Financial Inclusion, Financial Resilience, and Climate Change Resilience

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Abstract

The Sustainable Development Goal (SDG-1) aims to "end poverty everywhere" by strengthening people's resilience, reducing climate-related vulnerabilities and other socioeconomic shocks, and providing access to essential services, including financial inclusion. This chapter shows how financial inclusion, financial resilience, and climate change resilience are linked. The term "resilience" describes the adaptability of individuals, communities, and societies as a whole. "Financial inclusion" explains access to appropriate financial products and services for the public, while "financial resilience" describes the ability to meet urgent financial needs. Additionally, "climate change resilience" is a state in which an individual can successfully adapt despite environmental disturbances, stress, or adversity. This chapter draws a regulatory conceptual framework in understanding the nexus between financial inclusion, financial resilience, and climate change resilience. Existing literature confirms that financially integrated individuals are more financially resilient than those who are excluded. The findings of the extensive literature review also confirm that climate change resilience can be achieved through financial inclusion and financial resilience. Moreover, climate change resilience could be an inclusive solution against climatic and non-climatic stressors. Drawing examples from South Asian countries, we conclude that the inclusion of financial services enhances the resilience against the adverse effects of climate change. This study suggests integrated approaches to the management of risks related to climate extremes and disasters.

Keywords

Financial inclusion · Financial resilience · Microfinance institution · Climate extremes and disasters (CED) · Climate change resilience · Adaptation · Developing countries

Introduction

Although the global population in poverty has decreased from 36% in 1990 to 10% in 2015, more than 700 million people are still impoverished and struggling to meet their basic needs (United Nations 2019). Climate change is one of many other global problems that exacerbate the situation and the specific situation of the vulnerable populations who extremely suffer from poverty, malnutrition, and inequality. It has been a threat to the world since many extreme climatic events have been observed worldwide, contributing to human suffering and economic activity and capacity loss. Therefore, financial resilience to climate change and risk is considered an important tool for the new International Monetary Fund (IMF) research (Adrian et al. 2020). Since it is still unclear to what extent society will adopt adaptation measures to

climate change impacts (Bouwer and Aerts 2006), building resilience through financial services would be an exciting initiative to address climate risks. Poor people in developing countries are the most vulnerable (Dulal et al. 2010) and need to be anticipated and prepared to reduce climate risks before they are affected by a disaster. Therefore, this leads vulnerable people to adopt resilience, which aligns with 3A's ability to adapt, anticipate, and absorb climate risks and hazards (Haworth et al. 2016). Although resilience has different meanings, *BRACED*'s definition includes anticipation, avoidance, and planning various management or recovery mechanisms (Bahadur et al. 2015) which is essential to adapt climate-related disasters and their consequences (Haworth et al. 2016). *BRACED* stands for Building Resilience and Adaptation to Climate Extremes and Disasters which is one of the largest resilience programs globally, funded by the Department for International Development (DFID). The main goal of building resilience is to reduce the vulnerability of people affected by climate. In this case, microfinance may be a better choice as it provides essential financial services to the poor and can facilitate adaptation to climate change impacts. A study based on examples of microfinance institutions (MFIs) in Bangladesh and Nepal shows that 43% of the total MFIs in Bangladesh and 37% in Nepal were identified as successes in adapting to climate change (Agrawala and Carraro 2010). As Bangladesh has frequently observed various extreme climatic events, including changes in rainfall, extreme heat, drought, cyclones, and coastal flooding, people are trying to develop various mitigation and adaptation mechanisms such as drought-resistant plant varieties gardens, tree planting, organic farming, and use of renewable energy (Delaporte and Maurel 2018). Therefore, in countries which are vulnerable to climate extremes and disasters (hereafter referred to as "CED"), for example, Bangladesh, developing and accelerating differential resilience to climate change impacts required special attention from stakeholders.

The post-2020 global climate agreement needs to focus on building a financial regime with low-carbon policies to safeguard the developing countries' development process (Hannam et al. 2015). Therefore, microfinance is seen as a useful tool for building resilience and adapting to the impacts of extreme climatic events. It assures access to financial services and resources for the most vulnerable and most impoverished (Agrawala and Carraro 2010). Poor people in the Global South are more likely to be affected by climate vulnerabilities (Martin and Bergamann 2017). Therefore, they need to obtain financial services and increase financial resilience to stay in places vulnerable to CED. Therefore, resilience plays a central role in the Global South's developing countries. This chapter describes how climate change resilience can be achieved by increasing the financial resilience of climate-affected people worldwide through financial inclusion. In doing so, this chapter did an extensive literature review of published articles and reports from the database of Web of Science (WoS), Scopus, and Google Scholar. In this context, it first provides a clear concept of the three main concepts, financial inclusion, financial resilience, and climate resilience, from a theoretical perspective. Second, it combines three concepts and provides evidence based on previous studies. Third, this chapter

includes discussions and concluding sections to assess the relationship between the three concepts central to the issues.

