

# When climate change undermines poverty alleviation measures: exploring implications for communities of rural women entrepreneurs in Rwanda

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## Abstract

**Purpose** – Village Savings and Loan Associations (VSLAs) provide an important poverty-alleviation measure in countries of the Global South. They help rural communities develop small-scale entrepreneurial activities, often within agriculture. Countries of the Global South suffer disproportionately from the effects of climate change, with unpredictable weather conditions potentially challenging the success of rural entrepreneurial activities. Drawing on resilience theory, this paper aims to examine how climate change affects communities of rural women entrepreneurs in Rwanda and identifies the mitigation and adaptation strategies adopted at the micro, meso and macro levels.

**Design/methodology/approach** – We conducted a qualitative study in Rwanda, drawing on multiple data sources across three levels. At the micro level, we conducted 25 interviews and one focus group interview with seven VSLA members. The meso level was captured by ten interviews with local support organisations. At the macro level, we systematically analysed government policies and programmes, complemented by eight interviews with central government representatives.

**Findings** – We find that Rwanda's government has long been aware of the impact of climate change and has implemented a range of mitigation and adaptation strategies, including a focus on advancing transformative and learning skills. However, despite these concerted government actions, VSLA members still lack knowledge about possible adaptation strategies and commonly acquire skills informally within their

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community. This adversely impacts the primary functions of VSLAs – savings and loans – and results in an increased rate of loan defaults, potentially jeopardising the VSLA model.

**Social implications** – Rwanda aspires to become a middle-income country by 2035. Safeguarding small-scale entrepreneurial activities as a poverty-alleviation measure plays an important role in that process, and our findings can help raise awareness for more forcefully addressing the threat that VSLAs are currently facing.

**Originality/value** – The originality of our findings stems from applying a systemic approach across three levels of analysis (e.g. micro, meso, macro) that goes beyond the more isolated levels of analysis typically applied in prior research. This approach allows us to identify a meso-level gap between macro-level governmental policies and micro-level agency that would be important to address for supporting VSLA communities in increasing their adaptability to climate change and, with that, safeguard the economic sustainability of this important poverty-alleviation measure. We also highlight the willingness of entrepreneurial communities to play a more significant role in combating climate change.

**Keywords** VSLA, Women entrepreneurs, Climate change, Adaptability, Mitigation, Transformation, Resilience

**Paper type** Research paper

## Introduction

The United Nations' Agenda 2030 puts the global importance of alleviating poverty on centre stage by formulating 'No Poverty' as the first Sustainable Development Goal (SDG). One measure that has proven successful in lifting people out of poverty is Village Savings and Loan Associations (VSLAs) (e.g. [Maganga, 2021](#)). As community-based financial institutions serving economically vulnerable and marginalised groups ([Isaac and Remmy, 2017](#)), VSLAs enhance economic development by overcoming the 'last mile problem of micro-finance' ([Ksoll et al., 2016](#)). They provide some of the world's poorest people with access to financial services, such as savings, credit and insurance schemes ([Burlando and Canidio, 2017](#); [Flora et al., 2015](#)). In weekly meetings, VSLA members engage in informal training sessions, exchange ideas about entrepreneurial activities and save money to lend to community members for developing such small-scale activities. VSLA communities then jointly benefit from the interests these loans yield, which VSLA members often reinvest into their business activities to improve their socio-economic situation ([Rubyutsa et al., 2024](#)). Various studies have confirmed the positive impact of VSLAs on the participating women's lives (e.g. [Amponsah et al., 2023](#); [Karlan et al., 2017](#)).

To date, the successful contribution of VSLAs to poverty alleviation largely depends on investments in small-scale business activities entailing low thresholds and low risks ([Cassidy and Fafchamps, 2020](#); [Chineka and Mtetwa, 2021](#)). As these activities are typically undertaken within agriculture, such as planting crops and keeping livestock ([Pienaaah and Lugianaah, 2024](#)), climate change is evolving as a major challenge to the current functioning logic of VSLAs due to its negative impact on small-scale agricultural activities conducted by communities of rural women entrepreneurs. Climate change disproportionately impacts the most vulnerable, not least because their capacity to estimate the optimal timing for sowing and harvesting is greatly reduced. Here, prior research on contexts of developing countries has developed insights, for example, into the effects of climate change on agricultural production ([Ochieng et al., 2016](#)) or the impact of climate variability on household welfare ([Skoufias and Vinha, 2013](#)). The adaptation strategies used by African smallholder farmers have been assessed, for example, by [Dramani et al. \(2023\)](#), [Maponya and Mpandeli \(2012\)](#), [Nyiwul \(2019\)](#) and [Talanow et al. \(2021\)](#).

Studies have examined adaptive responses to climate change across diverse contexts. For example, social capital has been identified as an important coping and adaptation mechanism among farmers in rural areas of Türkiye, where formal adaptation measures remain limited ([Gören, 2025](#)). Similarly, adaptation strategies among small-scale farmers have been investigated by [Kom et al. \(2022\)](#) and [Shivamurthy et al. \(2015\)](#). [Kom et al. \(2022\)](#) found

that smallholders in a South African district adopted on-farm strategies, such as experimenting with different crop varieties, cultivating drought-resistant crops, selecting short-cycle crops and using furrow irrigation to enhance their resilience to climate variability. Likewise, [Shivamurthy et al. \(2015\)](#) reported that small-scale farmers in one region of India adapted by delaying the planting of short-duration crops and adjusting irrigation practices, including shifting from groundwater to drip irrigation systems.

The question of how poverty-alleviation measures, such as microfinancing in general and VSLAs in particular, are being affected by climate change has so far been addressed mainly in a few reports and white papers. For example, [Helwig et al. \(2020\)](#) evaluated the role of Urwego Bank in providing micro-finance loans to VSLAs in rural Rwanda. They assessed the impact of these micro-loans on VSLA members' vulnerability and adaptive capacity to climate change. Farmers in their sample viewed loans as an effective way to increase agricultural productivity and income. Reduced harvests due to climate change led to food scarcity, financial difficulties such as struggles to pay school fees and migration of labourers. The interviewed VSLA members adapted to climate-change impacts by implementing hydrological solutions (i.e. contours and water channels), changing their farming practices (such as planting earlier, crop rotation or sowing climate-resilient crops), increasing pesticide use, changing business models to non-agricultural activities or making changes to their financial management. Micro-loans were utilised to purchase fertilisers or climate-resilient seeds, ensuring some harvest and income even during adverse climatic conditions.

While prior academic publications and grey literature have contributed with many relevant insights on the impact of climate change on subsistence entrepreneurship in rural areas of the Global South, they mainly address isolated levels of analysis and, as a result, we lack a systemic understanding of how VSLA communities of women entrepreneurs are impacted by climate change and how their attempts of adapting to it are supported by meso- and macro-level initiatives. Our paper aims to address this gap by drawing on resilience theory, which calls for researchers to apply a systemic analysis when investigating climate change to generate a better understanding of the socio-ecological system's capacity to absorb shocks while maintaining its core functions ([Holling, 1973](#)). The *resilience* of a system refers to its capacity to absorb disturbances, in this case, those triggered by climate change. *Adaptability*, in turn, refers to the capacity of actors in the system – here, VSLA communities – to influence resilience through adaptation and mitigation. *Adaptation* refers to dealing with climate change-related vulnerabilities and risks in environmental and socio-economic areas such as food security, health, biodiversity and water supply. *Mitigation* focuses on addressing the causes of climate change, usually with a heavy emphasis on reducing greenhouse gas (GHG) emissions ([Nyiwul, 2019: 220](#)). Finally, *transformability* refers to the capacity of creating a new system when the existing system becomes untenable ([Walker et al., 2004](#)). In this paper, we address the following research questions:

- RQ1. How does climate change impact VSLA communities and their members, and how do they adapt to its effects on the micro level?
- RQ2. How are these micro-level adaptation strategies supported by mitigation and adaptation strategies on the meso and macro levels?
- RQ3. How do implemented policies and initiatives at the meso and macro level aim to strengthen communities' adaptive, learning and transformative capacities to deal with climate change?

