members, fostering informal trade networks and trust-based exchanges. These local market relationships reinforce community-based commerce, where transactions are often influenced by social ties, reciprocity, and long-standing trade practices. Most Indigenous producers depend on family labor, with only a small percentage engaging in commercial farming. However, these localized trade dynamics serve as a foundation for entrepreneurial activities, enabling Indigenous entrepreneurs to navigate economic opportunities within their immediate communities. Also, they engage in culture-based tourism, where they demonstrate their way of life to the tourists. In the Sri Lankan Indigenous context, these local market interactions play a crucial role in sustaining traditional economies and fostering small-scale entrepreneurship.

4. Discussion

This section discusses the key findings of our study in relation to the broader literature on Indigenous entrepreneurship and climate adaptation. We analyze how the identified drivers shape Indigenous entrepreneurial responses to climate challenges and explore their theoretical and practical implications, followed by the limitations of our study and future research recommendations.

4.1. Indigenous Entrepreneurship as a Climate Adaptation Strategy

Our study investigates the drivers of Indigenous entrepreneurship in the face of climate adaptation. We highlight how Indigenous entrepreneurship serves as a mechanism for climate adaptation, emphasizing sustainability, resilience, and cultural continuity. Recognizing the urgent need for adaptive responses to climate change, we examine how Indigenous communities integrate traditional ecological knowledge with entrepreneurial

activities to navigate environmental uncertainties. Our findings contribute to a growing body of research that positions Indigenous entrepreneurship as a sustainability-driven alternative to conventional business models, which often prioritize short-term economic gain over long-term environmental and social well-being.

Indigenous entrepreneurship differs from mainstream entrepreneurship by prioritizing community well-being, environmental stewardship, and intergenerational knowledge transfer [5]. Indigenous businesses embrace sustainability by leveraging local ecological knowledge, fostering collective action, and preserving cultural heritage [10]. This sustainability-driven approach ensures that entrepreneurial ventures remain ecologically viable while enhancing the resilience of Indigenous communities to climatic and socioeconomic challenges [4,5]. Although entrepreneurship has been identified as one of the most important adaptive strategies for climate change, it is still understudied [79], particularly in Indigenous contexts [1]. While Indigenous groups face heightened vulnerability to climatic impacts, scholarly, professional, and Indigenous communities lack systematic studies exploring the intersection of climate adaptation, Indigeneity, and entrepreneurship [87]. Our study addresses this gap by identifying factors in the emergence of entrepreneurship and applying them to the Sri Lankan Indigenous context.

We identified three cross-scale characteristics common in all 15 drivers of Indigenous entrepreneurship, crucial for their emergence amidst climatic or non-climatic challenges. First, these drivers are place-based, meaning their impact on entrepreneurship is highly context-specific. For instance, resource scarcity among Canadian First Nation communities creates entrepreneurial opportunities through processes like bricolage [67], while in the Sri Lankan Indigenous context, resource limitations discourage engagement in entrepreneurship. Second, the emergence of these factors is resource-dependent [88]. For example, the ability to access and share resources will help create strong social networks. Third, these factors are time-dependent and may lose potential over time, emphasizing the importance of timeliness in seizing entrepreneurial opportunities for effective action [89,90].

Interactions exist among 15 identified drivers of Indigenous entrepreneurship. For instance, stable political and economic nations foster social conditions, cultural norms, and community support for entrepreneurship [91,92]. Strong social ties create resource-abundant environments, and supportive legal and financial policies enhance access to knowledge and education [93]. Drives of Indigenous entrepreneurship can also be applied to non-Indigenous contexts. However, their application in Indigenous contexts is unique compared to non-Indigenous contexts. For instance, factors such as access to capital and information, crucial in non-Indigenous contexts [94,95], play a limited role for the Vedda. Instead, social networks, institutional support, and learning enhance adaptive capacity and entrepreneurialism [96–98]. Unlike non-Indigenous contexts, Vedda faces challenges in product diversification and overcoming the agency—structure paradox. Only two of six communities practice product diversification, making flour and handcrafts, while most sell raw produce. The economic environment directly influences the emergence of entrepreneurship [99].