The Nexus Between Financial Inclusion, Financial Resilience, and Climate Change Resilience: Conceptual Framework

For humans and their environment, resistance is a metaphorical concept that comes from physics to explain a material's flexibility or its ability to recover after displacement. Holling (1973) took this idea to describe ecological resilience. Since then, this concept has been used to illustrate the adaptability of individuals and larger populations, e.g., resilience in ecology focuses on a given natural habitat's ability to adapt to a new ecosystem and restore its original position after the destruction of the ecosystem. In contrast, resilience in social sciences emphasizes social structures' ability to cope with social change. Different disciplines identify resilience according to its extent and nature, but most focus on adapting effectively to adverse conditions. In general, resilience refers to coping with and adapting to stress caused by social, political, and environmental changes by individuals and communities (Martin and Sunley 2015). This includes their access to community resources to overcome these sources of stress and adversity and seize opportunities in response to change (Darnhofer 2014). According to the Intergovernmental Panel on Climate Change (IPCC), resilience is the social, economic, or environmental ability to deal with a destructive event or pattern (IPCC 2014). The IPCC definition generally focuses on the capability, basic functionality, and maintenance of the system; therefore, transformation, skills, and learning are fundamental to resilience. In contrast, based on rural development, Scott (2013) classifies two different resilience perspectives. They are:

(i) Equilibrium resilience is a short-term action that describes a structure's ability to adapt to shocks and disturbances without changing the existing state.
(ii) Evolutionary resilience emphasizes existing transformation and adaptive performance rather than equilibrium or reflection.

In this way, this resistance emphasizes sustained or long-term responses that can accelerate the system's recovery.

Resilience has several characteristics, including redundancy, diversity, efficiency, autonomy, and collaboration (Lyon and Parkins 2013). In general, resilience is enhanced by a variety or heterogeneity which allows for multidimensionality (Berkes and Ross 2012). However, this multidimensionality is always dependent on collaborative networks and engagement that bring diverse actors together and help promote equity (Barr and Devine-Wright 2012). Adaptability, the ecosystem characteristics that describe change and adaptation, is crucial for resilience. Norrish et al. (2008) mentioned four characteristics of resilience:

(i) *Robustness* is a form of skill to resist any pressure by not degrading.
(ii) *Redundancy* describes the availability of resources.
(iii) *Speed* can reach destinations in time, escaping from losses and elude any disruption.
(iv) *Resourcefulness* is the ability to recognize difficulties and any resource mobilization.

Adaptabilityis the confidence in one's ability to complete a task and deal with prospective situations (Glover 2012). This is an indication of individual's agency that refers to the ability to act independently, make own free decisions, and self-efficacy. Various social capitals, such as community trust, volunteer activities, and collaborations, accelerate collective agency development. In this regard, Norrish et al. (2008) described four types of adaptive capacity as "economic diversity," "social capital," "community competence," and "information and communication." However, these resilience conditions depend on various factors. For example, Uddin et al. (2020) identified 12 important attributes of resilience, where "economic diversity," "social capital," "active and autonomous government," "skills, knowledge, and learning," "traditional beliefs and cultural values," and "community resources" were critical factors to ensure community resilience. Similarly, based on the socio-ecological systems paradigm, the Resilience Alliance illustrated the relationship between exposure, stress, and adaptive capacity and clarified three key dimensions of resilience: first, the degree of disruption is a structure which can withstand and statically remain in the same state; second, the degree to which the structure can coordinate or self-organize; and finally, the degree to which a system can be produced and its ability to learn and transform accelerated (Fantechi et al. 2020). Matarrita-Cascante and Trejos (2013) also analyze resilience from the sociocultural and economic context and found that access to financial services, including micro-credit, economic diversity, and self-organization skills contribute to community resilience. Thus, the culture of tradition, knowledge, education and skills, historical heritage of social formation, political and economic relations, and access to various social and financial services are crucial for resilience.

