

Entrepreneurship-based factors to foster climate adaptation among Indigenous communities

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ABSTRACT (ACADEMIC)

This thesis investigates the factors that cause the emergence of entrepreneurship to foster climate adaptation responses among Indigenous communities. These factors can influence, enhance, or degrade the potential for entrepreneurship in the climate change adaptation context. While these factors are well-studied for non-Indigenous communities, they remain understudied for Indigenous communities' contexts. The objectives of this study are to identify the factors that shape the emergence of entrepreneurship to foster adaptive responses to climatic risks faced by Indigenous communities and to assess the identified entrepreneurship-based factors through a case study. I followed a two-stepped methodological approach through a systematic literature review and a case study analysis among Sri Lankan Indigenous 'Vedda' communities. The systematic review included 65 peer-reviewed articles from the Web of Science and Scopus databases, and the case study analysis involved 90 in-depth semi-structured interviews with nine Indigenous communities in Sri Lanka. I found 15 entrepreneurship-based factors that shape the emergence of entrepreneurship to foster climate adaptation. I categorized those 15 factors under five key themes. They are learning (*crop failure, learning, prior entrepreneurial experience*), institutions (*social networks, institutional support, overcoming the agency-structure paradox*), place (*resource (un)availability, location, environmental risk factors*), capacity (*access to information, entrepreneurs' psychological traits, access to capital*) and strategy (*business characteristics, product range, market characteristics*). I applied these factors to the Sri Lankan Indigenous community context and assessed them through case studies. My study frames the potential of entrepreneurship to foster climate adaptation among Indigenous communities. Further, the study provides insights for scholars, practitioners, and policymakers in making climate change adaptation-related Indigenous policies and broader-level applications, such as the development of new adaptation measures to reduce the risks of climatic changes through entrepreneurship.

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GENERAL AUDIENCE ABSTRACT

My study explores how entrepreneurship occurs to support Indigenous communities in adapting to the challenges and risks posed by climate change. I studied the factors that either help or hinder the emergence of entrepreneurship aimed at adapting to climate change. While these factors are well-studied in non-Indigenous communities, there is not much research on these factors focused on Indigenous contexts. My study aimed to identify the factors that support the emergence of entrepreneurship as an adaptive response to climate change and to apply those factors to the Sri Lankan Indigenous communities context. I used two main methods in this study. Firstly, I conducted a systematic review of the literature to explore documented knowledge on this topic through databases such as Web of Science and Scopus. Secondly, I conducted in-depth interviews with Indigenous community members ('Veddas') in Sri Lanka. This research identified 15 key factors that influence the emergence of entrepreneurship in response to climate change. I grouped these factors into five key themes: learning (*crop failure, learning, prior entrepreneurial experience*), institutions (*social networks, institutional support, overcoming the agency-structure paradox*), place (*resource (un)availability, location, environmental risk factors*), capacity (*access to information, entrepreneurs' psychological traits, access to capital*) and strategy (*business characteristics, product range, market characteristics*). I applied these factors to Indigenous community context in Sri Lanka and assessed those factors through detailed case studies. The findings of my study highlight the potential for entrepreneurship to support Indigenous communities in adapting to climate change. This research has important implications for researchers, practitioners, and policymakers to develop policies and measures to promote entrepreneurial activities within Indigenous communities.

DEDICATION

With deepest love and gratitude, I dedicate this work to my parents, *Amma* and *Appachchi*, my guiding stars!

This thesis is not just a culmination of my efforts but a testament to your sacrifices and belief in me...

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CREDIT AUTHOR STATEMENTS

This thesis includes two manuscripts in chapter 2 and 3 that are being prepared for submission to peer-reviewed journals. These manuscripts were prepared with co-authors, whose contributions are as follows.

Chapter 2: **Indunil P. Dharmasiri:** Conceptualization, Writing-Original draft. **Richard A. Hunt:** Supervision, Conceptualization, Writing-Reviewing and Editing.

Chapter 3: **Indunil P. Dharmasiri:** Conceptualization, Writing-Original draft, Data curation, Formal analysis, Validation, Visualization. **Eranga K. Galappaththi:** Supervision, Conceptualization, Methodology, Resources, Investigation, Writing-Reviewing and Editing, Validation, Funding acquisition. **Timothy Baird:** Writing-Reviewing and Editing. **Anamaria Bukvic:** Writing-Reviewing and Editing. **Santosh Rijal:** Writing-Reviewing and Editing.

Chapter 1: Introduction

1.1 Introduction

The introductory chapter will focus on describing the background of the research and the problem that needs to be addressed, which is associated with the study context. Next, the chapter states the research objectives of the study, the methodology followed, the theoretical context, and the significance of the study. The chapter concludes with the thesis outline.

1.2 Background and problem statement

Climate change refers to long-term shifts in global or regional climatic patterns (IPCC, 2021). Climate change can occur due to natural internal processes or external forces such as modulations of the solar cycles, volcanic eruptions, and anthropogenic changes in the composition of the atmosphere or land use (IPCC, 2021). It causes harmful geographical and environmental implications (Howard-Grenville et al., 2014). Adaptation to climate change involve adjusting social, economic, and environmental practices to cope with and mitigate the impacts of climate change (Ford et al., 2018). Key aspects of climate adaptation include resilience building, ecosystem management, infrastructure and technology development, water resource management, agricultural practices, and economic diversification (Altieri & Nicholls, 2017).

Tailoring climate adaptation to meet the unique needs of Indigenous communities is important (Ford et al., 2018). Indigenous cultures are deeply connected to their natural surroundings, while their traditional practices, customs, and livelihoods are tied to the environment compared to non-Indigenous communities (Cocks, 2006). As a result, climate change can disrupt these cultural practices and threaten the continuity of Indigenous livelihood patterns (Throsby & Petetskaya, 2016). They rely on natural resources such as land, water, and forests for their economic activities, food sources, and cultural practices (Godoy et al., 2005). Climate change can reduce the availability and stability of these

resources (Godoy et al., 2005). Furthermore, Indigenous communities often have limited economic resources, making them more susceptible to the financial impacts of climate change (Dolan & Walker, 2006).

In the context of climate change, entrepreneurship can play a role in developing innovative solutions and sustainable business practices (York & Venkataraman, 2010). Entrepreneurship can be an adaptive response to climate change among Indigenous and vulnerable communities (de Block et al., 2019; Dean & McMullen, 2007). Entrepreneurship can contribute to building resilience at the community level by creating economic opportunities and fostering self-sufficiency in the face of climate change. (Islam et al., 2020). Climatic risks and uncertainties can play a significant role in providing the ground for shaping entrepreneurship since entrepreneurs thrive in risky and uncertain environments, as introduced by Schumpeter in 1942 (York & Venkataraman, 2010). Entrepreneurship is a creative destruction process of the existing systems that exploit opportunities for generating economic returns and social growth (Hart, 2005). Entrepreneurship involves identifying and exploiting opportunities to create and grow businesses (de Block et al., 2019). It entails how people proactively adapt, take calculated risks, and innovate in response to stimuli from both internal and external environments (Iza et al., 2019).

Factors influencing entrepreneurship in climate adaptation are multifaceted and can vary across contexts (Baker & Welter, 2020). Several factors that support the emergence of entrepreneurship in the face of climate change are the availability of information, access to financial resources, and innovation and technology (Ruiz-Mallén et al., 2017). While considerable research has identified these factors within non-Indigenous contexts, there is a significant absence of studies addressing these factors within Indigenous contexts. Identifying and addressing these factors holistically is important for developing effective policies and support mechanisms that promote entrepreneurship in climate adaptation among Indigenous peoples. This study fills the research gap by synthesizing global scientific literature on entrepreneurship to foster climate change adaptation and applying that knowledge to Indigenous contexts to assess through a case study.

1.3 Research objectives

This study aims to identify entrepreneurship as an adaptive response to face climate change among Indigenous communities globally.

The specific objectives of the study are:

- 1) To identify the factors that shape the emergence of entrepreneurship to foster adaptive responses to climatic risks faced by Indigenous communities.

A systematic literature review was developed to synthesize the existing literature on climate adaptation, Indigenous communities, and entrepreneurship nexus. The systematic literature review aimed to capture the relationship between entrepreneurship and climate change adaptation among global Indigenous communities. The findings of the systematic review provide an account of the factors in Indigenous contexts that shape the emergence of entrepreneurship in the face of climate change. Also, the systematic review helps identify research gaps and the existing theoretical approaches in the current understanding of the field.

- 2) To assess the identified factors that shape the emergence of entrepreneurship through a case study.

Preliminary empirical data on entrepreneurship-based factors were collected among Sri Lankan Indigenous communities. The collected data were analyzed, and a case study was developed. Development of a case study followed by the primary data collection aimed at applying the new knowledge found through the systematic review to an Indigenous community context. The findings of both objectives provide a detailed picture of the entrepreneurship-based factors that shape the emergence of entrepreneurship among Indigenous communities to foster climate adaptation. This study can help researchers, policymakers, stakeholders, and practitioners promote entrepreneurship among Indigenous communities and formulate climate adaptation strategies focusing on Indigenous entrepreneurship.

1.4 Methods

I followed a two-step methodology to address the objectives of the study. In addressing the first objective, a systematic literature review was conducted using Web of Science and Scopus databases. A systematic approach was used because there were too few studies conducted in the area that I focused on: the intersection of the entrepreneurship-climate adaptation-Indigenous communities' nexus. The entrepreneurship-based factors that support the emergence of entrepreneurship to foster climate change adaptation among Indigenous communities were identified globally through this systematic literature review. Entrepreneurship-based factors in this study are referred to as the determinants that cause the emergence of entrepreneurship among Indigenous communities to foster climate change adaptation. I addressed the second objective of the study through a case study assessment focusing on field data collection. Here, I applied the identified entrepreneurship-based factors to the Sri Lankan Indigenous 'Vedda' community context to acquire an in-depth understanding. For that, I collected preliminary empirical data on entrepreneurship-based factors that support the emergence of entrepreneurship to foster climate adaptation among Sri Lankan Indigenous communities and assessed them through a case study. Chapter 3 provides further in-detailed information on the two-stepped methodology followed in this study.

The ethics of data collection and the positionality of the researchers were considered throughout the data collection process. The researchers adopted ethical considerations such as 'privacy,' 'confidentiality' and 'anonymity,' 'critical reflexivity,' researchers' difficulties adapting to participants' worldviews, and gender and power relations (Galappaththi, 2020). Regarding the positionality of the researchers, we are brown-colored males and females born and raised in Sri Lanka. All the researchers involved in this project are based in the United States. All of them are from a majority ethnic group (Sinhala) in Sri Lanka. Researchers study Indigenous communities, which are a minority group in Sri Lanka. The researchers acknowledge that their positionalities have changed over the data collection period and have affected the study's data collection and analysis. Researchers tried to be mindful of their positionality to minimize its effect throughout the study.

1.5 Conceptual background

The two main theoretical backgrounds this study will build upon are climate change adaptation and entrepreneurship. Climate change adaptation plays an important role in developing initiatives and measures to reduce the vulnerability of natural and human systems against climate change impacts (Hussain, 2019). Climate change adaptation is defined differently based on the contextual system. Adaptation in human systems is defined as the process of adjustment to actual or expected climate and its effects to moderate harm or exploit beneficial opportunities (IPCC, 2021). Adaptation in natural systems is defined as the process of adjustment to actual climate and its effects. In some natural systems, human intervention may facilitate adjustment to the expected climate and its effects (IPCC, 2021). Adaptation is a manifestation of adaptive capacity (Smit & Wandel, 2006). Adaptive capacity is defined here as the ability of a community to adjust its characteristics or behavior to expand its coping strategies under existing climate variability or future climate conditions (IPCC, 2021). The adaptation strategies can differ based on the nature of the community in focus (Brooks et al., 2005; Smit & Wandel, 2006).

This study uses the conceptual model of entrepreneurial ideation (i.e., opportunity recognition) and action introduced by McMullen & Shepherd (2006) as the primary entrepreneurship theory. I adopted McMullen & Shepherd's model here since it employs an action perspective that suggests how a combination of knowledge and motivation can overcome ignorance and uncertainty about an opportunity in the environment. Furthermore, this model explains how an entrepreneurial idea develops into the implementation stage (McMullen & Shepherd, 2006). Although this model explains the process from entrepreneurial ideation to action, it has not considered the significance of spatial context in entrepreneurship. Spatial context: which is the geographical location of entrepreneurial firms in terms of their distribution at global, national, regional, and local scales is a pivotal moderator in determining whether an individual progresses from recognizing an opportunity to pursuing it (Baker & Welter, 2020; Trettin & Welter, 2011). In my study, I apply McMullen & Shepherd's model to the broad Indigenous climate adaptation context to identify the factors that shape the emergence of this entrepreneurship process. Chapter 2 provides a holistic understanding of the theory applied in this study.

1.6 Significance of the study

The findings for the study objective one provides an account of the factors that shape the emergence of entrepreneurship to foster climate change adaptation at the global scale. The findings can provide information on how entrepreneurs shape conditions for success in the context of uncertainties related to climate change and their capacity to innovate and take risks to develop and exploit opportunities to create new ecosystem services, markets for these services, and actors that maintain these services. The findings of the second objective provide an assessment of the factors that shape the emergence of entrepreneurship to foster climate change in the context of Sri Lankan Indigenous communities. The study will help clarify the importance of entrepreneurship in the context of climate change adaptation among Indigenous communities.

Although scholars argue that entrepreneurship is a promising avenue to contribute to climate change adaptation (Dean & McMullen, 2007; Frederick, 2018; Lambooy & Levashova, 2011), the contextual factors that shape the emergence of entrepreneurship and the process through which entrepreneurial action occurs in Indigenous climate change adaptation context, remain unclear. Despite emerging literature suggesting that entrepreneurs may create links between different levels and spheres of climate governance (Boasson, 2014), governments rarely recognize entrepreneurship as an adaptive response to climate change. The reason is that the knowledge of entrepreneurship to foster adaptive responses to climate change is not widely studied (Ralston, 2013). Therefore, this study can be a helpful guide to policymakers in making more informed policy decisions conducive to promoting climate-adaptive entrepreneurship through supportive regulations, incentives, and funding mechanisms. Also, this study can provide insights to researchers seeking to conduct more research to further understand the applicability of entrepreneurship to foster climate change adaptation responses, especially focusing on Indigenous communities. Policymakers can play a role in fostering an environment conducive to climate-adaptive entrepreneurship through supportive regulations, incentives, and funding mechanisms.

1.7 Thesis outline

This thesis consists of four chapters. The first chapter introduces the research study. First, the chapter explains the background, the problem statement, and the research objectives. Next, the chapter discusses the methodological approach of the study, the conceptual background, and the significance of the research. Finally, the chapter concludes with the outline of the thesis.

Chapters 2 and 3 are written as individual papers. I have followed a manuscript format aiming to publish those papers in peer-reviewed journals. Chapter two is being prepared to be submitted to the *Entrepreneurship and Regional Development* journal, while chapter three is being prepared for submission to the *Global Environmental Change* journal.

Chapter 2 provides the theoretical context of the study. It reviews the relevant entrepreneurship theory that underpins the study. This chapter explains the effect of the spatial context in entrepreneurial idea generation (ideation) and entrepreneurial action, where an idea develops into the implementation stage. The chapter further describes the importance of spatial context in shaping the emergence of entrepreneurial opportunities and transforming them into the implementation stage.

Chapter 3 presents the results of the study (Objectives 1 and 2). First, the chapter presents the descriptive statistics of the systematic literature review. Next, the chapter answers the first research question by identifying 15 entrepreneurship-based factors. Finally, the chapter answers the second research objective using a case study developed through field data collected among Sri Lankan Indigenous communities.

The last chapter (Chapter 4) of the thesis consists of the conclusions, which state a final assessment of the research study. This chapter discusses the overall findings of the study and the policy implications for the broader entrepreneurship-climate adaptation-Indigenous communities' context. Finally, the chapter concludes with future research insights on Indigenous entrepreneurship to foster climate adaptation.