We conducted a qualitative study combining multiple data sources. At the micro level, 25 semi-structured interviews and one focus group with seven participants were carried out with

rural women entrepreneurs in Rwanda who are members of VSLAs. At the meso level, we conducted ten semi-structured interviews with stakeholders in the VSLAs' ecosystem, including representatives of local NGOs and local government officials. At the macro level, eight semi-structured interviews with national government representatives were complemented by a systematic analysis of government policies and initiatives on climate change. This multi-level research approach goes beyond existing research, which tends to focus on either the micro-level experiences of entrepreneurs or macro-level quantitative data.

Drawing on resilience theory, our findings offer two main contributions to the literature on enterprising communities and rural entrepreneurship at the bottom of the pyramid (Rockenbauch and Sakdapolrak, 2017; Sharma and Rautela, 2022). First, we detail the effects of climate change on communities of women entrepreneurs in selected VSLAs in Rwanda, along with the adaptation strategies these women use to manage the negative effects of climate change on their business activities. Secondly, by adopting a systemic approach inspired by resilience theory, we reveal a gap at the meso level that is gradually putting the economic sustainability of the VSLA model at risk. At the micro level, communities of women entrepreneurs are actively experimenting with adaptation strategies, and at the macro level, government policies reflect a high level of awareness of climate change and a broad range of adaptation and mitigation strategies. However, a gap persists at the meso level, as some ecosystem actors – particularly those promoting and supporting the VSLA system – have been slow to adjust their activities in ways that would strengthen the adaptability and long-term resilience of this important poverty-alleviation measure. Moreover, these actors have devoted limited attention to fostering transformative skills that would enable VSLA communities to diversify beyond their current reliance on agricultural activities. This gap poses a threat to the sustainability of VSLAs as an instrument for poverty alleviation: The viability of the VSLA model depends on members' ability to save, borrow and repay loans, an increasingly difficult task given the growing unpredictability of agricultural activities. The situation is further aggravated by rising loan defaults, as women entrepreneurs struggle to generate sufficient income to meet repayment obligations. The combination of these dynamics – declining savings and increasing defaults – risks precipitating the collapse of the VSLA system, thereby undermining both members' economic development and Rwanda's broader progress towards eradicating poverty and achieving SDG No. 1: 'No Poverty'.

### Theoretical background

Over the past few decades, resilience has become an important concept for understanding how human and ecological systems respond to change (e.g. Folke, 2016; Folke *et al.*, 2010). Rather than resisting change, resilience is positively related to a preparedness mindset as well as actions for living with change (Folke, 2006). Initially rooted in ecology (Gunderson, 2000; Jansen and Ostrom, 2006), resilience was originally defined as a system's capacity to absorb shocks while maintaining its core functions (Holling, 1973). Its scope has since expanded to social and socio-ecological systems (SEs), emphasising persistence, adaptation, learning and transformation under external pressures (e.g. Ngcamu, 2023; Pelling *et al.*, 2015; Walker *et al.*, 2004). These dimensions and building blocks frame challenges such as climate change as necessitating both adaptive (short-term coping) and transformative (long-term systemic) responses (Adger, 2000; International Panel on Climate Change [IPCC], 2023). Resilience thinking thus shifts the analytical focus from hazard prediction and prevention towards building flexibility and robustness to manage both expected and unexpected risks (Berbés-Blázquez *et al.*, 2017; Measham *et al.*, 2011; Sharma and Rautela, 2022).

Drawing on [Holling \(1973\)](#), the *climate resilience* of a small-scale agricultural ecosystem can be defined as one in which farmers thrive even when baseline conditions for agricultural activities change. A *vulnerable* system, instead, is one in which climate change threatens the viability of small-scale agricultural activities ([Burney et al., 2014](#)). Key factors contributing to vulnerability include the climate sensitivity of crops and livestock, fluctuations in water levels due to floods and droughts and the current poverty level of women entrepreneurs, compounded by low-yielding production practices, reliance on limited and seasonally variable water resources and weak institutional support ([Rockenbauch and Sakdapolrak, 2017](#); [Simões et al., 2010](#)).

Rural entrepreneurs often have some short-term coping capacity, such as leveraging savings from VSLAs to mitigate immediate shocks ([Helwig et al., 2020](#); [Pienaaah and Lugianaah, 2024](#)). However, adaptive capacity is critical for long-term resilience ([Burney et al., 2014](#)). The adaptive capacity of individuals or households is influenced and limited by social, economic and political processes at a larger scale ([Smit and Wandel, 2006](#)). [Cutter et al. \(2008\)](#) outlined key indicators of community resilience, including *ecological* factors (such as wetlands, erosion and biodiversity), *social* factors (such as demographics, social networks, community cohesion and faith-based organisations), *economic* factors (e.g. employment and wealth generation), *institutional* factors (such as hazard mitigation plans or zoning and building standards), *infrastructure* (such as transportation networks) and *community competence* factors (such as quality of life, health and wellness, counselling services and absence of alcohol, drug and spousal abuse).

Research indicates growing concerns that shifts in climate variability are likely to exacerbate the already high vulnerability of agriculture and rural households in developing countries ([Li, 2025](#); [Skoufias and Vinha, 2013](#)). The Intergovernmental Panel on Climate Change ([International Panel on Climate Change \[IPCC\], 2023](#)) confirms that climate change significantly reduces agricultural and livestock production, primarily due to inadequate rainfall and severe water shortages. For Rwanda, the World Food Programme ([WFP, 2019](#)) has identified poor rainfall, droughts, floods, pests and diseases as major threats to food security, disrupting various economic activities. Similarly, studies on the impact of climate change on agriculture emphasise that small-scale farmers in Sub-Saharan Africa (SSA) are particularly vulnerable. Due to high poverty levels, limited adaptive capacity and heavy dependence on climate-sensitive sectors such as agriculture, these farmers face significant risks from climate variability and change ([Pienaaah et al., 2023](#); [Rodríguez-Barillas et al., 2024](#)).

Agriculture is a vital sector in Rwanda, representing roughly one-third of the national GDP. Approximately 80% of rural households engage in small-scale farming, often led by women who frequently lack access to the necessary resources to improve productivity and income ([WFP, 2019](#)). Rural small-scale farmers face multiple challenges, including poor crop yields, soil erosion, increased pest infestations, rising food insecurity, reduced livestock production, water shortages caused by droughts, flood damage, extreme heat, worsening poverty, internal migration, social unrest and declining biodiversity ([Abdollahzadeh et al., 2023](#); [Akinyi et al., 2021](#); [Carr et al., 2021](#); [Magesa et al., 2023](#); [Panja et al., 2026](#)). In SSA, climate change continues to threaten food security, as fluctuating rainfall patterns reduce soil moisture and disrupt agricultural production. Smallholder farmers, in particular, struggle to adapt due to their limited resources and few alternative income opportunities, making them highly vulnerable to environmental and climatic hazards ([Perez et al., 2015](#); [Pienaaah et al., 2023](#)).