In the Sri Lankan Indigenous context, entrepreneurship often arises out of necessity, driven by a lack of alternative employment opportunities. Certain characteristics of necessity entrepreneurship, where individuals engage in entrepreneurial activities for survival rather than choice [100], are evident among these communities. Economic marginalization, resource access challenges, cultural barriers, and local community needs contribute to the emergence of necessity entrepreneurship [100,101]. In such a context, entrepreneurship can catalyze positive change [100,102]. Therefore, supporting entrepreneurship in Indigenous settings involves recognizing and addressing the specific challenges these entrepreneurs face and ensuring that initiatives provide tailored support. This approach aims to make

entrepreneurship a positive force for economic development and cultural preservation within Indigenous communities.

Indigenous entrepreneurship in the Sri Lankan Vedda communities primarily consists of small-scale, family-run enterprises that emphasize cultural preservation and local sustainability over expansion. Entrepreneurship in Indigenous Vedda communities relies on social networks within communities, intergenerational knowledge, and traditional ecological practices, carrying out subsistence pursuits such as agriculture, fishing, honey collection, and crafts. In contrast, larger-scale Indigenous enterprises, though rare, require greater capital, infrastructure, and market integration, often struggling to balance cultural integrity with commercial viability due to financial and regulatory barriers [9,12]. A key distinction also exists between subsistence-based Indigenous entrepreneurship, which primarily supports local livelihoods through traditional, community-oriented practices, and commercial Indigenous ventures, which engage with formal markets and income diversification [6]. As climate variability and land access restrictions challenge traditional livelihoods, some Vedda entrepreneurs adopt hybrid models like eco-tourism and organic farming to navigate modern economic systems while maintaining cultural authenticity [7]. Without targeted policies recognizing and sustaining Indigenous enterprises at different scales, many entrepreneurs remain confined to subsistence-level operations, restricting their potential for economic resilience and sustainable development.

Integrating entrepreneurship into climate change adaptation planning and action needs more attention, especially focusing on Indigenous communities [103]. Our findings indicate that Indigenous entrepreneurship should be recognized as a key pillar of climate adaptation and sustainability policy. Indigenous entrepreneurship presents a locally embedded, culturally responsive alternative that aligns economic development with environmental stewardship. The 15 drivers of Indigenous entrepreneurship, categorized under the five high-level key themes, offer valuable guidance for policymakers in incorporating entrepreneurship into climate adaptation planning. They should integrate Indigenous perspectives into climate adaptation frameworks, ensuring that Indigenous entrepreneurs receive institutional recognition, financial support, and legal protection for their sustainable business practices. Furthermore, capacity-building programs tailored to Indigenous entrepreneurs should emphasize business development, market integration, and financial literacy while safeguarding traditional ecological knowledge.

Our research reinforces the need to treat Indigenous entrepreneurship as a distinct category within economic and business studies. It challenges dominant economic paradigms, which tend to view entrepreneurship through the lens of individual achievement and competitive markets. Recognizing these alternative economic frameworks is crucial for developing policies and funding mechanisms that genuinely support Indigenous entrepreneurs. Considering the findings of the study, we developed a conceptual figure (Figure 3) to illustrate the drivers of Indigenous entrepreneurship that foster climate change adaptation in Indigenous communities. Together and individually, these drivers shape the emergence of entrepreneurship. This figure comprehensively presents the identified drivers within the five overarching themes, offering insights into how these drivers influence entrepreneurial behavior. It serves as a potentially valuable tool for Indigenous communities, policymakers, researchers, and practitioners, guiding them in developing and implementing climate adaptation responses through entrepreneurship.