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Chapter 2: The moderating effect of spatial context on sustainable entrepreneurial opportunity recognition and realization

Abstract

This study investigates the moderating effects of spatial context on sustainable entrepreneurial opportunity recognition and realization. The study draws upon McMullen & Shepherd's process model of entrepreneurial action, which conceptualizes factors influencing the migration from third-person business opportunity recognition (i.e., that "one" can pursue) to the first-person realization of that opportunity (i.e., that "I" can pursue). Although the model has become a classic in entrepreneurship theory, due to its limited incorporation of the decisional milieu, it has not been applied to the practice and study of sustainability. I remedy this shortcoming by developing a model replete with the key contextual drivers of business ventures for sustainability aims, resources, and educational, legal, political, financial, and social factors. This framework emphasizes the need for deeply contextualized research and policies concerning the impact of context on sustainable entrepreneurship.

2.1 Introduction

Along with the increased call for conducting business more sustainably, sustainable entrepreneurship (SE) has become an important subfield of entrepreneurship research. SE interconnects entrepreneurship and sustainability theory (Schaltegger & Wagner, 2011; Terán-Yépez et al., 2020). It is derived from several streams of thought, such as ecopreneurship, social entrepreneurship, environmental entrepreneurship, corporate social responsibility (CSR), and institutional entrepreneurship (Muñoz & Cohen, 2018). SE is "a process of recognition, development, and exploitation of opportunities by individuals to bring future goods and services with economic, social, and ecological gains into existence" (Belz & Binder, 2017:6). A fundamental characteristic that sets SE apart as a subfield is the integration of environmental, social and economic dimensions into core business activities and identifying and pursuing opportunities (Shepherd & Patzelt, 2011; Muñoz & Cohen, 2018). SE is still considered an emerging subfield due to the unclear theoretical

difference between SE, green entrepreneurship (ecopreneurship), and social entrepreneurship and the lack of clarity regarding key constructs and multiple definitions (Muñoz & Cohen, 2018; Nuñez & Musteen, 2020). However, these issues present scholars with opportunities to contribute to advancing theory and practice by investigating the phenomenon to understand the unique aspects of SE better (Mellett et al., 2018).

According to the world population review (2023), the countries with the greatest focus on sustainable businesses are Denmark, the United Kingdom, and Finland. None of the Asian or African countries are listed at the top of the ranking, and they predominately represent those nations making the least progress in this regard despite the urgent and obvious need. Moreover, entrepreneurial activity varies by region or industry, even within the same country, for instance, with Beijing vs. rural China or Silicon Valley vs. rural USA (Autio et al., 2014). Increasingly, the unavoidable question is: Are sustainable businesses a mere artifact of wealth – something that is solely implemented in areas where individuals are willing and able to pay a premium for sustainable development? According to a study by Spence et al. (2011), nations of the Global South- usually the suppliers of the multinational enterprises in the Global North- find it difficult to integrate sustainability practices due to challenging contextual factors. Even though sustainability is a universal issue, sustainability principles and best practices are recognized by multinational companies primarily located in the Global North. Therefore, it is vital to study how various contextual factors influence SE and how their influence varies depending on the spatial context.

This study draws upon the existing literature on entrepreneurial opportunity recognition and realization by McMullen & Shepherd (2006), where entrepreneurial action is conceptualized as a two-stage process. Stage 1 involves an individual recognizing an opportunity from a third-person perspective (i.e., “one could pursue that opportunity”). Stage 2 involves a process whereby individuals migrate from a third-person to a first-person perspective (i.e., “I can pursue that opportunity”) through an ability and willingness to bear risk, which elicits entrepreneurial action. This robust notion has exerted considerable influence in the theorization of entrepreneurial action (Townsend, Hunt & Manocha, 2020) but has encountered limited applicability to the study and practice of sustainability in entrepreneurship due to its limited incorporation of actor-independent,

macro-environmental, contextual drivers. This investigation aims to develop a conceptual framework that remedies this shortcoming, thereby enhancing scholarly efforts to identify, observe, describe, and predict the decisions, actions, and outcomes associated with sustainable entrepreneurship opportunities.

Several studies highlight the long-standing tendency to overlook or underestimate the significance of spatial context in entrepreneurship (Baker & Welter, 2020; Trettin & Welter, 2012). The spatial context of entrepreneurship refers to the geographical location of entrepreneurial firms in terms of their distribution at global, national, regional, and local scales (Welter, 2012). Even though comparative entrepreneurship research has been spurred due to the availability of data that investigates the effect of spatial context on the entrepreneurial dynamic, this research area is still in its early stages (Autio et al., 2014; Bowen & De Clercq, 2008). This study aims to examine the research questions: (1) What is the effect of spatial context on a third-person recognition (i.e., that one can pursue) of a sustainable business opportunity? (2) What is the effect of spatial context on the migration of a third-person sustainable business opportunity recognition to a first-person realization (i.e., I can pursue) of a sustainable business opportunity? This study contributes to the existing literature on SE by investigating the effect of contextual factors within which entrepreneurs recognize and realize sustainable business opportunities.

2.2 Opportunity recognition and realization in sustainable entrepreneurship

This section discusses the entrepreneurial opportunity recognition and realization process, followed by the effect of contextual level factors in sustainable opportunity recognition and realization. Finally, this section discusses the propositions and conceptual framework of the study.

2.2.1 The process of entrepreneurial opportunity recognition and realization

McMullen & Shepherd (2006) proposed a model that employs an action perspective that suggests how a combination of knowledge and motivation can be used to overcome ignorance and uncertainty about an opportunity in the environment (Figure 2.1). There are two stages in this model. Stage I represents attention and third-person opportunity

recognition. In this stage, the model explains how recognizing an opportunity caused by a third party depends on one's configuration. Individuals possessing the requisite knowledge and motivation are more likely to believe in the presence of a third-party opportunity resulting from a change.

Conversely, individuals who lack the necessary knowledge and motivation are less likely to view third-party change as an opportunity and may not attend it (McMullen & Shepherd, 2006). The term "third-person opportunity" refers to a potential opportunity for someone in the market that may or may not reflect an opportunity for everyone. However, the market potential exists for those individuals with the required attributes (Haynie et al., 2009). Stage II is only applicable to individuals who acknowledge the existence of a third-person opportunity. This stage is focused on evaluating the opportunity from a first-person perspective. Once prospective entrepreneurs believe that a change represents a third-party opportunity, they determine whether it can be pursued as a first-person opportunity by entering a decision-making process. Here, the entrepreneur's evaluation of a potential opportunity is not based on whether it is attractive to someone but rather on whether it is attractive to them personally (Haynie et al., 2009; McMullen & Shepherd, 2006). However, doubts may arise regarding the feasibility and desirability of its attainment and whether the motive for seeking it will be fulfilled (McMullen & Shepherd, 2006).

This noteworthy conceptual model provides significant insights into the entrepreneurial opportunity recognition process. However, it fails to incorporate the spatial context, crucial in shaping an individual's decision-making process. The spatial context where entrepreneurial opportunity occurs is a pivotal moderator that plays a crucial role in determining whether an individual progresses from recognizing an opportunity in the third person to pursuing it in the first person. This process especially applies to the SE context, which is rooted in contextual factors.

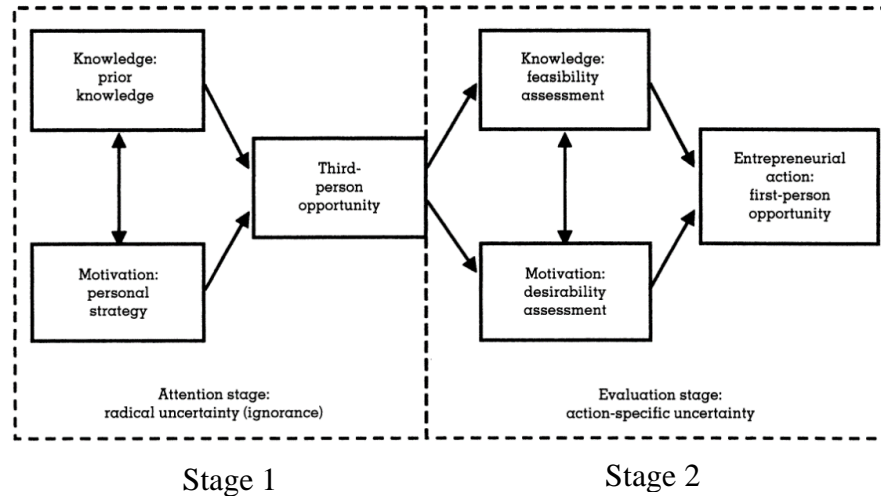


Figure 2.1: McMullen and Shepherd's (2006:140) conceptual model of entrepreneurial action

Shepherd & Patzelt (2011) contend that approaches used in traditional entrepreneurship research are inadequate in explaining opportunity recognition in SE since they exclusively account for economic factors. SE encompasses a broader framework underpinning social, economic, and environmental outcomes, necessitating a more comprehensive and inclusive approach to opportunity identification and exploitation (Khokhawala & Iyer, 2021). Previous research on SE has explored the correlation between environmental context and the recognition of sustainable business prospects (Khokhawala & Iyer, 2021). However, Muñoz & Cohen (2018), suggest that there needs to be more focus on how local contexts influence the sustainable venture process to advance the field of SE. A more expansive comprehension of how an entrepreneur's context shapes sustainable venture development (Muñoz & Dimov, 2015) is needed. Nuñez & Musteen (2020), in their study, have considered the entrepreneur as a central force in sustainable development and have examined contextual factors along with individual factors affecting the process of opportunity discovery and exploitation.

Based on the existing literature, several contextual factors are considered to play an important role in this process of entrepreneurial opportunity recognition, such as resources, social networks, access to finance, educational capacities, and supportive legal and political affairs (Autio et al., 2014). Interaction among contextual factors is discussed in previous

literature (Korsgaard et al., 2020; Welter, 2012). For example, nations with stable political institutions and economic and financial capacities create flourishing social conditions such as cultural norms, social attitudes, and community support (Argade et al., 2021). Strong social ties among individuals create resource-abundant environments for entrepreneurs (Argade et al., 2021). Nations with supportive legal and financial policies create environments with access to knowledge and education (Argade et al., 2021). All these factors create environments suitable for emerging SE. With time, potential entrepreneurs develop awareness and knowledge of environmental and social issues, especially those unique to their local communities (Nuñez & Musteen, 2020).

2.2.2 Propositions and conceptual framework

Relating back to McMullen & Shepherd's framework on opportunity recognition, Shepherd & Patzelt (2011) proposed a sense of compassion for those less fortunate and a strong emotional attachment to the local ecosystem and environmental resources as crucial factors for individuals to hold a third-person opportunity recognition. These stresses that understanding sustainability will not be enough if the individuals do not possess specific business expertise combined with a passion for the environment and compassion for others in society. Furthermore, Shepherd & Petzel (2011) suggests that prior knowledge coupled with motivation rooted in prosocial behavior leads to forming third and first-opportunity beliefs culminating in entrepreneurial action. This study adds to this perspective by highlighting the importance of contextual factors in the process of generating knowledge and motivation. Contextual factors have been identified as stimulators, motivational factors as well as sources of knowledge, which may, in turn, lead to entrepreneurial behavior (Muñoz & Dimov, 2015). This stresses the importance of contextual factors in the process of opportunity recognition.

Proposition 1: Contextual factors influence third-person business opportunity recognition.

According to (Muñoz & Dimov, 2015), knowledge and intention alone are insufficient to create sustainable value. They must be accompanied by action (i.e., exploiting a given opportunity). This process is explained by the second stage of McMullen & Shepherd's framework, which involves venture opportunity recognition and development into

businesses. Additional learning is required for this process, and it is primarily obtained by experimentation and action. In SE, these learning processes are involved in minimizing the use of natural resources, recycling, and innovating with the use of materials (Muñoz & Dimov, 2015; Shepherd & Patzelt, 2011). The required additional learning gained through experimentation depends on several contextual factors, such as the availability of resources, rules and regulations, and social norms (Shepherd & Petzel, 2011). Several scholars like Agarwal & Shah (2014) have investigated how the context influences and frames entrepreneurial action. The literature states that entrepreneurs make judgments and act based on their perception of opportunity, which may or may not differ from the judgments made by others (Bowen & De Clercq, 2008). Entrepreneurs use heuristics in making these judgments; through this, the context influences the entrepreneurial judgment of whether and how to exploit the entrepreneurial opportunity (Bowen & De Clercq, 2008).

Proposition 2: Contextual factors influence the migration of third-person business opportunity recognition to the first-person business opportunity realization.

2.2.3 Resources as a contextual factor in opportunity recognition and realization

The resource-based theory of entrepreneurship captures the crucial role played by access to resources in identifying entrepreneurial opportunities (Alvarez & Busenitz, 2001). According to the Resource-Based View (RBV), a company's capacity to create and sustain entrepreneurial profits is determined by its resource endowments of productive factors that are valuable, rare, and non-substitutable, as well as how they are effectively utilized to meet customer demands (Barney, 2001). Previous studies have found that individuals' economic resources are related to their engagement in pro-environmental behavior (Clark et al., 2003). Individuals with high disposable income are far more likely to engage in pro-environmental behavior (Tunçalp & Yıldırım, 2022), which hints at the recognition of sustainable business opportunities. High-income nations often possess a comparative advantage of abundant resources, which fosters a favorable environment for entrepreneurship (Tunçalp & Yıldırım, 2022). In contrast, emerging economies, characterized by rising living standards and available resources that support growth, are

distinguished from developing economies, which often lack such resources and exhibit lower growth rates due to limited economic liberalization (Roztocki & Weistroffer, 2011). In the case of emerging economies like India, sustainable profits can be achieved by adopting socially responsible practices, like innovative business processes, developing sustainable supply chains and prioritizing societal concerns in business goals (Viswanathan et al., 2007).

Proposition 1A: Resource-rich contexts increase third-person sustainable business opportunity recognition.

Opportunity evaluation represents not only a third person judgment based on the perceived attractiveness of the opportunity but also a first-person judgment that is influenced by the current knowledge, skills, competence, and resources of the business venture (Haynie et al., 2009). The importance of having access to financial, social, and human resources cannot be overstated in terms of increasing a potential entrepreneur's ability to detect and act upon discovered opportunities (Davidsson & Honig, 2003). Having abundant resources facilitates the feasibility and desirability of a venture idea (Haynie et al., 2009), which can trigger the opportunity transfer from the third person to the first person since it facilitates feasibility and desirability assessments mentioned in McMullen & Shepherd (2006). However, in some cases, such a bricolage-based approach to gaining additional learning will operate in a different manner. The bricoleurs will identify the feasibility and desirability of an opportunity through informal approaches such as internet searches or business outsourcing (Sunduramurthy et al., 2016). Nevertheless, they can co-occur as supplementary processes to the formal resource-seeking processes in new venture formation.

Proposition 2A: Resource-rich contexts influence the migration of third-person sustainable business opportunity recognition to the realization of first-person business opportunity.

2.2.4 Education as a contextual factor in opportunity recognition and realization

Educational facilities and their impact on contexts are specific to the considered contexts (Walter & Dohse, 2012). Educational factors in different contexts have the potential to

equip entrepreneurs with the necessary assets to engage in the entrepreneurial process (Walter & Dohse, 2012). Entrepreneurship education is vital in addressing youth unemployment and preparing youth for a world where employment patterns and practices change rapidly (Strachan, 2018). SE education can provide the competencies that enable entrepreneurs to make decisions they hold accountable for the ecological and social impacts while achieving economic gains (Strachan, 2018). Contexts with access to quality education, especially entrepreneurship education, can facilitate integrating and accumulating new knowledge. It can further stimulate the need to identify new business opportunities.

Proposition 1B: Contexts with a high level of education influence the third-person sustainable business opportunity recognition.