Several scholars have studied how small-scale agricultural entrepreneurs adapt to climate change. For instance, Eaken (2000) examined how smallholder farmers in Mexico respond to climate change by modifying their use of pesticides and fertilisers according to weather conditions, utilising former farming plots differently by diversifying into additional business

activities, relocating farming operations and leveraging social networks established within the community to access necessary resources. A study conducted among small-scale farmers in South Africa and Ethiopia by [Bryan et al. \(2009\)](#) identified various adaptation strategies aimed at managing the adverse effects of climate change, including using different crops or crop varieties, planting trees, practising soil conservation, altering planting dates and implementing irrigation. However, they found that despite changes in temperature and rainfall, a significant percentage of farmers did not adjust their farming practices. The primary barriers to adaptation identified by these authors were a lack of access to credit in South Africa and a lack of access to land, information and credit in Ethiopia. Another study by South African farmers highlighted the use of a digital system for monitoring, the incorporation of indigenous knowledge practices, the observation of wind directions and clouds to anticipate rainfall, as well as the use of nets to monitor temperature levels as adaptation strategies ([Maponya and Mpandeli, 2012](#)).

Several studies have applied SESs theory as a systemic analysis approach to examine the climate change risks affecting smallholder farming activities. [Chuku and Okoye \(2009\)](#) advanced the concept of socio-ecological resilience to provide a more comprehensive assessment of smallholder vulnerability in SSA. They identified four principal strategies for managing climate change-related risks: *Income and asset management strategies*, such as crop insurance to limit income risks resulting from climate change, diversification of households' income sources to spread risk and participating in income stabilisation programmes; *government programmes and support*, including agricultural subsidies, public and private insurance schemes and resource management initiatives; *farm production practices*, encompassing diversification of crop varieties, adjustments of production intensity in response to environmental and economic fluctuations, the use of irrigation to offset moisture deficiencies and drought and modification of planting schedules to accommodate seasons and temperatures; and *technology development measures*, including crop development, weather and climate information systems and resource management technologies.

[Atela et al. \(2018\)](#) studied climate change adaptation among female-led ventures in one region of Kenya, finding that women entrepreneurs experienced severe climate change related disruptions that reduced revenues and, in some cases, led to business closure. These rural communities often relied on short-term, unsustainable coping measures, such as reducing production to limit losses, while lacking activities that could strengthen long-term adaptive capacity. More recently, [Pienaaah et al. \(2025\)](#) evaluated the potential of a nature-based solution initiative known as Community Resource Management Area (CREMA). This community-led conservation programme designed to enhance climate change preparedness and resilience among smallholder farmers in one region of Ghana. Drawing on an SES perspective, the study found that CREMAs significantly strengthened both climate preparedness and resilience.

Similar to CREMA, VSLAs are widely regarded as important mechanism for strengthening community resilience. However, existing research on climate change and its effects on the agricultural activities of small-scale farmers has predominantly focused either on farmers' perceptions at the micro level or on macro-level climate change data. The systemic effects of climate change, encompassing not only how rural women entrepreneurs manage adaptation strategies within their communities but also how these efforts are shaped by support from meso-level ecosystem actors and macro-level institutions, remain largely underexplored. Addressing this gap is the central focus of our study.

## Methods

### *Research design and context*

Given the limited theoretical understanding of how climate change affects VSLA communities and how these groups adapt, this study adopted a qualitative research design. A

qualitative approach was chosen because it allows for the collection of rich, detailed information (Eisenhardt and Graebner, 2007), helping to build a contextual understanding of the climate change challenges and responses at the community level. In line with previous research on the impact of climate change in the Global South (e.g. Atela *et al.*, 2018; Kom *et al.*, 2022; Pienaah *et al.*, 2025; Shivamurthy *et al.*, 2015), our study focuses on one single region in Rwanda. This localised focus enables a more granular understanding of the perceived impact of climate change within a specific context – effects that regional climate variations might otherwise obscure. Fieldwork was conducted in the Ruhango District, in Rwanda's Southern Province. This district was chosen because it is where CARE International introduced the VSLA model more than two decades ago. Owing to this long history, Ruhango offers a particularly rich setting for studying how VSLAs function and how climate change affects their activities. CARE International served as a key intermediary facilitating access to five rural VSLAs established between 2002 and 2012. These communities provided valuable insights into VSLA organisation and operations, members' main entrepreneurial activities, loan utilisation practices, the perceived effects of climate change and the adaptive measures undertaken in response.

#### *Data collection*

As is typical for qualitative research, we relied on a combination of rich interview data and secondary material to provide in-depth insights into the studied phenomenon (Eisenhardt and Graebner, 2007). An interview guide was created to aid the data collection process, covering questions related to the organisation of VSLAs, their operations and key activities, the utilisation of loans, significant climate change factors affecting agriculture and investments and the strategies used to cope with these challenges. The interview guide was adjusted to different informant categories to ensure the collection of diverse and nuanced perspectives. The interview guide was prepared in English, but the first author conducted all interviews in Kinyarwanda, the local language.

The selection of participants was guided by purposive sampling and with the support of CARE International as a door opener (Miles and Huberman, 1994; Patton, 2015). Within each VSLA, VSLA agents helped us to select five participants with extensive, but diverse knowledge of its operations and activities, considering the duration of membership, position held in the VSLA and experience with entrepreneurial and agricultural activities as important selection criteria. Our aim was not to produce generalisable findings in a statistical sense; rather, our research design aimed to allow for the transferability of our findings by building on thick description, diverse sampling and triangulation across different levels of analysis (e.g. Drisko, 2024). In total, 25 semi-structured interviews and one focus group with seven participants were conducted on the micro level (see Table 1).

At the meso level, a total of ten semi-structured interviews were conducted with ecosystem actors and other stakeholders supporting rural women entrepreneurs in the region (see Table 1), representing the local government, public agencies, NGOs and micro-finance institutions. These interviews aimed to gather perceptions about the impact of climate change on the entrepreneurial activities and investments by the VSLA communities, as well as how they have adjusted their support activities to help them cope with this impact. They also captured the target demographics of the support programmes and the reasoning behind these choices.

At the macro level, two types of data were collected. Firstly, eight semi-structured interviews were conducted with central government actors. These interviews aimed to understand the Government of Rwanda's perspective on climate change and the reasoning for the implemented mitigation and adaptation strategies. They also helped us to better

**Table 1.** List of informants

No.	Data source	Date	Length	Organisation	Role
<i>Micro level</i>					
1	Semi-structured interview	13 March 2024	51 min	VSLA (a)	Leader
2	Semi-structured interview	13 March 2024	85 min	VSLA (a)	Agent
3	Semi-structured interview	13 March 2024	49 min	VSLA (a)	Member
4	Semi-structured interview	13 March 2024	63 min	VSLA (a)	Member
5	Semi-structured interview	13 March 2024	70 min	VSLA (a)	Leader
6	Semi-structured interview	19 March 2024	25 min	VSLA (b)	Member
7	Semi-structured interview	19 March 2024	96 min	VSLA (b)	Agent
8	Semi-structured interview	19 March 2024	93 min	VSLA (b)	Leader
9	Semi-structured interview	19 March 2024	61 min	VSLA (b)	Leader
10	Semi-structured interview	19 March 2024	95 min	VSLA (b)	Agent
11	Semi-structured interview	26 March 2024	97 min	VSLA (c)	Member
12	Semi-structured interview	26 March 2024	95 min	VSLA (c)	Leader
13	Semi-structured interview	26 March 2024	60 min	VSLA (c)	Member (leader)
14	Semi-structured interview	26 March 2024	69 min	VSLA (c)	Member
15	Semi-structured interview	30 March 2024	94 min	VSLA (c)	Agent
16	Semi-structured interview	28 March 2024	54 min	VSLA (d)	Leader
17	Semi-structured interview	28 March 2024	66 min	VSLA (d)	Member
18	Semi-structured interview	28 March 2024	69 min	VSLA (d)	Agent
19	Semi-structured interview	28 March 2024	54 min	VSLA (d)	Member
20	Semi-structured interview	28 March 2024	66 min	VSLA (d)	Member
21	Semi-structured interview	30 March 2024	60 min	VSLA (e)	Member
22	Semi-structured interview	30 March 2024	47 min	VSLA (e)	Agent
23	Semi-structured interview	30 March 2024	60 min	VSLA (e)	Member
24	Semi-structured interview	30 March 2024	45 min	VSLA (e)	Leader
25	Semi-structured interview	26 March 2024	59 min	VSLA (e)	Member
26	Focus group interview (1)	27 March 2024	117 min	VSLA members	Seven VSLA members from two groups: one leader, one accountant, one secretary, one controller, four members