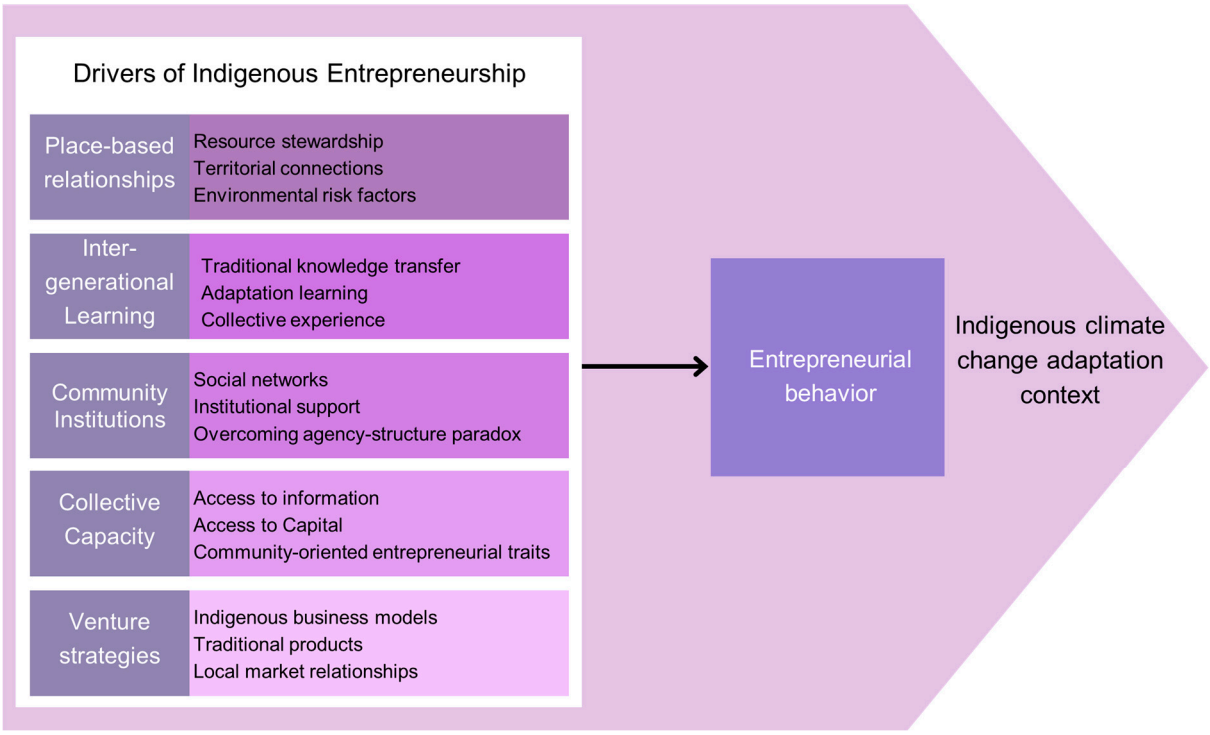

Figure 3. Conceptual figure on the drivers of Indigenous entrepreneurship and how they lead to entrepreneurial behavior in the Indigenous climate change adaptation context.

4.2. Contributions

Our research makes several significant contributions to both the theoretical underpinnings and practical applications of Indigenous entrepreneurship in the area of climate adaptation. Considering the theoretical contributions, first, we expand Indigenous Entrepreneurship Theory by offering a comprehensive framework that highlights the importance of collective capacity, culturally aligned venture strategies, and intergenerational learning in influencing entrepreneurial ventures addressing climate change. In contrast to traditional entrepreneurship approaches that tend to emphasize individualistic and profit-oriented objectives, our research stresses the community-oriented, resource-reliant, and culturally embedded nature of Indigenous entrepreneurship. Second, our work highlights the intersection of entrepreneurship and climate adaptation, an underexplored area within both sustainability and Indigenous studies. By identifying fifteen key factors grouped under five thematic areas—place-based relations, intergenerational learning, community institutions, collective capacity, and culturally aligned strategies—this research provides a novel framework to comprehend how entrepreneurship can serve as a mechanism for climate resilience. Third, our study adds to the field of sustainability-focused businesses by illustrating that Indigenous entrepreneurship, grounded in traditional ecological knowledge, represents an alternative model of entrepreneurship that emphasizes collective thriving, environmental stewardship, and cultural continuity over short-term economic profit.