Knowledge contexts have differential impacts on new firm formation for various innovators, including employees, academics, and user innovators. It affects their relationships with existing firms and subsequent performance (Autio et al., 2014). These variations can extend to the availability of complementary assets, appropriability, the stage of the industry life cycle in which firm formation is likely to occur, and the nature of relationships with the existing firms and their ultimate performance (Autio et al., 2014). In developing countries, a lack of skill development combined with factors such as insufficient professional training and education can hinder the development of sustainable entrepreneurial capacities (Argade et al., 2021; Autio et al., 2014). Therefore, environments with higher levels of education are highly desirable for forming new ventures (Peterman & Kennedy, 2003). Education can foster a sense of desirability and feasibility toward entrepreneurship and further nurture the intention to become a business owner (Argade et al., 2021; Autio et al., 2014), which leads to the following hypothesis of the study.

Proposition 2B: Contexts with a high level of education influence the migration of third-person sustainable business opportunity realization to first-person business opportunity recognition.

2.2.5 Legal and political contextual factors in opportunity recognition and realization

The broader regulatory context of a country has a significant impact on the emergence of SE (Schaltegger & Wagner, 2011). The efficiency of regulations in a country influences the shifting hierarchy of social, environmental, and political concerns in public policy (Spence et al., 2011). However, the citizens' trust level toward public policies would also influence how entrepreneurs may respond to new environmental laws. They might react passively to solely obtain legitimacy without looking beyond to gain a competitive advantage (Spence et al., 2011). Lack of government intervention, weak industrial policies, and low-quality institutions in developing nations can create significant challenges for sustainable entrepreneurship. In contrast, developed nations often have more supportive policies and institutions that enable sustainable entrepreneurship to thrive (Argade et al., 2021), facilitating third-person opportunity recognition.

Proposition 1C: Contexts with stable legal and political factors influence third-person sustainable business opportunity recognition.

Based on the literature, targeted support from the government towards Small and Medium scale Enterprises (SMEs) can facilitate the initiation of new firms (Al-Ani et al., 2020). This government support can be in the form of subsidies and supply of raw materials, selling of products, provision of technology, and quality testing (Al-Ani et al., 2020; Khokhawala & Iyer, 2021). Governments that provide support in research, marketing, financial management, quality assurance, and technology are needed to transform the entrepreneurial ideas of SMEs into successful firms that can compete in the global marketplace (Al-Ani et al., 2020). These factors will facilitate the feasibility and desirability assessment of third-person opportunities. Entrepreneurial ecosystems and governments that actively support sustainable entrepreneurs who create value beyond economic gains trigger the process of first-person venture opportunity realization (Hoogendoorn et al., 2019; Khokhawala & Iyer, 2021).

Proposition 2C: Contexts with stable political factors influence the migration of third-person sustainable business opportunity realization to first-person business opportunity recognition.

2.2.6 Financial contextual factors in opportunity recognition and realization

Availability of finance is critical to business initiation and development. Sustainable business opportunities are relatively expensive and costly for SMEs in developing countries (Hallberg, 2000). Despite SMEs promoting economic growth and innovation in economies, access to finance is a major constraint faced by SMEs (Cumurovic & Hyll, 2019). Local banks have identified barriers that hinder their ability to finance SMEs, including the high-risk profile of SMEs, challenges in meeting collateral requirements, banks; preference for earning higher returns on traditional lending activities, high administrative costs associated with lending to SMEs, inability to provide long-term capital due to significant short-term liabilities in their deposit mix, occasional paucity of information, lack of adequate skills, and limited regulatory support for SME lending (Hallberg, 2000). Recent studies have shown that in contexts where financial literacy is high, there is scope for entrepreneurial initiatives, taking advantage of financial market offerings to finance their businesses, even at the basic stage of idea generation (Cumurovic & Hyll, 2019).

Proposition 1D: Contexts with strong financial factors influence third-person sustainable business opportunity recognition.

Low and complicated access to funding in many developing countries has reduced their sustainable entrepreneurial capacities (Argade et al., 2021; Autio et al., 2014; Tunçalp & Yıldırım, 2022). Unlike in more developed countries, the financial gap and low access to finance have been a problem in developing countries for a long time because the companies face liquidity problems, especially when they start a new business (Argade et al., 2021), which reduces the feasibility and desirability of business opportunities.

Proposition 2D: Contexts with strong financial factors influence the migration of third-person sustainable business opportunity realization to first-person business opportunity recognition.

2.2.7 Social contextual factors in opportunity recognition and realization

Reynolds (1991) identified four social contexts that relate to entrepreneurial opportunity by looking at it from a social perspective. They include the establishment of social relationships and bonds that promote trust instead of opportunism, the influence of ethnic identity as a decision-making factor in driving entrepreneurial affinity, life course stage context that involves analyzing the life situations and characteristics of individuals who have decided to pursue entrepreneurship, and population ecology where environmental factors determine the survival of new ventures (Al-Ani et al., 2020). There is extensive literature on entrepreneurs' social networks (Davidsson & Honig, 2003), especially the emerging business ecosystems literature that discusses the networks among customers, suppliers, and services as facilitators of the entrepreneurship process in high-tech firms (Buhr & Owen-Smith, 2010). Evolutionary scholars have emphasized the dispersion of knowledge among heterogeneous actors by highlighting the pivotal role of social interactions between these actors in exchanging and generating knowledge (Davidsson & Honig, 2003). This process is crucial to the emergence of innovative entrepreneurial activities. These various actors, in combination with the complex social networks of their interactions, facilitate entrepreneurial processes (Autio et al., 2014).

Proposition 1E: Contexts with supportive social factors influence third-person sustainable business opportunity recognition.

According to (Davidsson & Honig, 2003), the process of growing local networks necessitates investing in knowledge about local producers operating in both formal and informal economies. Interactions with them can encourage potential entrepreneurs to conduct feasibility and desirability assessments of the opportunities in the business as others perceive them and eventually lead to first-person opportunity realization.

Proposition 2E: Contexts with supportive social factors influence the migration of third-person sustainable business opportunity realization to first-person business opportunity recognition.

Figure 2.2 provides the conceptual framework developed using the propositions discussed throughout the paper. It provides an overall understanding of how several contextual factors can play an important role in the entrepreneurial opportunity recognition process.

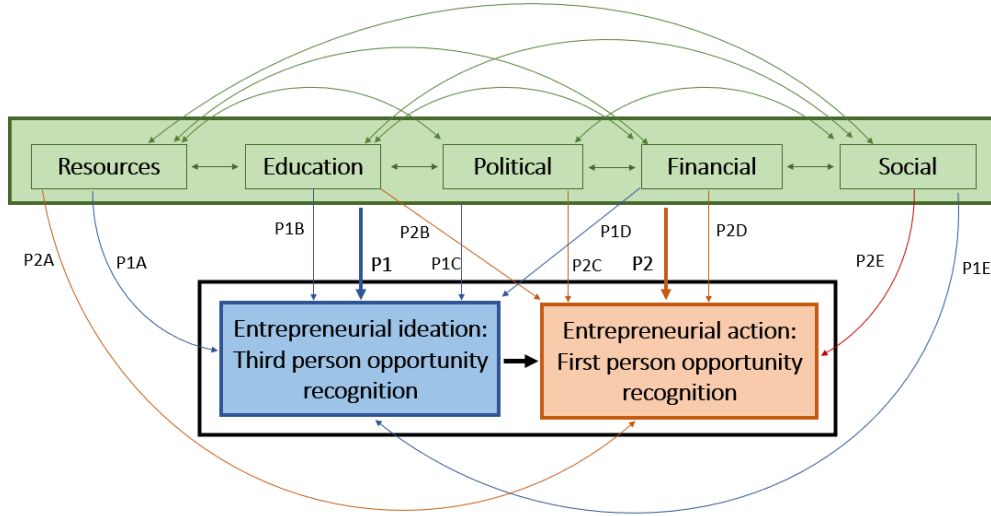


Figure 2.2: Conceptual framework

2.3 Conclusions

This study investigates the salient inquiries surrounding the spatial heterogeneity of sustainable entrepreneurship, such as why some countries actively engage in sustainable entrepreneurial activities while others exhibit few involvements. Also, it examines the factors that impede its emergence. This study discussed the effect of several contextual factors, resources, education, legal and political, financial, and social, that moderate the process of entrepreneurial opportunity recognition and realization. Accessibility to resources, adequate information and education, stable legal and political background, a strong financial basis, and a supportive social context can play a vital role in the process of third-party entrepreneurial opportunity recognition (entrepreneurial ideation) and migrating it to the first-person opportunity realization (entrepreneurial action). One notable observation here is that the attainment of third-person opportunity recognition is a necessary precursor to the achievement of first-person opportunity realization. In regions

like the Global North, there is a greater prevalence of individuals who successfully attain third-person opportunity recognition, which consequently expands the pool of individuals who can potentially transition from third person to first-person opportunity realization. In many areas of the world, including the Global South, there is a smaller number of individuals who go through both these stages. As such, the study bears substantial implications for a diverse audience of scholars, practitioners, and policymakers. This study warrants the importance of the proactive and innovative approaches to sustainable entrepreneurship grounded in deep understanding regarding the complex interplay between contextual factors such as resources, education, finance, legal and political factors, and social factors.

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Chapter 3: Entrepreneurship-based factors to foster climate adaptation among Indigenous peoples.

Abstract

The study aims to investigate the factors that cause the emergence of entrepreneurial ideation and action to foster climate change adaptation responses among Indigenous communities. These factors can influence, enhance, or degrade the potential to pursue entrepreneurship in a climate change adaptation context. Although these factors are well studied for non-Indigenous communities, they remain understudied for Indigenous peoples' contexts. The objectives of the study are to identify the factors that shape the emergence of entrepreneurship to foster adaptive responses to climatic risks faced by Indigenous communities and to assess the identified entrepreneurship-based factors through a case study. My approach combined a systematic literature review, which included 65 peer-reviewed articles from the Web of Science and Scopus databases, and a case study analysis involving in-depth semi-structured interviews (n=90) with nine Indigenous communities in Sri Lanka. I found 15 entrepreneurship-based factors, which I categorized under five key themes that shape the emergence of entrepreneurship. They are learning (*crop failure, learning, prior entrepreneurial experience*), institutions (*social networks, institutional support, overcoming the agency-structure paradox*), place (*resource (un)availability, location, environmental risk factors*), capacity (*access to information, entrepreneurs' psychological traits, access to capital*) and strategy (*business characteristics, product range, market characteristics*). I assessed these factors using the Sri Lankan 'Vedda' case study. This study frames entrepreneurship as a climate adaptation response among Indigenous communities. Further, it bears the implications for scholars, practitioners, and policymakers in making climate change adaptation and Indigenous entrepreneurship-related policies and broader-level applications, such as developing new national adaptation measures to tackle the risks of climatic changes through entrepreneurship.

1.0 Introduction

Climate change has become the greatest threat to the world in the 21st century. It has adversely impacted many communities worldwide (Tervo-Kankare, 2019). Hazardous impacts of climate change, such as sea-level rise, global warming, intense droughts, storm surges, heatwaves, and melting glaciers, can directly harm animals, destroy ecosystems, and weaken human livelihoods (Tervo-Kankare, 2019). Changes in the global climate can create risks and uncertainties since such changes could be greater in the future compared to present-day projections (de Block et al., 2019). Climatic shocks and stresses can lead to non-climatic shocks and stresses, such as poverty, food insecurity, health issues, and crop and livestock failure (Davis et al., 2009). Climatic shocks and stresses can alter the cultural and livelihood patterns of Indigenous communities at a greater scale (Galappaththi et al., 2020). 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-than-average levels of food insecurity and unemployment (Attanapola & Lund, 2013; Galappaththi et al., 2020).

Initiatives and measures developed due to adaptation to climate change can reduce the vulnerabilities that Indigenous and local populations face (Hussain, 2019). Adaptation is important in responding to climatic variability: assessing impacts and vulnerabilities and developing and evaluating response options (Nicholls et al., 2022). Without adaptation, the consequences of climate change impacts would be disastrous (Hussain, 2019). Reducing climatic risks and enhancing the adaptive capacities of populations is a global challenge that requires immediate action (Silva et al., 2012). Entrepreneurial activities among these disadvantaged communities include how people proactively adapt, take calculated risks, and innovate in response to stimuli from both internal and external environments (Iza et al., 2019). Despite the potential of using entrepreneurship to foster climate adaptation responses, it is highly understudied, especially in the context of Indigenous communities. Even the global-level synthesis reports, such as the Intergovernmental Panel on Climate Change (IPCC), do not focus on the potential of entrepreneurship in fostering climate adaptation.

There are different definitions of entrepreneurship. Most cited definitions highlight profit-oriented motives (Gedeon, 2010; Pirnar, 2015), risk tolerance (Hvide & Panos, 2014; Yi et al., 2022), experimentation (Kerr et al., 2014; Manso, 2016), and innovativeness (de Block et al., 2019; Lewandowska et al., 2021). De Block et al. (2019) define entrepreneurship as an innovative process that takes risks to develop and exploit opportunities to create new products, services, and markets. Entrepreneurial organizations are the engines of employment opportunities. They may create more new jobs than large established organizations due to breakthrough inventions (Dean & McMullen, 2007). Entrepreneurs are often motivated by more than just monetary goals (USDA, 2018). Vision, leadership, independence, innovation, and the ability to adapt during periods of change or stress are traits of all entrepreneurs (USDA, 2018).

Entrepreneurship can also be defined in the adaptation context. Tanner et al. (2019:406) define entrepreneurship as the efforts and strategies that focus on achieving a better fit with a change in the external environmental conditions. Indigenous communities are more vulnerable to climate change and are in need of entrepreneurial interventions than non-Indigenous communities (de Block et al., 2019; Dean & McMullen, 2007). Entrepreneurship can ensure a higher income, which can increase the adaptive capacity of Indigenous communities and decrease their vulnerability to future harmful climatic issues (Islam et al., 2020). Entrepreneurship is a process of creative destruction that subsequently exploits opportunities for generating economic returns and social growth (Hart, 2005). Entrepreneurship can reduce vulnerabilities among communities due to climatic risks and uncertainties while enhancing resilience since many entrepreneurs can thrive in risky and uncertain environments (York & Venkataraman, 2010).

Several factors can influence, enhance, or degrade entrepreneurial ideation and action as an adaptive response to climate change. These entrepreneurship-based factors are well-identified and defined only for commercial-scale businesses and in the context of non-Indigenous communities (Ruiz-Mallén et al., 2017). Despite the importance, the factors shaping the emergence of entrepreneurship in the face of climate change are highly understudied considering Indigenous communities' context. Whether the entrepreneurial approaches applied in non-Indigenous commercial scale context are applicable to

Indigenous context is yet to be studied. Therefore, investigating the entrepreneurial approaches applied in Indigenous contexts is timely. Knowing how environments become conducive to emerging entrepreneurship can be helpful for practitioners and policymakers to build entrepreneurial capacities, generate new entrepreneurial ideas, and develop and form new ventures among disadvantaged communities. Furthermore, investigating the factors that cause the emergence of entrepreneurship in fostering climate adaptation can be useful for scholars in developing new research in this area. This study fills the research gap by synthesizing global scientific literature on the factors that shape the emergence of entrepreneurship to foster climate change adaptation. Furthermore, it applies and tests these findings in the Sri Lankan Indigenous ‘Vedda’ Peoples context. Taken together, it provides a solution-oriented approach to improving the living standards of such disadvantaged communities.

The objectives of this study are (1) to identify the factors that shape the emergence of entrepreneurship to foster adaptive responses to climatic risks faced by Indigenous communities and (2) to assess the identified entrepreneurship-based factors through a case study of Indigenous communities in Sri Lanka. The first objective was fulfilled through identifying all the entrepreneurship-based factors that cause the emergence of entrepreneurship to foster climate change adaptation among the global Indigenous communities through conducting a systematic literature review. Entrepreneurship-based factors in this study refer to the determinants that cause the emergence of entrepreneurship among Indigenous communities to foster climate change adaptation. In fulfilling the second objective, the identified entrepreneurship-based factors were applied to the Sri Lankan Indigenous ‘Vedda’ community context. Preliminary empirical data were collected on entrepreneurship-based factors that shape the emergence of entrepreneurship among Sri Lankan Indigenous communities and later analyzed through case studies.