(continued)

**Table 1.** Continued

No.	Data source	Date	Length	Organisation	Role
<i>Meso level</i>					
1	Semi-structured interview	22 March 2024	51 min	Micro-finance institution	Manager
2	Semi-structured interview	20 Dec 2023	81 min	Local government representative	Director
3	Semi-structured interview	12 January 2024	33 min	Local government representative	Local authority
4	Semi-structured interview	7 March 2024	13 min	Local government representative	Officer
5	Semi-structured interview	7 March 2024	109 min	Local government representative	Officer
6	Semi-structured interview	28 March 2024	25 min	Local government representative	Officer
7	Semi-structured interview	22 March 2024	48 min	Local government representative	Officer
8	Semi-structured interview	29 Dec 2023	60 min	Local government representative	Officer
9	Semi-structured interview	7 Dec 2023	88 min	NGO	Manager
10	Semi-structured interview	12 Dec 2023	77 min	NGO	Officer
<i>Macro level</i>					
1	Semi-structured interview	8 Dec 2023	72 min	Central government representative	Director general
2	Semi-structured interview	14 March 2024	60 min	Central government representative	Climate mitigation specialist
3	Semi-structured interview	20 March 2024	98 min	Central government representative	Financial literacy expert
4	Semi-structured interview	16 January 2024	89 min	Central government representative	Coordinator
5	Semi-structured interview	1 March 2024	43 min	Public agency representative	Climate financial specialist
6	Semi-structured interview	18 January 2024	65 min	Public agency representative	Officer
7	Semi-structured interview	21 February 2024	85 min	Public agency representative	Officer
8	Semi-structured interview	8 August 2024	66 min	Public agency representative	Officer
<i>Total interview time: 2,963 min (=more than 49 h)</i>					
<b>Source(s):</b> Authors' own work					

understand the role of VSLAs and rural women's entrepreneurship in working towards fulfilling the first SDG, 'No Poverty', as part of Rwanda's overall aim of becoming a middle-income country. Secondly, systematic desktop research was conducted to identify government policies and initiatives launched to combat climate change and how these promote learning as well as adaptive and transformative capacities. The starting point for this search was based on the keywords 'Rwanda AND climate change AND government'. The hits received were complemented by a search on the webpages of national-level ministries working on climate change, i.e. the Ministry of Environment, the Ministry of Infrastructure, the Ministry of Emergency Management and the Ministry of Agriculture, as well as agencies such as the Rwanda Environment Management Authority, the Rwanda Forest Authority (RFA) and the Rwanda Green Fund. [Table 2](#) offers a detailed overview of these policies and initiatives as well as their link to relevant dimensions of resilience theory.

Ethical clearance for this study was obtained from the Research and Innovation Unit of the College of Business and Economics at the University of Rwanda. In addition, a letter from the authorities of Ruhango District granted permission to collect empirical data in the area, enabling connections with various local administrative entities involved in saving group operations. CARE International also provided support for this study, acting as a door opener for access to VSLAs and their members. Before the interviews, informants signed a consent form to participate in this study (with two respondents only giving oral consent), after being informed about their voluntary participation, their possibility to withdraw from the study at any time and being offered anonymity.

### *Data analysis*

Our analytical approach involved conducting data analysis alongside data collection, as this allowed us to generate insights throughout the various stages of the research process. This iterative approach also enabled us to refine our data collection based on findings that emerged during the study ([Grodal et al., 2021](#)).

The analysis began with transcribing and translating field notes and interview transcripts from Kinyarwanda to English. We then engaged in an iterative process, moving between the transcripts, field notes and a review of public policies and initiatives related to climate change, adaptation and mitigation. This approach allowed us to examine the data across three levels: micro, meso and macro. At the micro and meso levels, we gained insights into how VSLAs are organised, operate, how loans are utilised and how these groups are supported by meso-level actors. At the macro level, the review of the policies and initiatives revealed details of programmes for environmental protection, climate change mitigation, investments made and outcomes achieved, as well as the broader rationale for enhancing systemic adaptability and transformability. We used thematic analysis ([Gibbs, 2007](#); [Williams and Moser, 2019](#)), following [Braun and Clarke's \(2006\)](#) six-step approach: familiarisation with data, generation of initial codes, search for themes, review of themes, defining and naming themes and writing findings. Descriptions, phrases and terms used by informants, alongside relevant material from secondary sources, were manually coded. The codes were grouped around four broad analytical themes. VSLA operations, including codes related to community-based savings, pooled resource management and the development of small-scale enterprises; climate change effects on VSLA communities of rural women entrepreneurs, including codes capturing disruptions to agricultural activities, product shortages and difficulties in saving or repaying loans; adaptation and coping strategies among VSLA members, including codes reflecting measures such as soil erosion control, wetland cultivation, optimising seasonal farming cycles and diversifying income-generating activities; adaptation and mitigation strategies by macro-level actors, including codes

**Table 2.** Government policies and initiatives to combat climate change

Year	Name of the initiative	Aim	Link to resilience theory	Responsible institution and estimated investment
2007	Rwanda: NAPA Priority Project 1	Rehabilitation and preservation of forestry and agricultural potentials; protection of basins and water resources	Adaptive and resistance capacities upgraded, focusing on rehabilitation and preservation of the forest	Northern and Western Districts of Rwanda (US\$950,000)
2009	Climate resilience: Key priority goal for Green Gicumbi Project Interventions	To address the barrier of limited capacity to conduct meteorological analyses and forecasting, Green Gicumbi project provided weather and climate services for tea and coffee farmers to increase productivity and reduce losses from weather and climate variability	Increasing system resilience and adaptation; facilitating coping capacity on the micro level	Rwanda Green Fund
2010	Rwanda Irrigation Master Plan	Full, efficient and sustainable exploitation of both surface (runoff, rivers and lakes) and underground water resources by promoting irrigation in its various forms	Increasing resilience	Ministry of Agriculture and Animal Resources (MINAGRI)
2014	Forest landscape restoration opportunity assessment for Rwanda	Present and discuss opportunities for scaling up pilot projects in the prospect of supporting the government to achieve forest and landscape restoration	Mitigation and transformative capacity enhancement via forest landscape restoration assessment	Former Ministry of Natural Resources
2015	Baseline climate change vulnerability index for Rwanda	A first report that assesses climate change vulnerability at the national level in Rwanda and also lays out a framework expected to make Rwanda less vulnerable to the impact of climate change	Understanding climate change vulnerability nationwide for a better initiation of increasing resilience, adaptation and mitigation activities	REMA
2015	Landscape Approach to Forest Restoration and Conservation Project	Develop strategies to improve the management of forest ecosystems and generate multiple benefits	Adaptation of forest ecosystem management and development of transformative capacity	Implemented by REMA with support from Global Environment Facility (GEF), Least Developed Countries Fund (LDCF) and Nordic Development Fund