Every CED is experienced together by affected people. This can be an acute and short-term onset. Affected communities need to function effectively and adapt well to the effects of disasters, where resilience at the community level is a process that connects adaptive networks. The four basics of adaptation capability together help prepare for climate-related events. These four adaptive capacities are discussed below with Fig. 1, according to Norrish et al. (2008).

Economic Development

Economic growth, stable livelihoods, and equitable distribution of income and assets among vulnerable populations are important dimensions of community resilience. A variety of services such as access to health care, access to land and natural resources and physical capital, housing, employment opportunities, and schooling for children

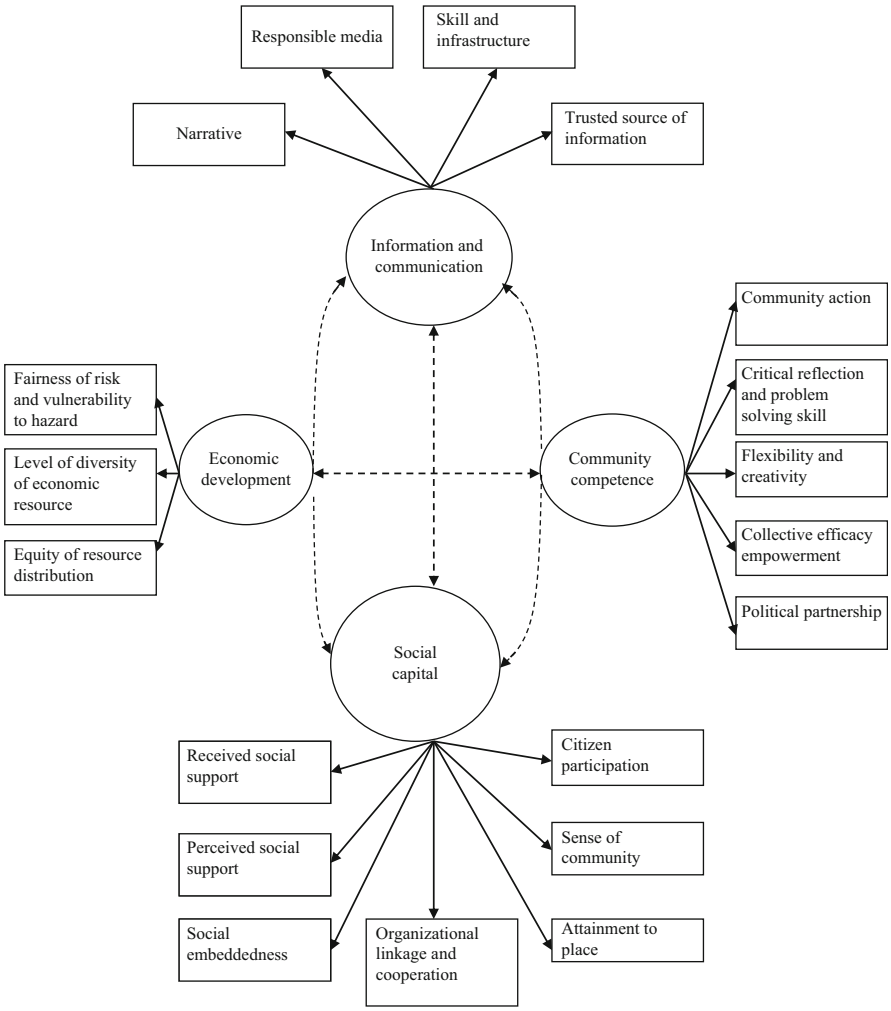

Fig. 1 Adapted from Norrish et al. (2008:136) on community resilience

are essential resources for community resilience. For example, Southeast Asian populations based on mangrove agriculture are dependent on natural resources. Climatic events, such as erratic floods and droughts, affect natural resource-dependent populations, thereby increasing income inequality and reducing resilience (Adger 2000).

Social Capital

Lin (2001) defines social capital as investments in generating returns from individuals, their access to natural resources, and the use of resources anchored in social networks. On the other hand, community capacity refers to interorganizational networks' existence. It implies the expectation that individuals are connected to support each other, connect with other social networks to form new coalitions, and participate collaboratively in decision-making processes (Goodman et al. 1998). Social support is essential to increase community resilience through regular social interaction with empathy from individuals while needed in crisis times (Barrera 1986). Social support includes support received (receiving help) and perceived support (trust in the availability of services when needed). Generally, support received increases after a disaster, with stress levels determining mobilization patterns.