2.0 Theoretical context

Indigenous communities are the inheritors and practitioners of unique cultures and share inter-generational ancestry with pre-colonial dwellers of ancestral lands in a specific region of the world (United Nations General Assembly, 2007). They are the descendants of

original groups who settled in an area prior to the modern states and current geographical borders. There are nearly 476 million Indigenous peoples globally, roughly 6.2% of the world population (FAO, 2022). Most of them (260 million or 70%) are in Asia Pacific countries (FAO, 2018). Indigenous communities have a high level of resource dependency for their food systems, livelihoods, nutrition, and health (Attanapola & Lund, 2013; Galappaththi et al., 2020). Indigenous communities are historically marginalized and face greater adversities compared to non-Indigenous communities due to political and economic marginalization, loss of land and resources, human rights violations, discrimination, and higher-than-average levels of food insecurity and unemployment (Attanapola & Lund, 2013; Galappaththi et al., 2020). Literature on Indigenous peoples further discusses the lack of entrepreneurial capacities among Indigenous communities (Attanapola & Lund, 2013). Climatic variability has exacerbated the difficulties these communities already face. Climatic shocks and stresses can lead to non-climatic shocks and stresses, such as poverty, food insecurity, health issues, and crop and livestock failure (Davis et al., 2009). Climatic shocks and stresses can alter the cultural and livelihood patterns of Indigenous communities at a greater scale (Galappaththi et al., 2020). Therefore, the importance of climate change adaptation is much higher in Indigenous contexts than in others (Hussain, 2019).

Climate change adaptation is defined differently based on the context. Adaptation in human systems is defined as the process of adjustment to actual or expected climate and its effects to moderate harm or exploit beneficial opportunities (IPCC, 2021). Adaptation in natural systems is defined as the process of adjustment to actual climate and its effects. In some natural systems, human intervention may facilitate adjustment to the expected climate and its effects (IPCC, 2021). Adaptation is important to the people at the community level, and adaptation strategies can differ based on the nature and the community in focus (Galappaththi et al., 2020). The impact of climate change on certain communities and populations affects more severely than others (Carr, 2020). Climate change adaptation responses followed by Indigenous peoples can be changes in practices such as changes in the adaptation methods applied, weather forecasts, and biodiversity conservation. Also, these adaptation responses can be changes in productive resource inputs such as water and

fertilizer and changes in location and time management (Pachauri et al., 2014; Raymond-Yakoubian & Raymond-Yakoubian, 2017; Schlingmann et al., 2021). Some responses draw from Indigenous and local knowledge, such as language and education, traditional medicine, seasonal climatic forecasts, shifting farming and food practices, and livelihood diversification (Galappaththi et al., 2019, 2021).

Several studies provide evidence of how entrepreneurship can foster climate change adaptation responses because uncertain environments provide the ground for emerging entrepreneurship (York & Venkataraman, 2010). The emergence due to the factors generated through climatic or non-climatic shocks or stresses can ultimately serve as an adaptive response to climate change ((Ruiz-Mallén et al., 2017; Skouloudis et al., 2020; Steiner & Atterton, 2015; Tanner et al., 2019). Adopting innovative measures with the available resources through entrepreneurship has paved the way to successfully facing the impacts of climate change (Abu & Reed, 2018). Studies suggest how the involvement of females in vulnerable communities in entrepreneurship has enhanced the adaptive capacities of those communities in the face of climate change (Ojemade et al., 2019). Furthermore, micro-level technical development among vulnerable communities can result in further entrepreneurial opportunities (George et al., 2021). Also, new areas of entrepreneurship, such as climate change and biosphere entrepreneurship, are introduced as adaptive responses to face climatic impacts (Federick, 2018; Le, 2020).

McMullen & Shepherd's (2006) conceptual model of entrepreneurial idea generation and action is noteworthy here. This model provides significant insights into the entrepreneurial action process in non-Indigenous contexts. McMullen & Shepherd's (2006) model employ an action perspective that suggests how a combination of knowledge and motivation can be used to overcome ignorance and uncertainty about an opportunity in the environment (Figure 3.1). There are two stages in this model. Stage I represents entrepreneurial ideation (i.e., opportunity recognition). In this stage, individuals possessing the requisite knowledge and motivation are more likely to believe in the presence of an opportunity resulting from a change (McMullen & Shepherd, 2006). Stage II represents entrepreneurial action. In this stage, the individuals who acknowledge the existence of an opportunity evaluate its desirability and feasibility, which ultimately leads to entrepreneurial action. (Haynie et al.,

2009; McMullen & Shepherd, 2006). However, there is a long-standing tendency to overlook or underestimate the significance of spatial context in entrepreneurship (Baker & Welter, 2020; Trettin & Welter, 2011). The spatial context shapes an individual's perception of an opportunity (Trettin & Welter, 2011). According to this argument, the feasibility of pursuing an opportunity is contingent on its context (Trettin & Welter, 2011). Furthermore, the spatial context where entrepreneurial opportunity occurs is a pivotal moderator that plays a crucial role in affecting whether an individual progresses from recognizing an opportunity to pursuing it. For example, certain environmental factors will shape the emergence of entrepreneurial opportunities and the implementation of those entrepreneurial ideas, causing entrepreneurial action. So far, this model has been only applied to non-Indigenous and commercial contexts.

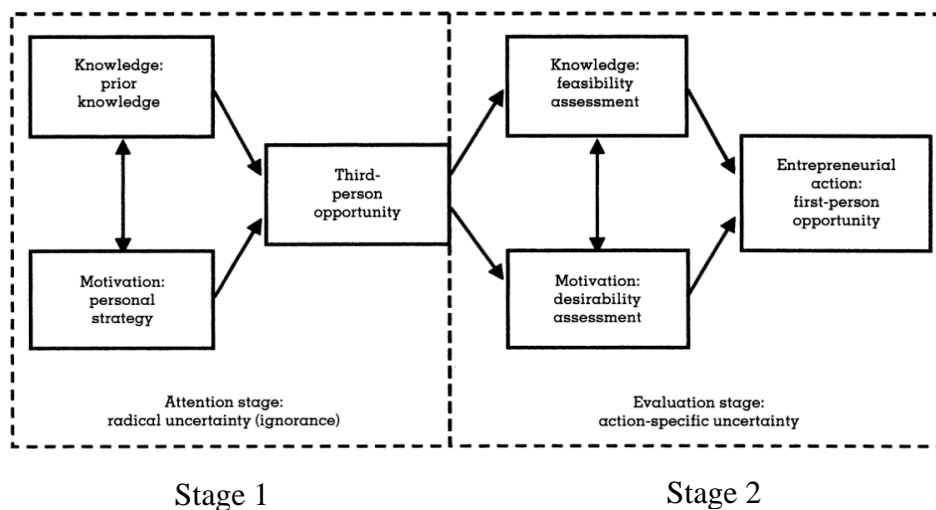


Figure 3.1: McMullen & Shepherd's (2006:140) conceptual model of entrepreneurial ideation and action.

There are factors that can cause the emergence of entrepreneurship through the facilitation of entrepreneurial ideation to action process. These factors are highly studied and focused on non-Indigenous contexts. Some of them are product diversification, geographic levels, mergers and acquisitions of competitor companies, government lobbying for friendlier adaptation restrictions and incentives, and purchasing of insurance and other financial hedging instruments (Naji, 2019). Furthermore, the easy availability of skillful workers is

considered an emergence of entrepreneurship (Naji, 2019). Other psychological factors, such as the need for achievement among entrepreneurs and motives behind their business operation besides wealth, such as independence, self-esteem, power, prestige, security and service to society, can also shape the emergence of entrepreneurship mostly in non-Indigenous contexts (Hall, 2021). Previous studies further suggest the importance of the positive attitudes of society towards entrepreneurship, which can result in the emergence of entrepreneurship. Some societies encourage innovations and novelties that can motivate entrepreneurs' actions, like rewards and profits (Hall, 2021). However, there is very little documented knowledge on what factors lead to or shape this entrepreneurial process to foster climate change adaptation responses among Indigenous communities. The purpose of this study is to bridge this gap by understanding the factors that lead to the emergence of entrepreneurship to foster climate adaptation among Indigenous communities.

3.0 Methods

A mixed-method approach consisting of a systematic literature review and case study analysis was used to investigate the entrepreneurship-based factors to support entrepreneurship in the face of climate change. These two methods were followed in two steps. Each is described below.

3.1 Step 1: Systematic review

A systematic literature review was conducted to synthesize the existing global scientific literature on entrepreneurship as a climate change adaptation response. This refers to a focused review of the literature that finds answers to a specific research question using predefined eligibility criteria for documents and explicitly outlined and reproducible methods (Gough et al., 2017). Berrang-Ford et al. (2015) propose that the systematic review approach is a conceptually appropriate and practical strategy to increase methodological transparency in synthesizing adaptation research. As systematic literature review can provide a broad sense of the existing literature by systematically evaluating and summarizing current knowledge and support despite the great volume of literature (Ford et al., 2014). Also, it is a dynamic process that can meet a variety of research questions and

reviewer needs (Eisenack et al., 2012; Ford et al., 2012; Kamau & Mwaura, 2013). A systematic literature review can help establish what we know and don't know, which helps define the methods that should be used in future studies and the research gaps that need more attention (Berrang-Ford et al., 2015). I followed several methodological steps in identifying and analyzing literature in the systematic review process. They are (1) defining the research question and scope of the study, (2) document selection, including the development of inclusion and exclusion criteria, (3) critical appraisal of study quality, (4) analyzing and synthesizing evidence, quantitative and/or qualitative, and (5) present results (Barth & Thomas, 2012; Elliott et al., 2017). The flow diagram of the systematic review is given in Figure 3.2.

Systematic review approaches have been criticized for several reasons. They are presumed to be biased toward analysis of primarily quantitative data, knowledge synthesis restricted by predefined keywords and inclusion/exclusion criteria and lacking the flexibility of more inductive inquiry approaches (Ansari & Moher, 2013; Gough et al., 2012). However, systematic approaches are considered the highest standard of evidence synthesis (Nightingale, 2009). Despite the critiques, researchers are adapting systematic approaches to meet the needs of their review questions in adaptation research, combining quantitative and qualitative analyses and designing complex literature searches (Biesbroek et al., 2013; Ford & Pearce, 2010). I also follow the systematic approach in my study since entrepreneurship among Indigenous communities is highly understudied and scholarship is scattered. Therefore, through a systematic approach, I collect the scattered information to generate greater understanding.

The systematic review was conducted between August 2022 to April 2023. Two databases, Web of Science (n=660) and Scopus (n=1109) were used to search literature based on keywords related to entrepreneurship, climate change adaptation, and Indigenous communities. The local communities were also added to the literature search due to the lack of Indigenous studies and since some studies have not documented the names of Indigenous communities they studied or the context. The scientific articles were searched, screened, read, sorted, abstracted, coded, and analyzed to develop the review (Hong &

Pluye, 2018; Mengist et al., 2020). The inclusion and exclusion criteria used in the screening process (Mengist et al., 2020) are given below in table 3.1.

Table 3.1: 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, books 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 3.2 provides the step-by-step process of conducting the systematic review. After removing duplicates from the total of 1769 papers from the two databases, I ended up with 1213 papers for title and abstract screening. Again, 624 papers were removed after this

screening stage since they did not focus on Indigenous climate change adaptation and entrepreneurship. Out of the 589 articles selected for the full-text review, 524 were removed since they did not focus on entrepreneurship concerning climate change adaptation. Therefore, only 65 publications were included in the analysis. The articles (1148) that did not meet the inclusion criterion were excluded (Mengist et al., 2020). Sixty-five of the articles included in the review were peer-reviewed articles. They spread across 15 journals. For example, the Journal of Climate Change and Environmental Sustainability, Journal of Entrepreneurship and Regional Development, Journal of Small Business Management, and Journal of Rural Studies.

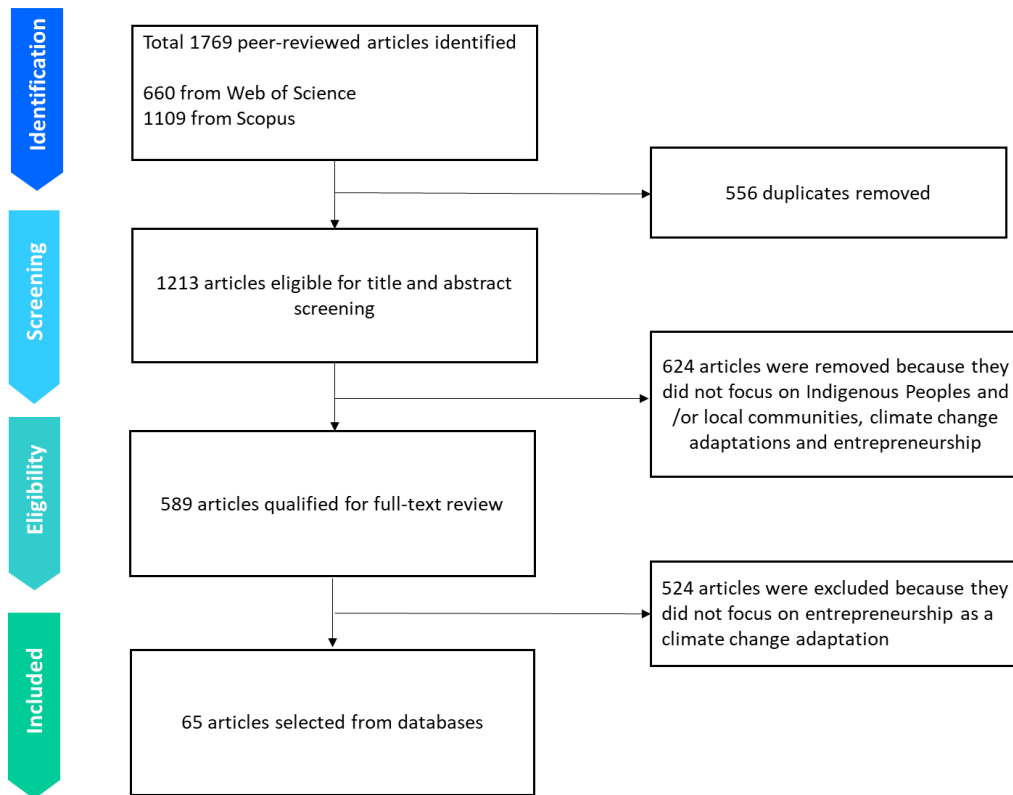


Figure 3.2: Flow diagram of the article selection process for the systematic literature review

An MS Excel sheet was developed to code all the selected papers manually. I developed a coding scheme with a set of themes to analyze each article's content systematically. These categories were mutually exclusive and exhaustive (Table S02 in the Appendix). Next, I manually coded the content, applying the coding scheme I had developed to each article.

Once coding was complete, content analysis was performed to analyze the extracted data. Quantitative content analysis, which involves counting and analyzing the frequency of categories, and qualitative content analysis, which focuses on interpreting the meaning and context of the content, were performed. Fifteen entrepreneurship-based factors that shape the emergence of entrepreneurship in the face of climate change were identified through content analysis. Next, they were categorized into five high-level themes to interpret the results. Key themes categorization was guided by the resilience-based framework introduced by Galappaththi et al. (2019b) and the model of community factors introduced by Seelos et al. (2011). Quality checking of the systematic review was conducted using the AMSTAR (Assessment of Multiple Systematic Reviews) method, and a high score was obtained indicating the methodological quality of the systematic review. AMSTAR is a tool that consists of 11 items and has good face and content validity for measuring the methodological quality of systematic reviews.