*(continued)*

Table 2. Continued

Year	Name of the initiative	Aim	Link to resilience theory	Responsible institution and estimated investment
2015	Climate change, water resources and WASH systems. Country case: Rwanda	Fund for environment and climate change (FONERWA) to ensure that the country is in a good position to coordinate, manage and disburse climate finance, as well as receive funding from international climate funds; a national fund through which international and domestic climate funding can be managed	Increasing resilience through resourcefulness, adaptation and mitigation; increasing transformative capacity	Rwanda Ministry of Natural Resources, Netherlands Commission for Environmental Assessment, Rwanda Climate Change Profile
2015	Climate-Smart Agriculture in Rwanda (CSA)	Increase adaptation and productivity benefits of agriculture in Rwanda. Investing in land husbandry, water harvesting and hillside irrigation to increase resilience to climate change, reduce water erosion and soil loss, halt land degradation and increase land productivity	Increase resilience, adaptation and mitigation focus	BRD, IDA, CGIAR, CCAFC (Climate Change and Food Security)
2019	Assessment of Climate Change Vulnerability in Rwanda – 2018	To examine the country's vulnerability by taking a detailed look at climate change vulnerability in the country's 30 districts focusing on households	Assessment of the country's vulnerability and climate change resilience	REMA
2019	Green Gicumbi project	To build the resilience of communities affected by climate change	Resilience building and increasing adaptation and transformative capabilities	Rwanda Green Fund (US\$32.8m)
2019	Forest Landscape Restoration in the Mayaga Region Project	Landscape restoration in Four Southern Districts of the Mayaga region: Kamonyi, Ruhango, Nyanza and Gisagara (2019–2025)	Landscape restoration in Mayaga region for mitigation and targeting transformability	REMA; project funded by the government of Rwanda, Green Environment Funds and UNDP (US \$32.7m)

(continued)

**Table 2.** Continued

Year	Name of the initiative	Aim	Link to resilience theory	Responsible institution and estimated investment
2020	Water Users and Uses Assessment in Rwanda	Report aiming to strengthen water governance processes in Rwanda for better preparedness and to ensure food security and adaptation to climate change, water scarcity and increased competition for water resources in an equitable and sustainable manner	Strengthen governance mechanisms to increase resilience, especially preparedness, as well as adaptability	Rwanda Water Resources Board (RWB)
2021	National Greenhouse gas Inventory – a report to the United Nations Framework Convention on Climate Change (UNFCCC)	Greenhouse gas inventory, highlighting an update of Rwanda's GHG inventory from 2006 to 2018	Assessment to facilitate mitigation strategies	Republic of Rwanda through REMA and the Ministry of Environment
2021	Kayonza Irrigation and Integrated Watershed Management Project – Phase II	Contribute to poverty reduction in the drought-prone Eastern Province of Rwanda; improve food security and incomes of at least 40,000 rural households on a sustainable basis and build their climate resilience	Increase climate change resilience in drought-prone zone by supporting adaptation and coping strategies	IFAD
2022	Rwanda Environment Management Authority strategic plan	Four priorities: ecosystem restoration/rehabilitation and biodiversity conservation, climate change resilience, compliance and enforcement and environmental education, awareness and mainstreaming	Strengthening transformative, adaptive and learning strategies; focus on education and training	REMA (Rifs 43,922,019,289)
2022	Revised Green Growth and Climate Resilience – National Strategy for Climate Change and Low Carbon Development	Aims to guide national-level policy and planning in an integrated way, ensuring alignment with other key documents and to mainstream climate change into all sectors of the economy	Macro-level strategy for safeguarding resilience, adaptation and mitigation	Republic of Rwanda via Ministry of Environment

(continued)

Table 2. Continued

Year	Name of the initiative	Aim	Link to resilience theory	Responsible institution and estimated investment
2022	KnoWat: Knowing Water Better: Towards a more equitable and sustainable access to natural resources to achieve food security	Focus on water accounting and water governance as crucial for addressing water scarcity to ensure food and water security; enhance understanding of the quantity and quality of water available and the rules that govern access to water to increase capacity to manage and use water resources efficiently and equitably	Adaptation to water scarcity	Food and Agriculture Organisation of the United Nations
2023	Climate risk mapping and mitigation measures to orient private-sector investment in Rwandan agriculture	Proposes measures to orient private-sector investment in agriculture to counter ecosystem degradation and its negative effects on food security. Vulnerability mapping for major value-chain crops and livestock to orient private investment toward climate-resilient agriculture	Advance resilience through increased adaptability of agricultural practices; mapping of adaptation and mitigation strategies	Ministry of Agriculture and Animal Resources, UNDP
2024	CCAFS Rwanda deep dive assessment of Climate-Smart Agriculture (CSA) in the USAID feed the future portfolio in Rwanda	Support efforts to increase resilience of agricultural system to achieve food and nutrition security for all people	Increase resilience and foster adaptability and transformative mechanisms through climate-smart agriculture practices	USAID, CCAFS (Climate Change and Food Security), CGIAR
2024	Rwanda investment plan	Address systemic challenges hindering the most vulnerable population in Rwanda, particularly those living in the Southern Province, from effectively coping with climate change; special focus on environmental degradation, severe erosion, disaster risks and poverty, low agricultural productivity, scattered	Enhance adaptability and foster coping strategies, advance mitigation	Climate Investment Funds

(continued)

**Table 2.** Continued

Year	Name of the initiative	Aim	Link to resilience theory	Responsible institution and estimated investment
2024	Gendered rural transformation in Rwanda	<p>unplanned settlements, livelihood challenges, limited availability of social infrastructure and limited economic opportunities</p> <p>The African green revolution (AGR) aims to modernise, intensify and commercialise agriculture through increasing technology adoption by smallholder farmers. AGR interventions also promote gender equality, aiming to close the 'gender gap' in agriculture by enhancing women's access to purchased inputs, technology, land and finance</p>	Enhancing transformative skills through technology adoption among female smallholder farmers	Africa's Green Revolution

**Source(s):** Authors' own work

concerning national or regional plans and programmes promoting environmental rehabilitation, ecosystem restoration and the use of electric vehicles. The analysis was guided by insights from the resilience literature, which informed both coding and interpretation of emergent themes.

## Findings

### *Village Savings and Loan Associations' operations*

Findings from our micro-level interviews explain that VSLAs are organised communities led by a committee of five elected individuals (president, secretary, cashier/accountant and two controllers). VSLAs typically consist of 25–30 members who meet weekly and save money by purchasing between one and four shares during these meetings. Members determine the cost of one share at the beginning of each VSLA cycle. VSLAs' activities typically span one year, after which all savings that have been collectively accumulated – along with the financial interests accrued from loans granted during that cycle – are proportionally distributed among the VSLA's members based on the number of shares purchased. Furthermore, our study reveals the importance of the event of sharing the pooled money, in Kinyarwanda called *kurasa ku ntego*, translating to 'share-out' in English: "Sometimes, we even invite local authorities to share-out events. [...] It is generally during this time that participants pay contributions to the health insurance scheme for their family members", a micro-level interviewee explains. VSLA members also set aside small amounts of money for a social fund used, for example, to provide financial support to sick VSLA members or those who have recently given birth. VSLA members can borrow from the pooled savings to develop small-scale entrepreneurial activities to improve their socio-economic situation. Through this measure, VSLAs contribute to the macro-level aim of alleviating poverty. Loans obtained by members are refunded at an interest rate of 5% per loan received. The following subsection discusses how the effects of climate change impact small-scale farming projects undertaken by women entrepreneurs.