Communication and Information

Having adequate information and access to it is essential in procedural and management structures (Comfort 2005). Through good communication, individuals can understand the meaning and critical messages conveyed, and this allows community members to express their demands and needs, thoughts, and observations to build community resilience. Public information and timely communication mechanisms with appropriate infrastructure and a trusted source about climate-related extreme events could influence behavioral decisions to address the challenges of climate change impacts (Reissman et al. 2005). Shared narratives bring a common sense of meaning and purpose. The media's role is significant for vulnerable communities, as media information primarily shapes how vulnerable populations think about the intensity and severity of the impacts of climate-related disasters.

Community Competence

Community potential means collective effectiveness, including a mix of mutual trust and a community willingness to make efforts to address any crisis. Community potential must be linked to collective action and decision-making. Action and decision-making should arise from cooperative effectiveness and accountability. Enabling factors include commitment, willingness to make efforts with precise expressions, meaningful communication, and participation in decision-making through discussion. Community capacity is critical to empowering communities to act (coping strategy). Despite environmental threats, collective action is complex and challenging, requiring community capacity to effectively meet community needs and collectively improve livelihood opportunities for vulnerable populations.

Many recent studies explain the relationship between financial resilience and climate resilience in many countries around the world (Adegbite and Machethe

2020; Reguero et al. 2020; Miller et al. 2019; Oostendorp et al. 2019; Abraham and Fonta 2018; Sibiko et al. 2018; Chirambo 2017; Bayer and Stigler 2015; Agrawala and Carraro 2010). The above studies show the contours of financing mechanisms during climate change risks. The studies also explain how financial affordability can help to address the impacts of climate-related extreme events and environmental risks through appropriate adaptation tools and options in developing countries. Besides, Bayer and Stigler (2015) point out the importance of financial investments that help vulnerable communities during pre-disaster and post-disaster security measures for climate change adaptation and poverty reduction (Bayer and Stigler 2015). It is assumed that poor people have less access to financial services and other financial support systems developed at the local or government levels. Therefore, they become more vulnerable than those who have access to financial resources.

Although a study by Islam (2016) shows that people from fishing communities in Bangladesh's coastal areas are vulnerable to cyclones and floods, which often occur because of climate change, these CED have become part of their lives. Thus, all people in these communities, regardless of their economic status, are equally vulnerable to extreme climatic events (Islam 2016). Even their financial activities cannot reduce their vulnerability to CED. The study shows how access to credit accelerated farmers' adaptation. This was due to the availability of adequate irrigation facilities, the availability of seedlings, and the adoption of sustainable farming practices (Abraham and Fonta 2018). Chirambo (2017) discusses how microfinance institutions can accelerate financial and nonfinancial resources' mobilization. The study also shows how resources are allocated to populations that need help and support. He suggested creating an enabling environment for microfinance institutions to promote inclusive growth and climate resilience. He also recommended expanding microfinance by mobilizing resources, operations, and appropriate distribution channels. Microfinance institutions are concerned about sustainability and its impact on the financial services industry (Chirambo 2017).

Adegbite and Machethe (2020) suggest that digital financial services should focus on how women care about financial services, including privacy, suitability, and security. It can be argued that financial inclusion should be provided in communities vulnerable to climate change because it increases resource mobilization among the poor and ensures their access to credit. In this way, people can develop their adaptation mechanisms or revive their activities after a climate catastrophe. However, this does not mean that the influx of finance to increase resilience is smooth and sometimes does not play its primary role in increasing resilience to climate-related hazards. Miller et al. (2019) point to barriers to financial resilience. They identified some barriers to climate risk management, such as insufficient support and incentives, ineffective policies and solutions, market barriers and operational gaps, and weak technical capacity. Regarding the effects of climate change and financial services, it is important to examine how climatic events weaken financial performance. Dafermos, Nikolaidi, and Galanis (2018) explain the impact of climate change on the value of financial utilization worldwide in 2016–2020, concluding that climate change is associated with the deterioration of firms' liquidity by destroying firms' capital reducing their profitability. The damage and financial

volatility caused by climate change could lead to a gradual decline in corporate bond prices and negatively affect credit expansion, negatively affecting economic activity.

In terms of global carbon markets as new – initially publicly created – institutions for climate change mitigation, it has been argued that carbon market debates, discussions, and decisions are important for managing climate change risks (Mol 2012). However, climate change risks can affect infrastructure projects. There must be critical funding sources for infrastructure projects through institutional investors and infrastructure banks by identifying climate risks in investments (Ambrosio et al. 2020). Huang-Lachmann, Hannemann, and Guenther (2018) found a positive relationship between a city's climate change adaptation plan and GDP if economic opportunities exist.