3.3 Step 2: Case study assessment

I conducted an in-depth case study analysis by applying the factors identified through a systematic literature review. I conducted the case study analysis using cases identified through interviews. This field data was collected among Indigenous households (n=90) in nine Indigenous communities in Sri Lanka between May – June 2023. These nine communities were selected because their leaders were integral members of the administrative circle of ‘Wariga Sabawa’ (a tribal society), whose main goal is to provide solutions for the challenges and issues the Sri Lankan Indigenous communities face. These leaders had direct contact with the national ‘Vedda’ leader, ‘Uru warige Wannila-etto.’ Given the endorsement of this research by the national ‘Vedda’ leader, it was convenient to access these nine communities and study them compared to others. Further, the feasibility of research with these communities was considered in selecting them for this study, including resource availability, lack of language barriers, and ongoing research relationships with these communities.

Sri Lankan Indigenous peoples, known as 'Veddas' are descendants of the original neolithic community originated in the 6th century BC (Attanapola and Lund, 2013; Jayashantha and Johnson, 2016). 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 (Galappaththi et al., 2020). While there are different 'Vedda' populations across the country, the total population as of 2011 was 0.0044% of the country's total population (Silva and Punchihewa, 2011). In this study, I have identified nine such 'Vedda' communities. The communities are named based on their geographical locations: Dambana 'Vedda', Henanigala 'Vedda', Rathugala 'Vedda', Dalukana 'Vedda', Pollebadda 'Vedda', Wakarei 'Vedda', Verugal Thikkana 'Vedda', Santhosapuram 'Vedda', and Neenakeni 'Vedda'. Figure 3.3 below shows the study locations in Sri Lanka. 'Vedda' belongs to two major ethnic groups: Sinhalese and Tamils. 'Vedda' communities in Dambana, Henanigala, Rathugala, Dalukana, and Pollebadda are Sinhalese, while Wakarei, Verugal Thikkana, Santhosapuram and Neenakeni are Tamil 'Vedda' communities.

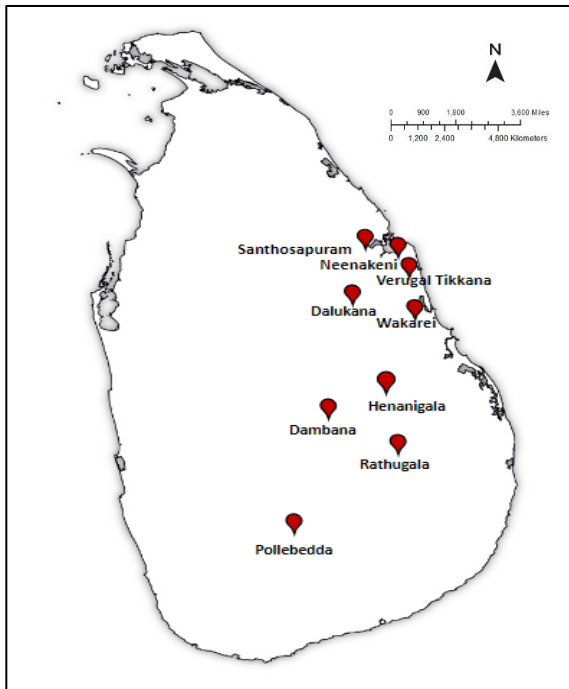


Figure 3.3: Study locations in Sri Lanka

Semi-structured interviews were conducted with the identified entrepreneurs among Indigenous peoples. I applied the broader working definition of entrepreneurship used throughout the study in identifying the individuals who engaged in entrepreneurial activities. Data were collected on the factors that shape the emergence of entrepreneurship in those communities in the face of climate change. The questionnaire consisted of who/what supported the entrepreneur in identifying the entrepreneurial opportunity or the initial idea generation, the failures and external stresses they face, and gaps in realizing entrepreneurial opportunities (Table S04 in Appendix). I used semi-structured interviews in data collection since they require close interaction with the respondents and allow space for them to express their ideas with limited guidance from the interviewer (Dryzek et al., 2011). Also, it is relatively cost-effective for the researcher and takes a relatively small period to conduct the interviews (Dearnley, 2005; Dryzek et al., 2011). Semi-structured interviews provide the opportunity for participant observation, which will further enrich the findings (Dearnley, 2005; Dryzek et al., 2011). However, the weaknesses documented for this method are limited access to research participants, low response rate, difficulty in protecting privacy, not receiving rich data from the participants, miscommunication and misinterpretation of information, no direct probing and potential for translation errors (Meho, 2006; Temple & Young, 2004). These drawbacks were minimized by building trust with the community members to make them feel comfortable sharing information and revisiting answers with the participants to check if the information collected was accurate (Meho, 2006). The study followed a snowball sampling method where the researchers asked for the assistance of respondents to identify additional respondents (McIntosh & Morse, 2015).

The research team developed the questionnaires before the field visit and tested them during the first community visit. Indigenous people's consent was obtained prior to the interviews. A culturally appropriate approach was followed by working closely with the Sri Lanka national Indigenous 'Vedda' chiefs. Institutional Review Board (IRB) approval was obtained from Virginia Tech (23-388). Three research assistants familiar with local languages and culture were hired and trained for the data collection. The interviewers were attentive and non-judgmental, creating a comfortable environment for the respondents.

They reassured participants that their information would be kept anonymous and provided participants with results and feedback near the end of the interpretive process. The interviews were audio recorded after receiving informed consent from the respondents. Key ethical considerations for research with Indigenous communities, including privacy, confidentiality and anonymity, critical reflexivity, gender relations, and power and politics among research participants, were considered throughout the data collection process (Husband, 2020; Kallio et al., 2016; Turner, 2010). Also, the community members who participated in the interviews were compensated USD 10 (5000 LKR).

After data collection, they were transcribed into Microsoft Excel (Meho, 2006). The research team developed a coding scheme with a set of themes to analyze each respondent's content. These categories were mutually exclusive and exhaustive. Next, the research team manually coded the content, applying the coding scheme we had developed. Once coding was complete, content analysis was performed to analyze the collected data. Content analysis was conducted to interpret and code textual materials to find out the inner meaning and probable effects of the data (Meho, 2006). Both inductive and deductive coding were done. 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, analyzed data were categorized to identify patterns and themes (Kallio et al., 2016; Mannan & Mannan, 2020). The underlying shaping factors that support emerging entrepreneurship in considered Indigenous context were identified through this content analysis. Then, a case study was developed for each of the identified entrepreneurship-based factors. Finally, data representation was done using descriptive statistics, figures, and case studies to investigate how each factor identified through the systematic literature review can be applied in the Sri Lankan Indigenous context.

4.0 Results

4.1 Descriptive results

The descriptive results are presented to provide an overall understanding of the articles selected for the systematic literature review. Considering the spatial scale of the studies, most articles were focused on local rural populations ($n = 44$) such as farming and coastal

communities, while the rest of the articles were focused on local urban communities (n = 17) and Indigenous communities (n = 4). Twelve percent of the articles focused on the regional scale studies (n = 8), while only ~2% of the studies focused on the global scale studies (n = 2). Most of the articles in the review were from Australia (n = 8), USA (n = 6), UK (n = 5), and Nigeria (n = 5). The first authors of most of the articles were from universities and colleges (n= 55), while the rest of the authors were from government authorities (n = 10). Most of the first authors were affiliated with institutions based in countries like UK (n = 10), USA (n = 9), and Australia (n = 8). Figure 3.4 shows the key climate change adaptation practices based on the findings of the systematic literature review. Furthermore, studies were focused on several key aspects of adaptation. Most of the studies (80%) focused on economic adaptation (n = 52), while the least number of studies (~5%) focused on cultural adaptation (n = 3).

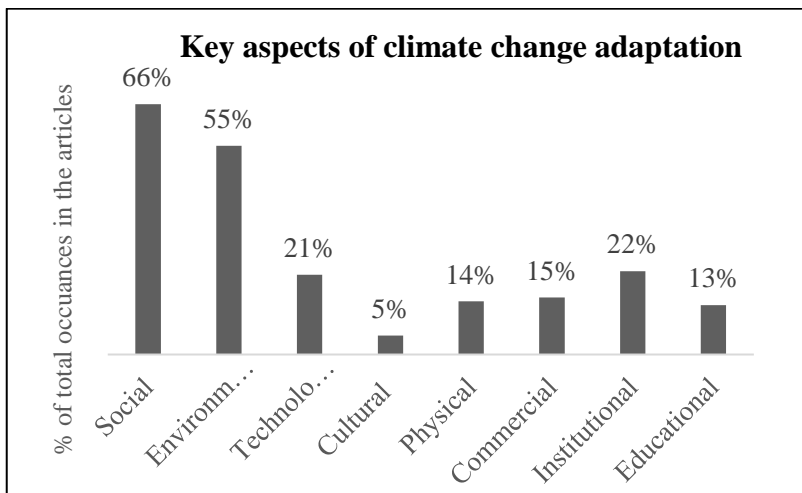


Figure 3.4: Key aspects of climate change adaptation

4.2 Entrepreneurship-based factors

Entrepreneurship-based factors identified through content analysis were *crop failure, social networks, entrepreneurial experience, institutional support, access to information, learning, access to capital, strategic location, business characteristics, product range, entrepreneur's psychological traits, environmental risk factors, market characteristics, overcoming the agency-structure paradox and resource (un)availability*. They were

categorized under five high-level key themes: learning, institutions, place, capacity and strategy. Table 3.2 shows how the articles discussed these entrepreneurship-based factors under each theme contribute to increasing the adaptive capacity of the communities. This section presents in-detailed evidence on how each entrepreneurship-based factor identified through the systematic review caused the emergence of entrepreneurship and facilitated the ground to foster climate adaptation.

Table 3.2: Entrepreneurship-based factors, key themes, and how those factors increase or decrease adaptive capacity among communities.

Themes	Entrepreneurship-based factors	How it operates		References
		Decrease adaptive capacity	Increase adaptive capacity	
Learning	<i>Crop failure</i>	2		2 (Mwatsika, 2015); (Nurlaela et al., 2022); (Ruiz-Mallén et al., 2017)
	<i>Learning</i>	1		7 (Kom et al., 2022); (McFadgen, 2019); (Xenarios et al., 2017); (Dwyer, 2016)
	<i>Prior entrepreneurial experience</i>	0		5 (Skouloudis et al. 2020); (Islam et al., 2020); (Dwyer, 2016); (Ruiz-Mallén et al., 2017)
Institutions	<i>Social networks</i>	0		9 (Yanda et al., 2023); (Forino & von Meding, 2021); (Kirina et al., 2022); (Xenarios et al., 2017); (Yanda, 2021); (Dwyer, 2016)
	<i>Institutional support</i>	1		8 (Burckhardt, 2014); (George et al., 2021); (Stephan et al., 2015); (Farny et al., 2019); (Pacheco et al., 2014)
	<i>Overcoming the agency-structure paradox</i>	3		4 (Harkes et al., 2015); (Korber & McNaughton, 2017); (Kimbu et al., 2022); (Ruiz-Mallén et al., 2017); (Fernández-Llamazares et al., 2016); (Dwyer, 2016)
Place	<i>Resource (un)availability</i>	1		10 (Korber & McNaughton, 2017); (Alvarez & Busenitz, 2001); (Barney, 2001); (Abu & Reed., 2018); (Ruiz-Mallén et al., 2017); (Islam et al., 2020); (Davey, 2019)
	<i>Location</i>	1		5 (Mahaliyanaarachchi et al., 2019); (Meek et al., 2010); (Ruiz-Mallén et al., 2017)
	<i>Environmental risk factors</i>	1		6 (Hart, 2005); (Atela et al., 2018); (York & Venkataraman, 2010); (Meek et al., 2010); (York & Venkataraman, 2010); (Ado et al., 2019)
Capacity	<i>Access to information</i>	0		3 (Kirina et al., 2022); (Iqbal et al., 2021); (Nurlaela et al., 2022); (Ruiz-Mallén et al., 2017)
	<i>Access to capital</i>	2		6 (Atieno, 2001); (Cumurovic & Hyll, 2019); (Mahaliyanaarachchi et al., 2019); (Steiner & Atterton, 2015)
	<i>Entrepreneurs' psychological traits</i>	0		7 (Iqbal et al., 2021); (George et al., 2021); (Ruiz-Mallén et al., (2017); (Meek et al., 2010)
Strategy	<i>Business characteristics</i>	0		3 (Iqbal et al., 2021); (Steiner & Atterton 2015); (Xenarios et al., 2017)
	<i>Product range</i>	1		2 (Ruiz-Mallén et al., 2017); (Nurlaela et al., 2022); (Meek et al., 2010)
	<i>Market characteristics</i>	1		3 (Hart, 2005); (Harkes et al., 2015); (Xenarios et al., 2017)

4.2.1 Learning

This theme includes the following entrepreneurship-based factors: *crop failure*, *learning*, and *prior entrepreneurial experience*. I found *crop failure* to be a factor supporting the emergence of entrepreneurship. Here, failure is the shaping factor because entrepreneurs see failure as a part of growth. Embracing failure and improving further are two of the fundamental characteristics of entrepreneurship (Kuckertz et al., 2020). A study conducted with small-scale fishers in Lake Malawi has found that fishers adjusted to low fish catches by expanding their agricultural farming land, running small businesses, and providing casual labor services to farming and fishing, which increased their adaptive capacities (Mwatsika, 2015). When adaptive capacity decreases through low fish catch, it shapes entrepreneurial ideation to diversify the income sources, which leads to entrepreneurial action. However, the loss of fish catch has decreased the adaptive capacity of coastal communities in Ghana in the face of climatic risks (Atindana et al., 2020).

Prior entrepreneurial experience is another factor that shapes the emergence of new start-ups, 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 became 'experts by experience' on the resilience measures they implemented, highlighting the enthusiasm among the SME community further for sharing and enhancing their capacities (Skouloudis et al., 2020). Prior experience in entrepreneurial activities leads to developing new entrepreneurial ideas and, eventually, entrepreneurial action (de Block et al., 2019; Dean & McMullen, 2007; Penner et al., 2005).

Findings emphasize how entrepreneurial *learning* has supported communities facing adverse climatic risks. Entrepreneurship as a livelihood diversification method has helped farmers in South Africa to overcome the challenges of poor productivity while the same season generates extra resources and reduces the hazard of crop failure (Kom, 2022). Kirina et al. (2022) found how public-private partnerships helped farmers and small and medium agri-businesses in East Africa become competitive through learning in entrepreneurship, such as incubator programs. Social learning and gaining highly required social capital

through social networks are other forms of learning (Korber & McNaughton (2017). Marshall (2010) explains that resources cannot be harvested according to set limits because the harvests vary and must be managed fluidly through learning, monitoring, feedback, and adaptation. Further, Marshall (2010) introduces a possible technique to address monitoring, feedback, and adaptation strategies and enhance awareness of vulnerability to climate change through 'collaborative learning.' McFadgen (2019) found that resilient rural communities prioritize a high quality of life, with a range of opportunities for people to get involved and belong through active participation and open networks encouraging self-help and active learning. New ideas generated through such learning lead to entrepreneurial action. The greater the environment conducive to learning, the greater the ideation (McMullen & Shepherd, 2006; Dean & McMullen, 2007).

4.2.2 Institutions

This theme includes the following entrepreneurship-based factors: *social networks*, *institutional support*, and *overcoming the agency-structure paradox*. I found that *social networks* act as a factor in shaping entrepreneurial ideation and entrepreneurial action. Schäfer et al. (2021) 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 small loans, particularly during bad weather and when fishing activities failed. Moreover, the loans enabled small businesses to purchase household food and other household expenditures (Yanda et al., 2023).

Schäfer et al. (2021) emphasizes the importance of *institutional support* in providing a ground for the emergence of entrepreneurship. According to Schäfer et al. (2021), 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. Findings from Australian studies suggest that interactions with local stakeholders are necessary for businesses adapting to climate change since businesses rarely adapt in isolation. Instead, they develop contextual interactions in their operational and institutional environment (Forino & von Meding, 2021).