In addition to these theoretical contributions, our study provides practical implications for policymakers, development agencies, NGOs, and Indigenous communities themselves. First, recognizing and supporting Indigenous-led entrepreneurship as a climate change adaptation strategy can empower communities to respond to localized issues using locally culturally suitable solutions. Policymakers can incorporate Indigenous entrepreneurial models into national and regional climate adaptation strategies that extend beyond the purely technical to community-based and culturally appropriate initiatives. Second, institutional and financial assistance must be designed to address the specific requirements of

Indigenous business individuals. The evidence gathered recognizes that obstacles, including restricted access to finance, markets, and institutional assistance, hinder the business operations of Indigenous individuals. Initiatives providing microfinance, grants, and culturally relevant training can reduce these obstacles. Promoting community-based business structures like cooperatives and collective enterprises would also increase resilience and sustainability. Third, educational interventions that support intergenerational knowledge transmission and adaptation learning need to be prioritized. Our study demonstrates that the continuity of traditional knowledge is critical to entrepreneurial resilience. Integrating Indigenous knowledge systems into entrepreneurship training, education, and capacity development programs can strengthen these communities' adaptive capacities.

4.3. Limitations

Despite the novel insights offered, we acknowledge several limitations of our study. First, our study is geographically limited to six Vedda villages in Sri Lanka. Although this limitation enables an in-depth exploration of contextually specific variables, findings may not be readily generalizable to other Indigenous populations, especially those in varying socio-political or environmental contexts. Second, the process of data collection relied heavily on semi-structured interviews and self-reported narratives, which, although providing in-depth qualitative insights, might be prone to social desirability bias or memory recall limitations. Despite efforts to enhance reliability (e.g., cross-validation, validation from community leaders), certain inherent limitations of qualitative research persist. Third, the research is cross-sectional in design and therefore has limited scope for examining longitudinal entrepreneurial processes or the development of adaptive strategies for climate change. Longitudinal studies in the future may provide more insight into how such programs unfold as they adapt to changing climatic and socio-economic circumstances over time.

4.4. Future Research Directions

Building on the findings of our study, future research should explore several key areas: comparative research with various Indigenous populations is required to test both the commonality and divergence of the factors found in various global contexts. For instance, an investigation into the prevalence of analogous drivers among Indigenous peoples in Africa, the Arctic, or the Americas may yield significant cross-cultural information. Second, longitudinal studies must be conducted to find out how Indigenous climate-adaptive enterprises evolve and change over the years and respond to ongoing environmental, social, and economic transformations. Such studies could potentially disclose the processes of entrepreneurial adaptation and resilience, including intergenerational knowledge transfer processes in operation. Third, future research should explore actionable policy mechanisms to integrate Indigenous entrepreneurship into national and global climate adaptation strategies. They may include frameworks for institutional support, financial mechanisms, and culturally appropriate capacity-building initiatives. Developing such policies would strengthen the role of Indigenous entrepreneurs in advancing sustainable and community-driven climate resilience efforts. Fourth, interdisciplinary research combining entrepreneurship, Indigenous studies, and climate science can significantly contribute to our understanding of how traditional knowledge can be combined with contemporary entrepreneurial approaches to tackle global sustainability issues. Partnership approaches with Indigenous researchers and communities as co-researchers would provide ethical, culturally appropriate, and meaningful research results.

5. Conclusions

Our study explored the drivers shaping the emergence of entrepreneurship to foster climate adaptation among Indigenous communities. We identified 15 drivers that support the emergence of entrepreneurship as an adaptive response to climate change through a systematic literature review. Categorized into five key themes—place-based relationships, intergenerational learning, community institutions, collective capacity, and culturally aligned venture strategies. These drivers exhibit cross-scale characteristics such as place-based nature, resource dependency, and time dependency. Their impact on adaptive capacity varies, influencing the emergence of entrepreneurship in response to climate change. Empirical data from the Sri Lankan Indigenous Vedda context validate the relevance of these factors. Our study contributes valuable insights into poverty reduction and capacity building through entrepreneurship promotion in disadvantaged communities. Finally, we recommend that future research explore scalable models of Indigenous entrepreneurship that retain cultural integrity while expanding market opportunities, ensuring that Indigenous-led sustainability efforts receive the global recognition and support they deserve.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/su17104472/su17104472/s1, Table S1. Coding questions used to analyze selected articles. Table S2. Questionnaire used in field data collection. Table S3. Selected case study profiles. Table S4. List of publications. Figure S1. Images of field data collection.

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