Climate Change Resilience: An Inclusive Solution for Multiple Stressors

Throughout the section, we describe how climate change resilience could be an inclusive solution against multiple stressors, either climatic or non-climatic. We drew worldwide literature to provide evidence on how climate change resilience could be developed through financial inclusion or services against the multiple stressors related to climatic or non-climatic. There is extensive research on the vulnerability of communities' capacities to climate change. These studies also examine how financial services (e.g., microfinance or insurance) and effective decision-making processes increase climate change resilience. Oostendorp et al. (2019) propose an inclusive agribusiness. These models should benefit a large part of the agriculture-based population in developing countries. It should also benefit subsistence farmers who market their products locally while keeping prices affordable for smallholders to increase their resilience to climate change. The authors also describe why farmers should invest in new climate-friendly agricultural practices by accessing a wide range of inclusive financial opportunities, such as investments in climate-smart agriculture. They believe that inclusive finance and business reinforce and connect. They recommended ensuring inclusive financial services and universal access to climate-sensitive financial services.

Sibiko et al. (2018) proposed that index-based insurance has a potential role in managing climate change risk in agriculture and rural areas. In developing countries, small farmers face frequent climate shocks and do not have access to agricultural insurance. Weather index insurance can promote marketable and sustainable agricultural growth (Hazell and Hess 2010). They proposed weather index insurance (WII) to solve the problems associated with traditional claims-based insurance programs. However, the WII is not yet available to meet smallholder farmers' needs and preferences in developing countries' disaster-prone areas. The WII should consider farmers' preferences, willingness to pay, and differences in farmers' preferences when preparing a WII for developing countries. For example, in Kenya, Sibiko et al. (2018) show that small farmers rely more on insurance than individual farmers when regularly updating rainfall measurements and thresholds increase farmers'

willingness to pay for weather index insurance. However, in developing countries that implement WII, transparency remains to build resilience among highly vulnerable populations (Sibiko et al. 2018). Therefore, to increase resilience, financing climate change risks as a form of financial inclusion or insurance can be successful by calculating an index based on type, severity, and socioeconomic, demographic, and cultural context.

Katongole (2020) mentions Disaster Risk Finance (DRF) as an effective mechanism to increase poor communities' resilience to disasters in Uganda. It includes early detection of disaster risks and providing financial resources for affected communities during and after extreme events. It can be through paid work that deals with reducing vulnerable populations' consumption and securing livelihoods by protecting livelihoods and assets (Katongole 2020). Other studies conducted in the United Kingdom and other EU countries by López-Dóriga et al. (2019) and Crick, Jenkins, and Surminski (2018) emphasizing how associations can incentivize flood risk reduction with a particular focus on disaster insurance. Crick et al. (2018) used an agent-based model to analyze how partnerships could strengthen insurance and reduce flood risk while maintaining reasonable insurance premiums. Another study in Spain shows that classic coastal engineering actions dominate the funding sources for solving current coastal problems. The coastal base improvement indirectly contributes to adaptation, which is not explicitly designed for climate change risk. That adaptation measures can provide additional security without a particular focus on needs-based adaptation actions. In this case, there should be clear guidance on how to implement adaptation measures through adequate climate risk management funding (López-Dóriga et al. 2019; Catalano et al. 2020). Simultaneously, there could be observations from the perspective of poor and even developing countries on the barriers to building resilience to CED (Adzawla et al. 2019; Castells-Quintana et al. 2018).

Several studies mention climate risk's influence on poor households' income insecurity. Castells-Quintana et al. (2018) show how government interventions influence livelihood choices, adaptation, and coping strategy. Measures and initiatives should focus on places highly affected by climate risks, and efforts should immediately support and provide services to highly vulnerable places, where the poor should prioritize receiving financial services. They emphasize the inclusion of a context-based approach in terms of socioeconomic, political, cultural, and demographic dynamics, not only in rural areas but also in urban areas, considering the impact of urbanization on climate change risk and building resilience among the urban poor, especially in developing countries (Castells-Quintana et al. 2018). Other studies also consider sociodemographic dimensions (age, gender, education, fertility preference, membership in a climate-related organization, etc.) to understand climate change risk and manage challenges through climate change resilience through financial inclusion and climate insurance index (Reguero et al. 2020). This helps households recover more quickly from environmental stress and disasters in coastal areas (Reguero et al. 2020; Adzawla et al. 2019; Biglari et al. 2019). However, Biglari et al. (2019) concluded some other resilience indicators such as climate change perception regarding climate parameters and the causes of climate change,

household income, and livestock ownership. Therefore, public policy should address the negative impacts of climate change through adaptation and coping strategies, considering the economic damages of disaster events (Catalano et al. 2020). They find that early intervention can lead to higher GDP growth or maintain the growth rate compared to not acting and waiting for corrective actions. However, this could be due to the high costs associated with early adaptation. There are also budget constraints. Resulting countries focus on corrective actions after disasters and may turn to international agencies for help (Catalano et al. 2020).