Overcoming the agency-structure paradox is a factor that can shape entrepreneurial ideation, which eventually leads to action. Agency-structure paradox is the dilemma an individual faces when determining whether to act as a free agent or in a manner dictated by the prevailing social structure (Dujin & van Buuren, 2017). A study focusing on the ‘Tsimane,’ a society of Indigenous hunter-horticulturalists living in Bolivian Amazonia, argues that overcoming the agency-structure paradox can open entrepreneurial opportunities in the face of climate change (Ruiz-Mallén et al., 2017). The ‘Tsimane’ community mostly depends on household labor in agriculture and the social structure is very rigid with less power on them. However, some households have started hiring labor (short-term investment) from outside to increase the area of cultivation and productivity by following a market-oriented adaptation strategy to deal with climate change (Ruiz-Mallén et al., 2017). Traveling a long distance is a limitation to this community. Therefore, some households have decided to buy motorbikes (long-term investments) to increase their access to regional markets, another adaptation strategy to deal with climatic uncertainty (Ruiz-Mallén et al., 2017). These strategies have created a space to overcome the prevailing agency-structure paradox through inserting more power to the individuals in the ‘Tsimane’ community. Furthermore, Dwyer (2016) identified that rural European Indigenous farming communities could improve their adaptive capacity to climate change with relative sovereignty over their territories, recognized land rights, and increased access to formal education and financial resources (e.g., subsidies).

4.2.3 Place

This theme includes entrepreneurship-based factors: *location, resources (un)availability, and environmental risk factors*. *Location* or the local embeddedness (i.e., the overlap of social and economic relationships and networks in a specific geographical location), which is argued to be particularly strong in rural locations, may open opportunities for businesses, helping them to overcome some of the constraints of the rural environment (Steiner & Atterton, 2015). For instance, Mahaliyanaarachchi et al. (2019) point out the suitability of Sri Lanka as a sustainable agrotourism destination since Sri Lanka is bestowed with diverse agro-climatic conditions, ancient irrigation tanks, tea, rubber, coconut and spice plantations, scenic paddy fields, dairy farms, traditional cultural activities, and hospitable

people. Also, maintaining strong ties with local suppliers, grounded in strong social network relationships, may save a business from sourcing supplies from distant markets, which leads to both ideation and action of entrepreneurial activities adapting to rural climatic conditions.

Furthermore, the *availability or unavailability of resources* plays a crucial role in identifying entrepreneurial opportunities. According to the Resource-Based View (RBV) of entrepreneurship, the capacity of an entrepreneurial activity/firm to create and sustain entrepreneurial profits is determined by its resource endowments (Alvarez & Busenitz, 2001). It depends on valuable, rare, and non-substitutable resources and how they are effectively utilized to meet customers' demands and create and sustain entrepreneurial profits (Alvarez & Busenitz, 2001). Having resources facilitates the feasibility and desirability of an entrepreneurial idea (Haynie et al., 2009). Also, the authors discuss how entrepreneurial activities can represent adaptation strategies in resource-poor environments. According to Abu & Reed (2018), the Canadian First Nations community uses "bricolage," an entrepreneurial process that utilizes "entrepreneurial making do" with whatever is at hand. Bricolage is considered an option for growth, innovativeness, and adaptation when resources are constrained (Senyard et al., 2014). Adopting innovative measures with the available resources can pave the way to successfully facing the impacts of climate change through entrepreneurial ideation and action (Abu & Reed, 2018).

The third factor under this theme is *environmental risk factors*. Climate change causes risk and uncertainty through extreme temperatures, high rainfall variability and fluctuations in natural capital, rising sea levels, and global warming (Duguma et al., 2018). Research has recognized how entrepreneurial activity helps address climate change impacts through innovative strategies (Meek et al., 2010; York & Venkataraman, 2010). According to Schumpeter (1942), the important role of entrepreneurship is the destructive, creative processes that subsequently exploit opportunities for generating economic value (Hart, 2005). Entrepreneurs can thrive in environments of risk and uncertainty (Frederick, 2018). Therefore, environmental factors play a role in entrepreneurial ideation and action. Climatic and non-climatic shocks and stresses provide the ground for emerging entrepreneurship. Entrepreneurship can serve as an income source for vulnerable

communities in the face of climate-related impacts (Ado et al., 2019; Sindhu et al., 2021). For example, the entrepreneurial activities of Indigenous farming communities in Augie district, Niger, supports in increasing their food security in extreme weather conditions (Ado et al., 2019).

4.2.4 Capacity

This theme includes the following entrepreneurship-based factors: *access to information*, *access to capital*, and *entrepreneurs' psychological traits*. *Access to information* remains one of the most important factors for entrepreneurship because entrepreneurial ideation significantly relies on access to information (Frederick, 2018). Information exchange can occur via informal channels in these communities (Kirina et al., 2022). For example, less tangible elements, values, and culture, which potentially influence scaling, are expressed more through informal networks (Kirina et al., 2022). Information can help expand the market scope, product diversification, and knowledge about farming techniques (Nurlaela et al., 2022). Cultivation and market opportunities are the most information that farmers need (Kirina et al., 2022)—according to the findings of Iqbal et al. (2021), farmers in Southern Punjab, Pakistan, demonstrated behavior of opting for non-farm income diversification since they had access to information about the markets.

Access to capital is another factor that is critical to the initiation and development of any entrepreneurial ideation and action. Recent studies have shown 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 idea generation (Ćumurović & Hyll, 2019). Harkes et al. (2015) highlight the importance of the mechanisms that could enable subsidies, insurance, and bank loans to the firms, which will facilitate investment by foreign private enterprises and lead to subsequent export through their studies with the Sri Lankan shrimp farmers.

According to (Korber & McNaughton, 2017), an *entrepreneurs' psychological traits* and social capital predict the survival or growth of entrepreneurial firms. Most prominent psychological traits of successful entrepreneurs are the need for achievement, internal locus

of control, risk taking propensity, need for power, tolerance of ambiguity and need for autonomy (Omar, 2009; Iqbal et al., 2021; Meek et al., 2010). In a study conducted in Uganda considering grocery store owners located on a flood plain, the authors have identified the importance of the psychological traits of the shop manager in identifying and implementing new start-ups (Kimbu et al., 2022).

4.2.5 Strategy

This theme includes the following entrepreneurship-based factors: *business characteristics, product range, and market characteristics*. *Characteristics of the businesses*, such as the age, size, and stage of the business growth cycle, can increase or decrease its entrepreneurial capacities (Mahaliyanaarachchi et al., 2019). For example, Iqbal et al. (2021) pointed out that the effect of non-farm income on the living standard of farming households was determined by factors related to business and market characteristics such as the total farming area, number of household workers, and dependency ratio had a significant and positive impact on endorsing non-farm activities like self-employment.

The *product range* of the business predicts the survival or growth of entrepreneurial firms (Littunen & Hyrsky, 2000). Expanding the range of products is an essential characteristic of a successful entrepreneurial activity (Ringhofer & Ringhofer, 2010). For example, ‘Tsimane’ community initially started selling their native products such as latex and traditional medicine. However, the economy transformed radically once they diversified their product range with cattle meat, leather products, and sugar cane products (Ringhofer & Ringhofer, 2010). *Market characteristics* such as competition, entry and exit barriers to markets, and pricing can foster individual or enterprise resilience, which in turn predicts the survival or success of entrepreneurial firms (Biggs et al., 2012). These strategy factors significantly shape the emergence of entrepreneurial ideas and action.

4.3 Case study assessment

The insights gained through the systematic literature review were tested against the case study findings (Table S03 in the appendix). I applied the entrepreneurship-based factors identified under each theme to the Sri Lankan Indigenous 'Vedda' communities. Sri Lanka has experienced significant weather changes, resulting in considerable fluctuations in rainfall patterns (Mahaliyanaarachchi et al., 2019). Midyear heat waves, long prevailing droughts, and floods are the other most common climatic issues faced by Indigenous 'Vedda' communities in Sri Lanka (Mahaliyanaarachchi et al., 2019). The most pressing non-climatic factors they face are poverty, low access to healthcare, and food insecurity. Most Indigenous settlements are closer to the forests and coastal areas as these ecosystems are linked to their cultural practices and subsistence. Indigenous peoples encounter difficulties in accessing resources due to the government's denial of their land rights and forest access.

4.3.1 Learning

Crop failure due to unexpected fluctuations in rainfall patterns, delays in monsoon seasons, and prevailing droughts has mostly created difficulties for Indigenous communities in Sri Lanka. Getting the required crop fertilizer has always been difficult since the government stopped providing fertilizer subsidies. 'Vedda' communities must pay full price for fertilizer now, which is costly. The lands have become infertile, and without fertilizer, 'Veddas' can no longer have a good harvest. On top of that, the government circular banning the importation of synthetic fertilizer has created difficulties for them in gaining access to the required amounts of fertilizer. This made 'Vedda' lose their main livelihood and forced them to turn to alternative methods supporting the process of entrepreneurial ideation and action.

Indigenous communities rely on the knowledge of the past generations and their *learning* in almost every aspect of their lives, including entrepreneurial activities. Indigenous communities have learned and applied all the traditional farming techniques even today. They believe it to be the best method to grow food without adding a lot of synthetic

fertilizers. Indigenous peoples in Sri Lanka are proud that they consume and sell ‘poison-free’ agricultural produce to the people. These communities use past knowledge to identify environmental changes and forecast when it will rain or be sunny and windy. Based on that forecast, the community members used to start the planting cycles. However, with the change in climatic conditions, Indigenous people find it hard to accurately estimate the seasons. Therefore, these communities rely on this learning to develop entrepreneurial ideas and actions. Entrepreneurship has contributed to these communities in securing alternative livelihood activities such as collecting honey and medicinal plants from the forest, fishing, tourism (on a small scale), and home gardening.

“Cultivations have become seasonal now due to weather changes. We [‘Vedda’] only cultivate for six months and consume that harvest for the next six months. When the rain is late, we [‘Vedda’] go hunting and collecting honey until we [‘Vedda’] get rain to start cultivation” (Respondent 06: ‘Dambana’ community)

4.3.2 Institutions

Social networks play a pivotal role 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 provide a vital role in 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 07: ‘Dambana’ community)

Sri Lankan Indigenous groups are supported by a range of community-based institutions. The *institutional support* they receive plays a crucial role in facilitating their livelihood activities. For example, all nine communities had farmers' societies that distributed seeds and fertilizers to community members that are received from the government, such as the Department of Agriculture, and other private companies or NGOs. Another significant

organization is the Death Benevolence Society, which all households are a part of, where they get support during a death in the family. 'Kuweni Samithi' (Kuweni society) in 'Santhoshapuram' is another community-based society overseeing 24 Indigenous villages in 'Trincomalee' and helping solve their day-to-day problems. Most coastal 'Vedda' communities have fishing societies to regulate fishing activities. Also, 'Vedda' communities have a society called 'Wariga Sabawa' (a tribal society) where representatives of all Indigenous communities in the country get together and present the concerns of each community to Indigenous 'Vedda' leader of the country. 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 in accessing the forest. Our leader agreed to provide us with an identity card mentioning that we [‘Vedda’] are members of Indigenous Community” (Respondent 01: Dalukana community).

Respondents confirmed how these community-based organizations support 'Veddas' in continuing their livelihood activities and how that support leads to entrepreneurial ideation and action through creating new business opportunities. However, 'Veddas' do not continuously receive support from the UN or any Non-Governmental Organizations (NGOs). Support from governmental institutions such as the Department of Agriculture, the Department of Wildlife Conservation, the Mahaweli Authority (An authority supporting agricultural activities in the dry zone of Sri Lanka), the National Aquatic Development Authority, and the 'Samurdhi' program (Sri Lankan government sponsored national poverty alleviation program) is also weak. 'Veddas' confirmed that the only private agency that visited Indigenous communities recently was 'Sirasa' (a national media station).

“If someone is using prohibited nets or overfishing, the Department of Wildlife Conservation helps us [‘Vedda’] to catch the people who overfish. The Mahaweli Authority, NAqDA, and ‘Samurdi’ provide us [‘Vedda’] with fingerlings for free. But

during the recent past, we ['Vedda'] mostly obtain fingerling from the Mahaweli Authority” (Respondent 10: Henanigala community).

Furthermore, the structural agency in the Sri Lankan Indigenous communities is built upon resource scarcity, lack of access to financial and educational facilities, and loss of land rights. The structure is a recurrent patterned system arrangement that influences or limits the available opportunities, while the agency is the capacity of individuals or organizations to act independently to make their own free choices (Mellin & Gaddefors, 2023). *Overcoming this agency-structure paradox* is difficult. The role that the government and other NGOs, including private organizations, play can support transforming the structural paradox. The process of transforming structural paradox requires presenting Indigenous communities with access to capital and education while securing their land rights. Also, capacity building among the community members will increase their chances of overcoming the agency-structure paradox while using the resources at hand through ‘entrepreneurial making do.’ The efforts of individuals with agentic abilities can bend the existing rigid structure and provide more opportunities for the emergence of entrepreneurship.

4.3.3 Place

Indigenous Peoples in Sri Lanka lived isolated from the general population for many years. Most communities had no means of transportation or infrastructure till the late 1990s due to their geographical *locations*. Even today, ‘Veddas’ have limited access to the cities outside the village, which has reduced their ability to access markets even if they have a considerable entrepreneurial capacity. However, most communities had access to the forest during the 1990s, when no strict law prohibited ‘Veddas’ from accessing and getting resources from the forests. Therefore, strategically, ‘Veddas’ were in a place where they had access to enough resources to support their livelihoods and survival. The same applied to the coastal ‘Vedda’ communities since these people had ample access to the sea and fishing. However, since the government decided to move the Indigenous community settlements to other areas and restricted access to the forest for their needs, it has become difficult to sustain life and the opportunities to develop livelihood options. Since the

resource un(availability) in these communities is associated with their geographical location, gradually they have lost access to resources with the relocation efforts of the government.

“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’] did not get anything”
(Respondent 04: Henanigala ‘Vedda’ community)

Environmental risk factors themselves can serve 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 two-three decades. ‘Veddas’ says that the onset of monsoon rains is delayed now. Also, there are ‘fake rains’ where it looks like the monsoon season will start, but it only rains one or two days, and the drought comes again. If ‘Veddas’ assume the monsoon has come and started the planting season, they usually get a low harvest or crop failure. Therefore, these communities have adopted alternative livelihood options when a long-prevailing drought or the rain gets delayed.

“We [‘Vedda’] need rain to grow our seeds, and 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 04: ‘Rathugala’ community)

4.3.4 Capacity

Access to information is one of the major issues faced by these Indigenous communities. ‘Veddas’ have only a few ways of connecting with the world outside their villages. According to the leader of the ‘Dambana’ community, no one has internet access. Only four or five out of nearly 400 families have a TV. Most people don’t know how to read or write Sinhala (the national language of the country). These communities only have access to radios. Almost all households own a radio. ‘Veddas’ listens to the news and other radio

programs. People who travel outside the village often provide the communities with updates. Therefore, word of mouth plays a greater role in information exchange. However, it increases the risk of inaccuracy of the news. Also, the officers from the Department of Agriculture, the Department of Wildlife Conservation, or the Department of Health rarely visit the community and investigate their livelihood or health and wellbeing-related issues. The lack of concern of the healthcare officers was a major issue during COVID-19 because ‘Veddas’ had only a few opportunities to access the latest or the most accurate information, which caused the spread of COVID-19 to be rapid inside the villages. Oftentimes, when community members fell sick, these people could not tell if it was COVID.

“I [‘Vedda’] did not stay home during COVID. I [‘Vedda’] went everywhere around the village and to the forest. I am [‘Vedda’] not afraid of COVID because I [‘Vedda’] chant and pray to the ghosts and ask them to cure me if I [‘Vedda’] get COVID. Also, I [‘Vedda’] cannot afford to stay home. I [‘Vedda’] must earn a living. Nobody will feed my family if I [‘Vedda’] do not.” (Respondent 06: ‘Henanigala’ community)

Similar to various other disadvantaged communities, *access to finance* is a major constraint faced by these Indigenous communities in Sri Lanka. One of the primary constraints ‘Veddas’ faces is the reluctance of local banks to extend financial support to them. This is due to the perceived high-risk profiles of these communities, occasional scarcity of reliable information, lack of adequate skills, and limited regulatory support for lending. Only two representatives from the ‘Dambana’ and ‘Henanigala’ communities confirmed that ‘Veddas’ received loans for farming, fishing, or other livelihood activities through a state bank. Even though everyone in the village faces the same environmental issues, some are more engaged in income-earning activities than others. A respondent from the ‘Dambana’ community shows *entrepreneurial traits* by saving money and investing it in their business activities. She demonstrated traits such as the need for power, achievement, taking calculated risks, and need for autonomy.