### *Climate-Change effects on Village Savings and Loan Associations communities of rural women entrepreneurs*

Our study confirms that climate change has an adverse effect on communities of rural women entrepreneurs organised in VSLAs in Rwanda. Interviewees experienced significant climate variability over the past few years. They perceive this variability to be one of the main challenges currently affecting their entrepreneurial activities. Like other residents in rural areas, they primarily rely on products and income derived from agricultural activities. Thus, climate change is increasingly becoming a barrier to the small-scale activities that they are pursuing with the help of VSLA loans.

The rural women entrepreneurs in our study report that the most significant climate changes they experience are fluctuations in rainfall and sunshine, as well as shifts in seasonal patterns, all of which threaten their agricultural production. For example, unpredictable temperatures and changes in precipitation lead to severe droughts, floods and occasionally strong winds. The women explain that they are used to beginning agricultural activities at specific times, relying on their knowledge of seasonal patterns and guidance from the national meteorology agency, which is typically conveyed through local agricultural technicians or agronomists. They prepare their farming plots a few weeks before the rainy seasons, which previously lasted from September to December (agricultural season A) and from March to May (agricultural season B), expecting sufficient rainfall for their crops. However, due to climate change, they increasingly face prolonged dry seasons that previously were distinguished into a long dry season (June to August) and a short one

(January to February) – disrupting the expected transition into the rainy periods. These extended dry spells intensify drought conditions, severely impacting their farming yields. One VSLA member shared: “Two types of climate change effects are prevalent here – excessive rainfall and excessive sunshine. Both significantly affect our activities. We often take out VSLA loans and invest in agriculture, hoping for good yields. Part of the income from the harvest is meant to cover family needs such as food and school fees and to purchase four savings shares at our weekly meetings. However, when these extreme weather conditions occur, they disrupt all our plans, making it difficult to meet our goals. We struggle not only to save and buy shares, but also to repay the loans we have taken.”

The effects of climate change include heavy rainfall that damages cultivated fields and crops, causes soil erosion, triggers landslides and destroys essential infrastructure such as roads and bridges. In addition, the women in our study report that higher temperatures often lead to a lack of water for irrigating crops, limiting their growth and yield. Furthermore, they note a significant reduction in available water for livestock. One VSLA member explains: “Agriculture is the main activity for rural residents. Most VSLA members are smallholder farmers who typically invest their small loans from VSLAs in crops like beans, maize, cassava and other produce. Delays in rainfall and extended dry periods affect their crops. Unpredictable climate variations ultimately damage the crops they plant, reducing the expected harvests. This leads to hardships, including food scarcity, diminished savings and difficulty repaying loans, and other essential living expenses.”

Our findings show that climate change not only disrupts the agricultural activities of rural women entrepreneurs but also increasingly affects VSLA operations by reducing the financial capacity of community members. One interviewee shared: “VSLA members receive loans to purchase and sow seeds. During harvest, they sell their products to generate funds for buying shares and covering other needs. When participants are impacted by climate change, they lose part of their planned production and the money they invested. This reduces their financial capacity, which poses a threat to VSLA operations – both savings and loan activities. Moreover, the effects of climate change extend beyond the projects of rural women entrepreneurs, impacting various commercial activities in the area due to a noticeable decline in the community’s financial resources.” Another VSLA member explains the impact of climate change on four levels: individual, family, VSLA and country: “Climate change impacts agricultural production, which is the primary income source for the rural population. It causes a shortage of agricultural products for both households and markets, disrupting living conditions of individuals and families. In VSLAs, savings are clearly diminishing, which undermines their financial capacity. Sometimes, VSLAs can no longer provide the necessary loans. This not only hinders the intended development; it also threatens the sustainability of VSLA activities.”

#### *Adaptation and coping strategies among Village Savings and Loan Associations community members*

VSLA groups are primarily formed to improve the living conditions of disadvantaged women and support poverty alleviation. However, as shown above, VSLA activities and members’ entrepreneurial projects are increasingly affected by climate change. In terms of adaptation strategies, rural women entrepreneurs in our sample highlighted anti-erosion measures, tree planting (sometimes alongside crops), wetland cultivation, crop irrigation and optimising the seasonal timing of agricultural activities. Moreover, VSLA members reported diversifying their income-generating activities – such as farming, livestock and small businesses – as a key adaptation measure. A woman in our sample explains: “VSLA members engage in various economic activities, such as small businesses, agriculture and

livestock management. This diversification of economic activities aims not only to increase income, but also to spread risks across projects – when one project fails, the VSLA member can still benefit from another. For example, money from a domesticated animal, such as a goat or pig, may help someone repay a VSLA loan or provide food for their family during tough times.”

Importantly, the interviews with VSLA members revealed their limited understanding of climate change issues. Our findings show that CARE organises training sessions for community agents or mobilisers, who play a vital role in establishing and growing VSLAs. These mobilisers are responsible for sharing the knowledge and skills gained from these trainings with their peers. Occasionally, training is extended to include VSLA committees. In the early stages of the formation of a VSLA group, the focus of training is on basic, but fundamental, topics such as VSLA community organisation, operations, weekly savings, bookkeeping and share-out activities. As VSLAs mature, training shifts to more advanced subjects such as financial literacy, loan utilisation, project management, entrepreneurship, market assessment and the relationship between VSLAs and micro-finance institutions. However, interviewees noted that the content they learned through informal training did not relate to the environment or climate change. Yet, as they expressed, it is through these trainings that they could gain a better understanding of topics such as environmental protection and practices to safeguard the environment and adjust to climate change. In this respect, one informant from the meso level underlined: “It might be necessary to train people and particularly VSLAs members on how to protect forests. Many people do not possess enough information about their importance [...]. They do not know about the positive role that forests play for the environment.”

However, interviewees repeatedly stressed their potential roles as agents whose actions could either contribute to damaging or promoting environmental health. They expressed that with a better overall understanding of climate change and related adaptation and mitigation strategies, as well as guidance on when and how to effectively use different coping mechanisms, they could manage its consequences more successfully. In other words, interviewees discussed how VSLAs and their members could become valuable channels and active participants in developing and disseminating adaptive and even transformative capacities related to climate change at the community level.

#### *Adaptation and mitigation strategies by macro-level actors*

The government of Rwanda recognises climate change as a significant threat to the country’s economic development and is committed to addressing its impacts. This commitment is reflected in the current institutional framework, which includes laws such as Law No 115 / 03 of 25 / 06/2015, Law No 47bis/2013 of 28 / 06/2013, Law No 48 / 2018 of 13 / 08/2018, Ministerial Order No 005 / 2021 of 08 / 04/2021 and Ministerial Order No 004 / 2021 of 12 / 02/2021, as well as public institutions and agencies such as the Ministry of Environment, the Rwanda Environment Management Authority, the RFA and the Rwanda Green Fund. These bodies were established to manage and coordinate efforts related to the environment and climate change and to design and implement adequate adaptation and mitigation strategies. [Table 2](#) outlines these strategies, policies and initiatives, which serve not only as guidance and direction for various stakeholders but also promote greater transparency in coordinating, implementing, monitoring and evaluating climate change interventions and strategies.

Through an analysis inspired by resilience theory, [Table 2](#) makes evident how the Government of Rwanda explicitly links its sustainable development planning with efforts to increase systemic resilience through climate change mitigation and adaptation efforts. This connection is demonstrated in reports evaluating the integration and implementation of

environmental and climate change activities across various development sectors, plans and programmes for the periods 2013–2014, 2014–2015 (Rwanda Environment Management Authority (REMA, 2015); and 2017–2018 (REMA, 2019). These reports cover the economic, social and governance sectors, including central government ministries, public agencies and local government levels.