Thus, based on all these previous studies, it can be argued that climate change is a topic discussed and taken into consideration by every country in the world, be it a developed, a developing, or an underdeveloped country, as it affects all countries in many different ways and with varying intensity. Therefore, climate change resilience is becoming one of the possible ways to reduce the risks and hazards caused by the climate and increase climate regions' sustainability and populations. Thus, climate finance plays a crucial role in reducing the risks and dangers of climate change by building resilience. It develops markets that provide a maximum number of people with more products at the lowest cost (Haworth et al. 2016). Furthermore, previous research on climate change and financial inclusion has shown that developing resilience to climate-related risks requires adaptation and building resilience, which can be ensured by providing financial services. Climate change is one of the many factors hindering inclusive growth, especially in Africa, where economic growth is low due to poverty, inequality, unemployment, and unsustainable resources. They have struggled to achieve the Millennium Development Goals (MDGs) due to the negative impacts of climate change, which exacerbate existing inequality and poverty and hinder the MDGs' achievement (Chirambo 2017). Microfinance should be included in the development agenda covering climate change policies to ensure mitigation and adaptation to climate change (Chirambo 2017). Sustainable development, which is linked to employment, food, energy, water, and sanitation in Africa, can only be achieved if the region can show inclusive growth as the average per capita income is low.

While many African countries have higher economic growth than inclusive growth, they have failed to reduce poverty levels due to several influential factors, including high inequality, strong population growth, price increases, weak governance, and climate change. So there is a gap between economic growth and inclusive growth in Africa. Furthermore, inclusive growth can be achieved through climate resilience, as microfinance brings about positive changes in poverty and income. It will also play a role in delivering inclusive growth in Africa through climate resilience. Inclusive growth works by ensuring a higher per capita income and low CED through insurance initiatives (Chirambo 2017). Like African countries, Asian nations such as Myanmar are vulnerable to the effects of climate change because of long-term poverty and less access to traditional financial services that are not inclusive and cannot exacerbate climate change (Haworth et al. 2016). Therefore, microfinance is considered an adjustment tool used in many African and Asian countries (Chirambo 2017; Haworth et al. 2016; Hogarth 2012; Becchetti and Castriota 2011; Agrawala and Carraro 2010; Rippey 2009; Hammill et al. 2008; Morris et al. 2007). The best option to achieve an increasing number of people's

incomes in Africa is to engage people in agricultural financing to create varieties of income sources to improve food security and resilience to climate change (Chirambo 2017). Therefore, climate resilience is essential in Africa and urban coastal cities in Asia. These areas cannot cope with climate-related disasters and are therefore the most vulnerable, while developed countries have not yet reached consensus on reducing greenhouse gas emissions.

Furthermore, it is time to assess the role of financial services in Muslim-majority countries, many of which lack financial inclusion for resilience and climate adaptation. As the demand for financial inclusion to build resilience and tackle climate change has increased, Islamic financial tools should also be promoted to include Muslims in the formal financial system. Financial services help people build their ability to adapt to climate change and disasters by investing in physical goods, education, and business (Calderone et al. 2019). By declaring the risks of climate change as a moral crisis, Islamic leaders are also advising Muslims to play an active role in the fight against climate change. Leaders support Islamic finance, which is attractive to Muslim and non-Muslim countries, thanks to its equity-based risk and profit-sharing principle. Although Islamic finance is globally accepted as a Sharia-based provider, its mainstream recognition of climate resilience and disaster risk management is still low (Calderone et al. 2019). Takaful, an Islamic financial system, can improve low-income people's adaptability to CED in Bangladesh. Furthermore, the Zakat system can also influence the Muslim population's financial inclusion for resilience and climate adaptation. Therefore, there is a need to promote financial inclusion in Muslim countries as Islamic finance would play a vital role in building resilience and adaptation to climate change through its investment and financial inclusion. Thus, finance can help people, especially the poorest ones, overcome vulnerable situations in two vulnerable countries – Bangladesh and Nepal – where there are some other constraints in applying microfinance for adaptation. Hence, to overcome these constraints, a bottom-up approach should be taken to apply microfinance services successfully. Adaptation is more important than mitigation because adaptation is about changing the behavior and lifestyle of societies and their people and building capacity and resilience. Microfinance has successfully built the poor's capacity, especially women in Bangladesh, who are highly vulnerable to climate change, enabling them to reduce climate-related risks and dangers by creating a diversity of livelihoods, building assets, and diversifying risks. In Bangladesh, microfinance supports vulnerable people in various ways, including crop diversification, access to irrigation, better sanitation, weatherproof homes, and drought- and salt-tolerant seeds.