“It was my idea to start the shop. I [‘Vedda’] worked as a daily wager for a long time and saved LKR 5000 (~USD 17) every month and started this shop. Also, I [Vedda] received a

loan of LKR 100,000 (~USD 350) from the bank to continue my business.” (Respondent 01: ‘Dambana’ community)

4.3.5 Strategy

Although product diversification is one of the most profitable ways to generate income, most Indigenous communities do not add value to their agriculture or fisheries-based produce through additional processing or packaging. Therefore, it is not easy to see a *range of products*. ‘Veddas’ mostly sells agricultural or fisheries-based produce in raw form, i.e., maize and millets as seeds. However, in several cases, ‘Veddas’ made flour from maize seeds before selling it in the village retail shops or taking it to the nearby city market. Also, some make dried fish out of raw fish caught by the village fishermen. This product diversification has supported individuals in earning a much higher income than other families or individuals who sold the same in the raw form. Indigenous communities do not have a developed market system to sell their products/produces. Therefore, ‘Veddas’ usually sells its products to the village retail shops owned by community members. The main reason is that only a very small percentage of community members engage in commercial farming to produce for the market, mostly on a small scale. ‘Veddas’ rarely employ outside labor while predominantly relying on family labor, which in return supports the emergence of entrepreneurship in the Sri Lankan Indigenous context.

5.0 Discussion

This study has sought to investigate the factors that shape the emergence of entrepreneurship to foster climate adaptation responses among Indigenous communities. It is essential to respond to the increasing impacts of climate change on vulnerable populations, especially in Indigenous settings (Daddi et al., 2018). The process aspects of entrepreneurship, such as entrepreneurial idea generation and action, can be studied to determine the adaptive capacities to the fast-changing climate (de Block et al., 2019). Although entrepreneurship has been identified as one of the most important adaptive strategies for climate change (Dean & McMullen, 2007), it is still understudied, particularly in the contexts of Indigenous communities (de Block et al., 2019). The need for entrepreneurship as an adaptive response is higher among Indigenous communities because

they are more vulnerable to climatic impacts than non-Indigenous communities (Curry et al., 2015). There are no systematic studies that examine the nexus of climate adaptation-Indigenous-entrepreneurship. This study identified the factors that shaped the emergence of entrepreneurship among Indigenous communities to foster adaptive responses to climate change and applied those factors to the Sri Lankan Indigenous context.

Interactions exist among the identified 15 entrepreneurship-based factors (Korsgaard et al., 2020; Welter, 2012), which are *crop failure, learning, prior entrepreneurial experience, social networks, institutional support, overcoming the agency-structure paradox, resource (un)availability, location, environmental risk factors, access to information, entrepreneur's psychological traits, access to capital, business characteristics, product range, and market characteristics*. For example, nations with stable political agendas and economic and financial capacities create flourishing social conditions such as cultural norms, social attitudes, and community support (Argade et al., 2021). Furthermore, strong social ties among individuals or communities can create resource-abundant environments to emerge entrepreneurship in the face of climatic risks (Argade et al., 2021). Nations with supportive legal and financial policies can create environments with access to knowledge and education (Welter, 2012).

Entrepreneurship-based factors identified for Indigenous settings are also featured in non-Indigenous contexts. However, how these factors are applied in Indigenous contexts is unique compared to non-Indigenous communities. For example, certain entrepreneurship-based factors, such as access to capital and information, which usually play a significant role in non-Indigenous contexts (Murphy et al., 2020; Lindsay et al., 2006), are not playing a considerable role in the Sri Lankan 'Vedda' context. Alternatively, entrepreneurship-based factors such as social networks, institutional support, and learning increased the adaptive capacity among communities, allowing them to be more entrepreneurial (Chiles et al., 2010; Pelling & High, 2005). Unlike in non-Indigenous contexts, 'Veddass' rarely have product diversification strategies, and it is hard for the 'Veddass' to overcome the structural paradox. For example, only two out of nine communities had product diversification practices. 'Veddass' made flour out of grains before selling them in the market along with the raw form of grains. Some made handcrafts out of grains and other

plant-based materials. Most of the time, they sold their produce in raw form to the markets. The economic environment has the most direct and immediate influence on the emergence of entrepreneurship (Naji, 2019).

In the Sri Lankan Indigenous context, people become entrepreneurs out of necessity when there are no other jobs or due to the availability of opportunities. Characteristics of necessity entrepreneurship, such as individuals in the communities starting entrepreneurial activities out of necessity as a means of survival rather than choice (Munoz, 2010), are visible among the Sri Lankan Indigenous communities. Reasons for the emergence of necessity entrepreneurship can be economic marginalization, challenges in accessing resources, cultural barriers, and local community needs that Indigenous communities face (Levitte, 2004; Munoz, 2010). In such a context, entrepreneurship can catalyze positive change (Munoz, 2010; Langevang et al., 2012). Therefore, supporting the emergence of necessity entrepreneurship in Indigenous context involves recognizing the specific challenges these entrepreneurs face and implementing initiatives that provide tailored support. This approach helps ensure that entrepreneurship becomes a positive force for economic development and cultural preservation within Indigenous communities.

I identified three cross-scale characteristics common to all 15 of the entrepreneurship-based factors. These characteristics support the emergence of entrepreneurship-based factors in the face of climatic or non-climatic shocks and stresses. The first characteristic is place-based nature. All these factors are place-based. The role these factors play in shaping entrepreneurship is highly context-specific. The same factors may enhance the adaptive capacity of the communities to climate change through entrepreneurship in one context, whereas it can reduce the adaptive capacity of the communities in other contexts. For example, a lack of resources among Canadian First Nation communities has created entrepreneurial opportunities through processes like bricolage, creating a new opportunity by utilizing the minimum resources (Iqbal et al., 2021). However, in the Sri Lankan Indigenous context, lack of resources remains a factor that reduces the adaptive capacity of the communities. Not having enough resources discouraged them further from engaging in entrepreneurial activities. The second characteristic is that the emergence of

entrepreneurship-based factors is resource-dependent (Embry et al., 2019). For example, social networks are formed by accessing and sharing resources with people. The third characteristic is that these factors are time-dependent and may diminish with time. They will not have the potential to support the emergence of entrepreneurship unless they are used at the right time (Hunt et al., 2021). It is crucial for groups to promptly seize the entrepreneurial opportunities that emerge through these factors to develop entrepreneurial action (Van Lent et al., 2020).

Entrepreneurship can facilitate economic development and social growth (Huggins & Williams, 2011). Integrating entrepreneurship into climate change adaptation planning and efforts needs more attention, especially focusing on Indigenous communities (Matlay, 2008; Torri, 2010). The identified fifteen entrepreneurship-based factors under the five high-level key themes can be helpful guidance to policymakers in making more informed decisions on how to incorporate entrepreneurship into climate adaptation planning. These factors can further support practitioners in promoting entrepreneurship among Indigenous communities to foster climate change adaptation responses (Matlay, 2008). Moreover, these factors will provide insights for the researchers to further investigate areas of entrepreneurship that support climate adaptation responses concerning Indigenous communities. This study bridges this research gap by identifying the opportunity for emerging entrepreneurship as an adaptive response to climate change and the factors that support the emergence of entrepreneurship. This study links global scholarship through a systematic literature review and local data through a case study approach in Sri Lanka to deeply capture the complex climate change adaptation-Indigenous communities-entrepreneurship nexus. Future research in this area should focus on how different entrepreneurship-based factors can affect the emerging facets of entrepreneurship, such as female, social, sustainable, and resource entrepreneurship.

I developed a conceptual figure (Figure 3.5) to provide a broader picture of the identified entrepreneurship-based factors to support the emergence of entrepreneurial ideation and action to foster climate change adaptation among Indigenous communities. These factors together and individually shape the emergence of entrepreneurship. The conceptual figure provides an overall understanding of the identified entrepreneurship-based factors under

five high-level themes. It provides pathways to how the factors shape entrepreneurial ideation, action, and the transition from ideation to action. Last, it can be helpful for Indigenous communities, policymakers, researchers, and practitioners in engaging, developing, and/or implementing climate adaptation responses, such as developing novel adaptation measures to reduce the risks of climatic changes through entrepreneurship.

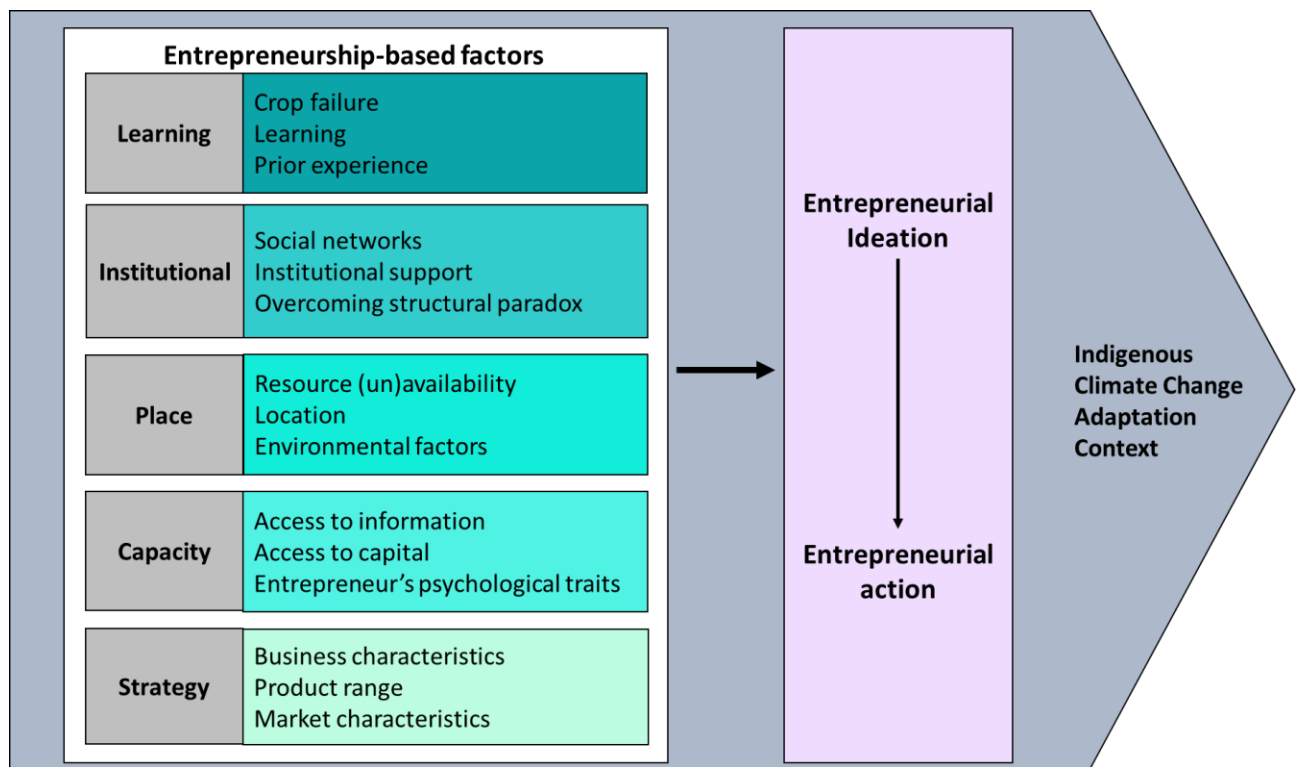


Figure 3.5: Conceptual figure on the entrepreneurship-based factors and how they lead to entrepreneurial ideation and action in Indigenous climate change adaptation context.

6.0 Conclusions

This study aimed to investigate the entrepreneurship-based factors that shape the emergence of entrepreneurship to foster climate change adaptation among Indigenous communities. I identified 15 shaping factors that support the emergence of entrepreneurship as an adaptive response to climate change through a systematic literature review. I categorized those factors under five high-level key themes: learning, institutions,

place, capacity, and strategy. Place-based nature, resource dependency, and time dependency are cross-scale characteristics common to these entrepreneurship-based factors. These shaping factors can increase or decrease the adaptive capacity of the communities to climatic changes by creating conducive environments to support the emergence of entrepreneurship. Based on empirical data, the study has further assessed the relevance of the identified shaping factors to support the emergence of entrepreneurship to foster adaptive responses to climate change in the Sri Lankan Indigenous ‘Vedda’ context. This new knowledge on the entrepreneurship-based factors that can shape the emergence of entrepreneurship to foster climate change adaptation responses will provide insights for reducing poverty and increasing capacity building among disadvantaged communities through promoting entrepreneurship.

7.0 Acknowledgments

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8.0 References

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Chapter 4: Conclusions

4.1 Introduction

This is the concluding chapter of the research study. The chapter first summarizes the research findings of the study. Next, the chapter provides future policy implications and discusses insights into new areas of research within the context of entrepreneurship-climate adaptation for Indigenous communities.

4.2 Key summary

This thesis aimed to investigate the factors in Indigenous climate adaptation contexts that shape the emergence of entrepreneurship. This research addresses two research objectives:

1. To identify the factors that shape the emergence of entrepreneurship to foster adaptive responses to climatic risks faced by Indigenous communities.
2. To assess the identified entrepreneurship-based factors through case studies.

This research was guided by conceptual and empirical approaches to finding answers to the research objectives. Chapter 2 provides an in-depth assessment of the entrepreneurship theory that the study is built upon. It contributes to the existing literature by providing new knowledge on the effect of spatial context on entrepreneurial idea generation and action. The theoretical framing developed through Chapter 2 provides the basis for the research objectives to be addressed considering Indigenous climate adaptation context. Regarding objective one, Chapter 3 describes a systematic review of the literature using 65 peer-reviewed articles. Objective two is addressed in the same chapter (chapter 3) through primary data collection in the Sri Lankan Indigenous ‘Vedda’ communities and developing case studies focused on those communities. Finally, Chapter 4 summarizes the overall findings of the study and describes the contributions of this thesis towards Indigenous climate adaptation research. Table 4.1 highlights the key findings of the study by research objective.

Table 4.1: Overall findings of the study by research objective

Research objectives	Overall findings
Identify the factors that shape the emergence of entrepreneurship to foster adaptive responses to climatic risks faced by Indigenous communities	<ul style="list-style-type: none"> <li data-bbox="610 327 1360 741">● Fifteen entrepreneurship-based factors were identified: <i>crop failure, learning, entrepreneurial experience, social networks, institutional support, overcoming the agency-structure paradox, resource (un)availability, location, environmental factors, access to information, entrepreneur’s psychological traits, access to capital, business characteristics, product range, market characteristics</i> <li data-bbox="610 825 1263 961">● Fifteen entrepreneurship-based factors were categorized under five high-level themes: learning, institutions, place, capacity, strategy <li data-bbox="610 1045 1300 1182">● Cross-scale characteristics common to these entrepreneurship-based factors are place-based nature, resource dependency, and time dependency
Assess the identified entrepreneurship-based factors through case studies	<ul style="list-style-type: none"> <li data-bbox="610 1262 1382 1570">● Identified 15 factors are applicable to the Sri Lankan Indigenous context. It was difficult to identify how <i>prior entrepreneurial experience</i> under learning theme and <i>business characteristics</i> and <i>market characteristics</i> under strategy theme support the emergence in the Sri Lankan Indigenous context <li data-bbox="610 1654 1308 1843">● Entrepreneurship-based factors can cause an increment or decrease in the adaptive capacity of the communities to climatic change by creating conducive environments to emerge entrepreneurship

4.3 Policy implications

Indigenous communities face unique challenges related to their cultural, social, and economic contexts (Bartlett et al., 2007). Those challenges include marginalization, discrimination, disempowerment, food insecurity, and poverty (Lemke & Delormier, 2017). Adverse climatic changes exacerbate the challenges that Indigenous communities face (Attanapola & Lund, 2013; Glappaththi et al., 2020). Indigenous people experience broader impacts and greater risks from climate change, and new opportunities as climate change alters their cultural and livelihood practices (Bhowmik, 2021; Glappaththi et al., 2020). Indigenous communities require special attention in formulating climate adaptation and Indigenous entrepreneurship policies. The new knowledge presented here on entrepreneurship-based factors that shape the emergence of entrepreneurship to foster climate change adaptation among Indigenous communities will provide a basis for promoting Indigenous entrepreneurship and, ultimately, policies that can support community-based entrepreneurial initiatives (Torri, 2010). In the Sri Lankan Indigenous context, entrepreneurship-related policies can be added to the national adaptation plan. Such policies can address barriers for Indigenous communities to access resources, financing, and technology strengthening Indigenous entrepreneurship (Jongwe et al., 2020). Indigenous entrepreneurship policies can promote entrepreneurship education by incorporating traditional knowledge and skills along with modern business practices (Garavan & O’Cinneide, 1994; Matlay, 2008). Therefore, the new knowledge generated through this study can help reduce poverty and improve capacity building among Indigenous communities.