The analysis of the policies and initiatives outlined in Table 2 shows that, in addition to aligning strategic planning with climate change-related goals, a variety of adaptation and mitigation strategies across different sectors are promoted, often with support from international partners, underlying the relevance of this issue for the country. These efforts are typically aimed at achieving national objectives and fulfilling international climate commitments. While most macro-level initiatives aim at enhancing the resilience of the current system through greater adaptability and mitigation strategies, there are some examples of measures advancing the transformability of the system (see Table 2).

Also, macro-level interviewees described their work on mitigation strategies, such as controlling CO<sub>2</sub> emissions by promoting electric vehicles and motorcycles, stimulating the development of renewable energy, as well as rehabilitating wetlands and ecosystems. Regarding adaptation measures, they emphasised the importance of planting trees – both to increase forest diversity and as trees integrated with crops – on private and state-owned lands, to safeguard and conserve land from floods and erosion, combating land degradation through progressive terraces and other anti-erosion mechanisms and providing energy-efficient cooking stoves to reduce wood consumption, as well as restoring forests and landscapes. One example of such a project designed and implemented by the government was the *Landscape Approach to Forest Restoration and Conservation* (LAFREC). As a five-year project initiated in 2015 within the Rutsiro and Ngororero districts, it was undertaken by REMA in partnership with the Global Environment Facility, the Least Developed Countries Fund and the Nordic Development Fund through the World Bank. This project brought 3,400 hectares under enhanced biodiversity protection, 3,200 hectares of land transitioned into sustainable land management practices and 18,400 land users adopted sustainable land-use management practices. Another example is the project *Green Gicumbi* – a six-year initiative launched in the Gicumbi district in 2019, implemented by the Rwanda Green Fund. This project achieved the construction of three automated weather stations, the planting of 2,000,000 seedlings of fruit trees, 600 hectares of progressive terraces completed and the restoration of 747 hectares of degraded forests restored.

While our findings show climate change and its effects as obstacles to rural women entrepreneurs' small-scale farming activities on the micro level, macro-level strategies such as the Economic Development and Poverty Reduction Strategy [EDPRS] II (2012:48) are among instruments explicitly referring to the VSLA approach as a key policy programme to positively impact the living standards of local communities and rural women entrepreneurs. The following section elaborates further on this.

### *The impact of Village Savings and Loan Associations activities on communities of rural women entrepreneurs*

Interviews with macro-level informants, similar to those conducted on the meso level, highlight that women were initially targeted as members of VSLAs because they were among the most disadvantaged in society in terms of their economic conditions. Traditionally, women's roles were largely confined to household responsibilities such as child-rearing, farming, livestock management and food preparation. Economic participation, particularly in commercial and entrepreneurial ventures, was largely inaccessible to them, and it was uncommon for women to leave their homes for such activities.

VSLAs not only represent government policies and initiatives to promote and empower rural women, but also play a transformative role in breaking these barriers. They serve as essential platforms that allow rural women to step beyond their household confines, connect with others and exchange ideas. Beyond social interaction, VSLAs provide financial access to rural poor women, enabling them to initiate small-scale businesses, particularly in agriculture. Interviewees widely recognise VSLAs as a powerful tool for the socio-economic empowerment of poor women, as illustrated in the following quote: “Women were lagging in various sectors, but specifically in the economic sector. Women were often begging their husbands for money to meet their needs. CARE International introduced informal financial associations to empower women. Firstly, VSLAs have provided them with an exceptional opportunity to learn and acquire knowledge through training. Secondly, they have helped them to access financial resources through the savings and loan activities they offered.”

Another interviewee emphasised the transformative impact of VSLAs on rural women’s self-confidence and entrepreneurial mindset: “VSLAs support rural women in acquiring knowledge, which significantly transforms their thinking and mindset. Moreover, they become increasingly self-confident, set aside fear and begin small entrepreneurial initiatives that, in turn, considerably contribute to reducing the magnitude of poverty for themselves and their families.” In discussing the broader impact of VSLAs, a macro-level informant highlighted their role in fostering financial discipline and shifting spending habits: “VSLAs have significantly contributed to promoting their members’ development. These participants have not only made a tangible step in terms of development, but these communities have also enormously changed the attitude and mindset of members in various aspects, particularly regarding saving. For instance, VSLA members who previously would have used the money to buy unnecessary items nowadays no longer do that. This is due to both a saving mentality and knowledge about a better usage of money informally acquired from those informal financial groups.”

In summary, our findings indicate that climate change affects entrepreneurial activities within VSLA communities of rural women in various ways. These groups are facing increasing pressure, as women entrepreneurs struggle to save and repay loans due to the challenges of adapting to climate change. While the Rwandan government has made significant efforts at the macro level to mitigate and adapt to climate change, these efforts have not yet fully reached the micro level. This appears to be due to a lack of attention to the impact of climate change on the meso level – specifically, VSLA’s promoters are lagging in adjusting the system to the current threats of climate change.

### Discussion and conclusions

This study examined the impact of climate change on communities of rural women entrepreneurs in Rwanda through the lens of resilience theory, addressing three interrelated research questions: How does climate change impact VSLA communities and their members and how do they adapt to its effects on the micro level? How are these micro-level adaptation strategies supported by mitigation and adaptation strategies on the meso and macro levels? How do implemented policies and initiatives at the meso and macro levels aim at strengthening communities’ adaptive, learning and transformative capacities to deal with climate change? [Table 3](#) summarises the key findings.

Our findings confirm that climate change significantly undermines small-scale farming among rural women entrepreneurs. Extended dry seasons, high temperatures and irregular water availability reduce crop and livestock productivity. Irregular, heavy or delayed rainfall causes soil erosion, landslides and infrastructure damage, with cascading effects on food security, financial stability and community activities. These results align with prior studies in Rwanda and comparable contexts ([Dramani et al., 2023](#); [Maponya and Mpandeli, 2012](#); [Nyiwul, 2019](#)) and other recent research reporting significant decreases in both agricultural

**Table 3.** Summary of key findings

Level	Perceived effects of climate change	Adaptation and mitigation strategies	Key gaps and risks
Micro (VSLA communities and rural women entrepreneurs)	<ul style="list-style-type: none"> <li>- Unpredictable rainfall, prolonged droughts and floods damage crops and livestock</li> <li>- Reduced yields → food insecurity, difficulty repaying loans</li> <li>- Constraining VSLAs' major activities of saving and loans; increasing loan defaults threaten VSLA sustainability</li> </ul>	<ul style="list-style-type: none"> <li>- Anti-erosion measures, terracing, tree planting, wetland cultivation</li> <li>- Irrigation, seasonal timing adjustments</li> <li>- Diversification into livestock and small businesses</li> </ul>	<ul style="list-style-type: none"> <li>- Limited formal knowledge about climate change adaptation</li> <li>- Reliance on informal peer learning</li> <li>- Increased financial vulnerability of VSLAs</li> </ul>
Meso (local support ecosystem: NGOs, local government, micro-finance)	<ul style="list-style-type: none"> <li>- Some awareness of VSLA vulnerability, but limited climate-specific interventions</li> </ul>	<ul style="list-style-type: none"> <li>- CARE and partners provide training on financial literacy, entrepreneurship</li> </ul>	<ul style="list-style-type: none"> <li>- Climate adaptation not integrated into VSLA training</li> <li>- Weak linkage between macro-level policies and micro-level needs</li> <li>- Meso actors lag in promoting transformative skills</li> </ul>
Macro (national government and policies)	<ul style="list-style-type: none"> <li>- High level of awareness of climate change impacts on agriculture and rural poverty - Climate change is recognised as threat to SDG #1: No Poverty</li> </ul>	<ul style="list-style-type: none"> <li>- Wide range of adaptation and mitigation policies (irrigation, forest restoration, renewable energy, water governance, climate-smart agriculture)</li> <li>- Large projects (e.g., Green Gicumbi, LAFREC) and investments to combat climate change effects</li> </ul>	<ul style="list-style-type: none"> <li>- Implementation gap: strategies not reaching VSLA members effectively</li> <li>- More effort is needed to build transformative capacity for rural entrepreneurs</li> </ul>

**Source(s):** Authors' own work

and livestock production (Daba *et al.*, 2025; Gören, 2025; M-Buu File *et al.*, 2023). Economic vulnerabilities caused by climate variability have also been observed among smallholder farmers (Pienaa *et al.*, 2025), while Atela *et al.* (2018) and Helwig *et al.* (2020) linked climate change to food insecurity and reduced financial and material resources.