Conversely, microfinance provides little support in Nepal's water resources. Therefore, Nepal can take an example from microfinance's success story in Bangladesh. Microfinance in Bangladesh has shown its success in many cases of livelihoods of people affected by the climate: loans for irrigation, health and sanitation, agricultural inputs, such as a variety of crops, and housing loans to increase the resilience of communities and people to climate-induced risks and dangers (Agrawala and Carraro 2010).

Inclusion of Financial Services Increasing Resilience to Climate Change Impacts: Lessons from South Asian Countries

This section describes how financial services or microfinance increases climate change resilience or adaptation in three selected South Asian countries: Bangladesh, India, and Nepal. We reviewed published literature for these countries since microfinance is also being increasingly tapped in reducing the poor's vulnerability in these OECD countries and may therefore have the potential to contribute to climate change resilience or adaptation. Tables 1 and 2 present three countries Climate Risk Index (CRI) and the Global Financial Inclusion Database, respectively. According to the long-term CRI based on extreme weather events records, the rank of Bangladesh, India, and Nepal is 7, 17, and 9, respectively.

Moreover, Table 2 shows the financial inclusion status of the selected countries based on selected variables. Regarding financial inclusion (indicators A, B, and C), India is in better position than other two countries. And regarding the financial resilience indicators (D, E, and F), Bangladesh and Nepal have better position than India.

People in CED areas develop various adaptation and resilience programs to address CED and the risks that come with them. Therefore, climate change issues should be addressed in all types of social and development projects. For example, a climate risk management system has been incorporated into the social protection scheme in southern Sikkim of India, i.e., the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) to highlight poverty in changing climate change (Kaur et al. 2019). Hence, vulnerable people in rural southern Sikkim of India can build climate-resistant livelihood strategies through employment guarantee schemes. As MGNREGS has successfully helped families build their resilience to climate-induced winter drought, Indian policymakers could incorporate climate risk management into this social poverty reduction scheme to achieve society's local resilience.

Similarly, microfinance programs in Bangladesh support vulnerable people in many different ways, such as crop diversification, access to irrigation, better sanitation, weatherproof housing, and drought- and salt-tolerant seeds (Agrawala and Carraro 2010; Howden et al. 2007). However, in some countries, such as Nepal, microfinance provides little support for increasing resilience to the impacts of climate change. In Nepal, 41% of microfinance programs have no connection with

Table 1 Long-term Climate Risk Index (CRI) for Bangladesh, India, and Nepal (1999–2018)

Country	CRI rank	CRI score	Fatalities 1999–2018 (rank)	Losses in million US$ (PPP) 1999–2018 (rank)	Losses per unit GDP in % 1999–2018 (rank)
Bangladesh	7	30.00	9	17	40
India	17	38.67	3	3	58
Nepal	9	31.50	17	56	41

Data Source: Global Climate Risk Index 2020 (Eckstein et al. 2020)

Table 2 The Global Findex Database 2017 for Bangladesh, India, and Nepal

Country	A. Account (% age 15+)	B. Financial institution account (% age 15+)	C. Mobile money account (%age 15+)	D. Main source of emergency funds: savings (% able to raise funds, % age 15+)	E. Main source of emergency funds: loan from a bank, employer, or private lender (% able to raise funds, % age 15+)	F. Sent or received domestic remittance in the past year (% age 15+)
Bangladesh	50	41	21	9	3	29
India	80	80	2	23	2	19
Nepal	45	45	0	15	9	26

Data source: The Global Findex Database 2017 (Demirgüç-Kunt et al. 2018)

the process of adaptation to climate change (Agrawala and Carraro 2010; Dulal et al. 2010). Hence, some marginal changes are suggested to be made in existing agricultural systems to cope with moderate climate change. These marginal changes are defined as systematic changes, which can ensure the diversification of production systems and livelihoods (Howden et al. 2007). Howden et al. (2007) also argue that agricultural adaptation is crucial. This sector uses land worldwide and meets the growing demand for food due to population growth. Furthermore, this sector is highly dependent on the climate. Therefore, a small change in the climate impacts the production process and alters the food supply. Due to monsoon rainfall, continuous floods in Nepal, exacerbated by the melting of glaciers from mountains and hills, destroy infrastructure and damage agricultural production. Low-income families face the highest vulnerability of this damage caused by CED.