4.4 Future research insights

This study provided the basis to promote Indigenous entrepreneurship research. More research on this area needs to be carried out to understand the role of Indigenous entrepreneurship in fostering climate change adaptation. Future research in Indigenous entrepreneurship focused on climate adaptation can contribute to a deeper understanding of the unique challenges and opportunities these communities face (Johnson et al., 2016;

Lindsay, 2005). Research should focus on the conditions that Indigenous entrepreneurs need to contribute to climate change adaptation and the processes through which conditions for successful entrepreneurship in climate change adaptation are developed and/or shaped. Future studies should focus on how different facets of entrepreneurship (female entrepreneurship, cultural entrepreneurship, sustainable entrepreneurship focus, resource entrepreneurship, institutional entrepreneurship) foster climate adaptation in Indigenous context. Comparative case studies on different Indigenous communities worldwide will provide broader and timely insights into Indigenous entrepreneurship. For example, a comparative case study analysis between Sri Lankan Indigenous communities can be a starting point for such research.

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Appendix

Supplementary materials for chapter 3

S01: Search string developed to identify peer-reviewed literature

Searched on: 05/26/2022

	Search String	Query Link	Number of articles
WOS	((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)))	https://www.webofscience.com/wos/woscc/summary/239db870-b975-4c5a-bc23-862a791385fc-39dd607f/relevance/1	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)))	https://www-scopus-com.ezproxy.lib.vt.edu/results/results.uri?sort=plf-f&src=s&st1=%28climat*%29AND%28Chang*%29AND%28Adapt*%29&st2=%28Entrepreneur*%29OR%28Intrapreneur*%29OR%28Enterprise*%29OR%28start-up*%29OR%28business*%29OR%28ventur*%29&searchTerms=%28Indigenous%29OR%28communit*%29OR%28local%29OR%28village%29%3f%21%22*%24&sid=ab2f59c112c16a8cf1d9589bff2ba544&sot=b&sdt=b&sl=217&s=%28TITLE-ABS-KEY%28%28climat*%29AND%28Chang*%29AND%28Adapt*%29%29+AND+TITLE-ABS-KEY%28%28Entrepreneur*%29OR%28Intrap	1109

reneur*%29OR%28Enterprise*%29OR%28start-
up*%29OR%28business*%29OR%28venture*
%29%29+AND+TITLE-ABS-
KEY%28%28Indigenous%29OR%28communit
it*%29OR%28local%29OR%28village%29%
29%29&origin=searchbasic&editSaveSearch=
&yearFrom=Before+1960&yearTo=Present

S02: Coding questions used to analyze selected articles.

(Theme numbers correspond to the seven key themes: 1. Entrepreneurship, 2. Climate change, 3. Adaptation, 4. The shaping factors to emerge entrepreneurship in the face of climate change among Indigenous and vulnerable communities, 5. The role of entrepreneurship as a climate change adaptation among Indigenous and vulnerable communities, 6. Entrepreneurship and Adaptation, 7. Constraints/limits to entrepreneurship as an adaptative measure, and 8. Interesting case studies)

Coding #	Theme #	Column item	Description	Coding
0.1		Included/Excluded	Is the article included or excluded from the analysis?	1 = Included; 0 = Excluded
0.2		Spatial scale	Spatial scale of article	L = Local; R = Regional; A = Global
0.3		Geographical focus	Name of the country, region, or community studied	Country name or name of the community
0.4		People	People studied?	Name of the study sample
0.54		Country affiliation	The name of the country, based on the first-author affiliation	Country name
0.65		Institutional affiliation	The name of the academic or research institution, based on the first-author affiliation	Institution name
Theme 1: Entrepreneurship				
1.1	1	Explicit use of the term entrepreneurship	How does this study use the term, or concept, of entrepreneurship?	Describe

1.2	1	Key categories of entrepreneurship	What are the key categories of entrepreneurship thinking applied or explored in this study, if applicable	Name key categories
1.2.1	1		Is resource entrepreneurship thinking applied or explored in this study?	Select “X” if applicable
1.2.2	1		Is gender/female entrepreneurship thinking applied or explored in this study?	Select “X” if applicable
1.2.3	1		Is social entrepreneurship thinking applied or explored in this study?	Select “X” if applicable
1.2.4	1		Is institutional entrepreneurship thinking applied or explored in this study?	Select “X” if applicable
1.2.5	1		Is environmental entrepreneurship thinking applied or explored in this study?	Select “X” if applicable
1.2.6	1		Is sustainable entrepreneurship thinking applied or explored in this study?	Select “X” if applicable
1.2.7	1		Is climate change entrepreneurship thinking applied or explored in this study?	Select “X” if applicable
1.2.8	1		Is digital entrepreneurship thinking applied or explored in this study?	Select “X” if applicable

1.2.9	1		Is any other entrepreneurship thinking applied or explored in this study?	Name the thinking applied or explored
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Theme 2: Climate change

2.1	2	Climate shocks and stresses	What kind of shocks and stresses responded by the entrepreneurs?	Name shocks and stresses
2.2	2	Quotes	Add supporting quotes	“Quotes”

Theme 3: Adaptation

3.1	3	Explicit use of the term adaptation	How does this study use the term, or concept, of adaptation?	Describe
3.2	3	Quotes	Add supporting quotes from the article	“Quotes”
3.3	3	Key aspects of adaptation	What are the key aspects of adaptation thinking applied or explored in this study, if applicable i.e: adaptation measures related to entrepreneurial activities, natural assets, governance and social assets, human assets, financial assets etc.	Name key items

Theme 4/ Obj 1: The shaping factors to emerge entrepreneurship in the face of climate change among Indigenous and vulnerable communities

4.1	4	Shaping factors of entrepreneurship	Any information related to shaping factors of entrepreneurship?	1=Yes; 0=No
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4.2	4	Describe	If yes, what are the factors	Name the factors
4.3	4	Quotes	Add supporting quotes	“Quotes”
Theme 5/Obj 2: The role of entrepreneurship as a climate change adaptation among Indigenous and vulnerable communities				
5.1	5	Factors of entrepreneurship that advance cc adaptation	What are the factors within entrepreneurship that advance cc adaptation?	Name the factors
5.2	5	Quotes	Add supporting quotes	“Quotes”
5.3	5	Benefits of entrepreneurship	How adaptation can benefit from entrepreneurship?	Describe
5.4	5	Quotes	Add supporting quotes	“Quotes”
Theme 6: Entrepreneurship and Adaptation				
6.1	6	Entrepreneurship and adaptation	Any documents that define entrepreneurship in the context of cc adaptation?	1=Yes; 0=No
6.2	6	Describe	If yes, please describe here.	Describe
6.3	6	Typology	Ways entrepreneurs /entrepreneurship contribute in CCA	Describe
6.4	6		Add examples	Text
6.5	6		Barriers for contribute in CCA	Describe
6.6	6		Add examples	Text
Theme 7: Constraints/limits to entrepreneurship as an adaptative measure				
7.1	7	Constraints or limits	Does the article identify constraints or limits to	1=Yes; 0=No

			entrepreneurship as an adaptive measure?	
7.2	7	Quotes	Supporting quotes	“Quotes”
Theme 8: Interesting case studies				
8.1	8	Quotes	Supporting text	text

S03: Case study profiles

Case study #	Respondent	Age (years)	Gender	Community	Entrepreneurial/livelihood activities practiced
01	01	34	Female	Dambana	Small-scale business, hand crafting and selling, farming
02	07	59	Female	Dambana	Chena cultivation, home gardening and selling agricultural produce
03	01	64	Male	Dalukana	Farming, Hunting
04	04	67	Male	Dalukana	Collecting honey, Fishing Activities, Farming
05	04	50	Male	Henanigala	Farming, fishing, and selling
06	10	16	Male	Henanigala	Farming, home gardening, fishing
07	06	65	Male	Henanigala	Farming, fishing, going around the country doing 'mantras' and chants and earning money through that, local medicines
08	04	43	Female	Rathugala	Farming

S04: Questionnaire used in field data collection.

Research Questions	<ol style="list-style-type: none"> 1. What are the existing food systems of Indigenous communities in Sri Lanka? 2. What are the impacts of climate change on Indigenous food systems? 3. How Indigenous and local knowledge systems are incorporated to food systems? 4. What are the food insecurities among Indigenous communities in Sri Lanka? 5. How are Indigenous food systems governed?
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Questionnaire

Demographic data (Household)	<ol style="list-style-type: none"> 1. Age 2. Gender: Male Female Other 3. Ethnicity 4. Highest level of education 5. Occupation(s) /Livelihood(s): primary other..... 6. Number of family members in the family (Including you) 7. Coordinates of the locations
-------------------------------------	--

Food systems of Indigenous communities in Sri Lanka

Q1. What are the existing food systems of Indigenous communities in Sri Lanka.	<p>Nutritional Status</p> <ol style="list-style-type: none"> 1. What are the traditional foods consumed in your community? 2. a. What was the last time you consumed traditional food? b. How often you consume traditional food (weekly, daily ,monthly) 3. What are the non-traditional foods consumed in your community? a. What is the frequency of consumption of non-traditional or imported foods?(a. What was the last time you consumed non- traditional food? b. How often you consume traditional food? b.How often you consume traditional food? (weekly, daily ,monthly)
---	--

-
3. What are the food items that you usually consume? (Protein, carbohydrate)
-

Production data

1. What is/are your main produce/s? (e.g., agriculture, fishing)
 2. What are the farming techniques that you used?
 3. What are the knowledge sources in related to farming practices? (e.g: trainings)
-

Economic Value

1. Are you a subsistence level farmer and/or a commercial level farmer? (two boxes)
 2. What are the primary productions for subsistence and commercial farming?
 3. purposes in your family?
 4. How is commercial farming affecting livelihoods and the local economy in your community?
 5. Do you add value/s to the produce/s or not? (How to you sell these products to outside?) (7th question)
 6. What are the traditional or modern marketing and distribution systems for commercial farming products?
-

Self-sustainability

1. To what extent do you think your family is self-sustainable? (High, low, medium)
 2. Are there any specific items or resources that your family relies on from outside sources?
 3. How does being self-sufficient affect your family's overall quality of life?
-

Q2. What are the impacts of climate change on Indigenous food systems?

1. What are the changes you noticed in the weather over the past 30 years?
 2. What are the responses for the noticed changes (Entrepreneurship aspects: access to finance, resources, education etc))
-

	Changes	Responses	Barriers

Q3. How Indigenous and local knowledge systems are incorporated to food systems?

1. How do you use past experiences to identify environmental changes?
2. If “yes” please give evidence/ applications(Collect quotes)

Q4. What are the food insecurities among Indigenous communities in Sri Lanka?

How easy or difficult is it to access enough food for your family’s needs?

In the past month, did you or anyone in your household skip meals because there wasn't enough money to buy food?

If “yes” please explain.

How many meals per day?

Why do you skip the meals?

	Before COVID	During COVID	After COVID
Number of meals			
Why			
Livelihoods			
Health			
Other			

Q5: How are Indigenous food systems governed?

1. Management system characteristics
 - 1.1 (Partnerships (yes,no) if yes what are the partnerships, with whom)
 - 1.2 (Regime (yes,no) (Government, Communal, NGO, Private)
 - 1.3 (Linkages, collaborations)
 - 1.4 (Decision making) (Who is involved, what are the decisions)
 - 1.5 (Local Institution (Samithi, Sangam)
 - 1.6 (Leadership) (Community Leadership)
 - 1.7 (Community Actions) evidence of food system transformation
 - 1.8 Application of Local Knowledge for food system governance (Examples/ Evidence, e.g., Covid Era challenges)

Q6. Entrepreneurial aspects of the community

1. Who supported you in initial idea generation and the starting process of your livelihood activity? (e.g. (non) availability of support from families, friends and other governmental/non-governmental organizations, financial service providers)
2. Are there any occasions that your livelihood activities failed in the face of external stressors? If so, what are they?
3. Are there any occasions that your livelihood activities were successful in facing external stressors? If so, what are they?
4. Gaps in realizing opportunities for the future?
5. What is the support you further need from government and other non-governmental organizations?

Q7. Health Issues

1. How many of your family got COVID? (How many females tested positive/ males tested positive)
 2. How many of them are vaccinated?
 3. How many doses obtained?
 4. Qualitative descriptions about COVID experience? (Quotes) ?
 5. How do you all survive (responses) during COVID? (Try to get some quotes and evidence?)
-

-
6. What challenges you faced in responding COVID?
 7. From where/ when did you first hear about COVID?
 8. What are the precautions you took during the COVID?
 9. How did you all apply your traditional knowledge and cultural practices in managing the COVID spread?
 10. As you experience what was the government support you required to manage the spread and severity of the diseases?
 11. What are the other stressors (e.g., floods, landscapes) came with COVID?
 12. What are the other health risks associated other than the COVID? (e.g lists for diseases: Malaria, HIV, Dengue, TB, Diabetes, Obesity, Anaemia, Hypertension, Snakebites, Wild Elephant Attacks, COVID 19)
-

S05: IRB Approval



Division of Scholarly Integrity and
Research Compliance
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MEMORANDUM

DATE: May 9, 2023
TO: Eranga Galappaththi, Sithuni Mimasha Jayasekara Pathiranage, Indunil Prabodha Dharmasiri, Chrishma Dharshani Perera
FROM: Virginia Tech Institutional Review Board (FWA00000572)
PROTOCOL TITLE: Food security and climate change among Indigenous Peoples in Sri Lanka
IRB NUMBER: 23-388

Effective May 9, 2023, the Virginia Tech Human Research Protection Program (HRPP) determined that this protocol meets the criteria for exemption from IRB review under 45 CFR 46.104(d) category (ies) 2(ii).

Ongoing IRB review and approval by this organization is not required. This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these activities impact the exempt determination, please submit an amendment to the HRPP for a determination.

This exempt determination does not apply to any collaborating institution(s). The Virginia Tech HRPP and IRB cannot provide an exemption that overrides the jurisdiction of a local IRB or other institutional mechanism for determining exemptions.

All investigators (listed above) are required to comply with the researcher requirements outlined at:

<https://secure.research.vt.edu/external/irb/responsibilities.htm>

(Please review responsibilities before beginning your research.)

PROTOCOL INFORMATION:

Determined As: **Exempt, under 45 CFR 46.104(d) category(ies) 2(ii)**
Protocol Determination Date: **May 9, 2023**

ASSOCIATED FUNDING:

The table on the following page indicates whether grant proposals are related to this protocol, and which of the listed proposals, if any, have been compared to this protocol, if required.

Invent the Future

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S06: Images of field data collection

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