At the micro level, our study revealed that women entrepreneurs use diverse coping strategies, including tree planting, irrigation, wetland farming, anti-erosion measures, terracing, economic diversification and optimised farming schedules (Helwig *et al.*, 2020; Kom *et al.*, 2022; Shivamurthy *et al.*, 2015; Talanow *et al.*, 2021; Taremwa *et al.*, 2016). However, knowledge gaps limit the effectiveness of these strategies. Informal training programmes provided by CARE and partner organisations rarely address climate adaptation in depth, and meso-level actors supporting the VSLA system have not sufficiently adjusted their interventions to reduce the vulnerability of the system and thereby enhance its resilience (e.g. Burney *et al.*, 2014).

We found that macro-level actors demonstrate greater awareness of climate change, reflected in laws, policies and coordinated programmes that implement adaptation and

mitigation measures and, to a limited extent, promote system transformability (Ngcamu, 2023; Pelling *et al.*, 2015). These strategies aim to safeguard Rwanda's national development goals and fulfil international commitments – however, the translation of these efforts to the meso and micro levels remains uneven.

Our study highlighted that VSLA activities remain a critical micro-level mechanism for poverty alleviation and empowerment. They provide financial literacy, small business skills and access to savings and loans, enabling members to cope with shocks and invest in income-generating activities (Maganga, 2021; Pienaah *et al.*, 2025). These findings confirm that VSLAs allow women not only to manage social and financial emergencies but also to invest in entrepreneurial activities, contributing to micro- and macro-level economic development. However, the resilience of VSLAs is increasingly stressed by climate change-induced unpredictability. Loan repayment becomes difficult as agricultural productivity fluctuates, threatening the economic sustainability of VSLAs and, by extension, broader poverty-alleviation objectives and progress towards SDG 1 (No Poverty).

#### *Theoretical contributions*

This study contributes to the literature on enterprising communities and rural entrepreneurship at the bottom of the pyramid (e.g. Rockenbauch and Sakdapolrak, 2017; Sharma and Rautela, 2022) by adopting a systemic, multi-level perspective grounded in resilience theory (Holling, 1973; Walker *et al.*, 2004). Whereas much of prior research examined impacts of climate change on smallholder farmers and coping measures predominantly focusing on either the micro or macro level of analysis (e.g. Bryan *et al.*, 2009; Chen *et al.*, 2025; Panja *et al.*, 2026; Perez *et al.*, 2015), our study integrates micro-, meso- and macro-level perspectives in a systemic approach to capture the complex dynamics through which climate change affects rural women entrepreneurs in Rwanda (cf. Rodríguez-Barillas *et al.*, 2024). The main theoretical contributions of our study are, thus, derived from this systemic analysis approach integrating the three levels of analysis.

At the micro level, prior research had focused on how adaptation measures contribute to enhancing resilience capacities of farmers (e.g. Bunclark *et al.*, 2018; Li, 2025; Makete, *et al.*, 2019; Pienaah *et al.*, 2025). In our study, we detail how communities of women entrepreneurs perceive and respond to climate-related challenges through coping and adaptation strategies, such as tree planting, irrigation, terracing and diversifying income sources. These practices illustrate that the women are not passive recipients of environmental shocks, but active contributors to the resilience of their entrepreneurial systems. This contribution is relevant, as the role of agency for the resilience of such systems has been largely overlooked to date (Kurikka and Grillitsch, 2021). However, our findings reveal a persistent knowledge gap: women often lack access to more sophisticated adaptive strategies that could further strengthen their capacity to respond to climate variability (Pienaah *et al.*, 2023). By highlighting both the agency and the limitations of these actors, our study extends theoretical frameworks on bottom-of-the-pyramid entrepreneurship and resilience, emphasising the dual role of local actors as implementers and potential drivers of adaptive change.

At the macro level, our study demonstrates that government policies reflect a high level of awareness of climate change and implement broad adaptation and mitigation strategies aimed at increasing systemic resilience. Some initiatives also seek to foster transformability within the system (Ngcamu, 2023; Pelling *et al.*, 2015; Walker *et al.*, 2004). However, our study reveals that these policies are inconsistently translated into tangible support at the meso level. Specifically, actors supporting the VSLA system are not sufficiently adapting their activities to bolster the resilience of these community-based initiatives. Support for

transformative skills that would enable VSLA members to diversify beyond agriculture remains limited, leaving the long-term economic sustainability of these poverty-alleviation systems vulnerable (cf. Burney *et al.*, 2014).

#### *Policy and societal contributions*

The magnitude of the impact of climate change on the vulnerable group of rural women entrepreneurs became evident throughout our study, which underscores the need for policy support directed at ‘the last mile’, i.e. support that has a chance of ‘trickling down’ to this group. The VSLA communities have been demonstrated to be an effective channel for reaching their individual members (Rubyutsa *et al.*, 2024) and VSLAs could thus play an important role in strengthening their members’ adaptive capacities to climate change on the micro level. To date, VSLA communities connect rural women entrepreneurs characterised by low adaptive capability (Bryan *et al.*, 2009) and with no to little formal training, and thus, VSLAs could serve as starting points for increasing women entrepreneurs’ resilience (Akinyi *et al.*, 2021). On the meso level, international actors such as CARE International could take a more active stance in pushing capacity-development projects that focus on knowledge, awareness and implementation of improved agricultural processes. This is important not least because agricultural activities are not only a crucial source of income for many Rwandans but also serve as the primary employment sector, particularly for poor, smallholding farmers and less educated segments of the population (Musafiri and Mirzabaev, 2014).

#### *Limitations and future research*

Consistent with prior research on the impact of climate change on rural entrepreneurship (e.g. Kom *et al.*, 2022; Pienaah *et al.*, 2025; Shivamurthy *et al.*, 2015), our study was limited to a single region. Although we studied multiple VSLAs within this region, regional differences may exist in how macro- and meso-level climate adaptation initiatives have reached and influenced local communities. Future research could extend this work by mapping experiences across multiple regions to capture broader variation in responses and outcomes. In addition, our study provides only a cross-sectional snapshot of how climate change is perceived and addressed at one point in time. Longitudinal research would be valuable for tracing the impact of macro-level initiatives on meso- and micro-level actors over time, providing insights into the pace of change and the barriers that hinder implementation. Finally, future research could explore the resilience of the VSLA model as a poverty-alleviation strategy under varying levels of environmental and economic stress. We suggest that, based on our findings, the model may be vulnerable to break down under intensified climate pressures, and a formal “stress test” could illuminate the conditions under which it remains viable.

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