Financial institutions can also help the poor build their adaptive capacity by providing training in life skills, health, financial management, and entrepreneurial skills for better livelihoods and sustainable strategies in the face of uncertainty (Dulal et al. 2010). Also, sea-level rise due to global warming is causing coastal flooding, which is also exacerbated by excessive rainfall during the monsoon in Bangladesh, a country with 32% low-lying coastal areas where 30% of the country's total population lives. Besides, the country's physical vulnerability is exacerbated by high population density, poverty, and limited access to water, sanitation, energy, and health services. Therefore, the government and many NGOs have provided financial services to introduce many adaptive technologies in agriculture and water and sanitation, especially for coastal Bangladesh, so that affected households can increase their resilience to climate hazards such as flooding and salinization (Huq and Rabbani 2015). However, many migrate to other safer places in Bangladesh, mostly urban areas. It is argued that migration has been considered an adaptation strategy where environmental disasters are more frequent and devastating. As households are vulnerable to disasters, women's migration, which is influenced by various local and cultural factors, requires livelihood security and appropriate management of gender issues. In many places worldwide, such as the Bhola district

in Bangladesh, migration is considered a vital adaptation strategy due to frequent and devastating environmental disasters (Evertsen and Geest 2020). However, climate-induced migration is presented in the literature as other factors and resources play a significant role in migration. In contrast, environmental stressors play a minor role in disaster-affected people migrating temporarily or permanently to coastal Bangladesh (Bernzen et al. 2019). In rural areas of Bangladesh, NGOs promote small-scale activities targeting poor women, which play an essential role and empower the targets (Amin et al. 1998). Therefore, the microfinance institutions in Bangladesh can empower vulnerable women and their households to develop households' resiliency against the adverse effects of climate change.

Agrawala and Carraro (2010) examined the nexus between microfinance and adaptation to climate change in Bangladesh and Nepal. Their findings reveal a nexus between the observed phenomena. Findings show that in addition to access to a large portion of the poor, microfinance companies have the knowledge-methods and information networks required to track a large number of small transactions. This is especially relevant in the context of adaptation, which would require funding for thousands of activities involving changes and adjustments to existing practices. Furthermore, both case studies clearly show that there is already a strong link between existing activities financing through microfinance and what may be needed for adaptation. Diversification of income and livelihoods will reduce the risk of weather and climate risks, while projects focusing on disaster preparedness, irrigation and sanitation facilities, crop diversification, insurance planning, and shelter and housing construction will also reduce exposure to current and future climate impacts.

Some people from affected regions migrate to other locations due to the vulnerability and lack of resilience. On the one hand, migration occurs due to household vulnerability and climate change resilience. On the other hand, it exacerbates the vulnerability of those who migrate. However, not all people can move to safer places. For example, poor people and women migrate to other places more similar to their affluent and male counterparts because they cannot access financial services in the affected areas. Gender plays a significant role in coastal migration and adaptation processes, as women face local and cultural factors and permission from male family members when they decide to leave their families for a safer location (Evertsen and Geest 2020; Martin and Bergamann 2017; Islam 2016). The elderly are also vulnerable to climate change impacts due to their limited access to social and economic resources, reduced physical and mental capacity, and dependence on adult family members. The elderly living in coastal Bangladesh are insecure and look older than their actual age, having experienced at least one cyclone in their lifetime (Malak et al. 2020). With less access to credit or remittances to increase their resilience to climate change impacts, the poor live in fragile dwellings and are less likely to receive support after disasters, making them more vulnerable to climate change impacts (Martin and Bergamann 2017).

However, there is a knowledge gap between disaster risk reduction (DRR) and climate change adaptation (CCA) practitioners in integrating DRR and CCA interventions in Bangladesh. Lack of adequate funding mechanisms, collaboration and coordination, lack of implementation, poor governance, the sociopolitical and

cultural structure of Bangladesh, and knowledge and policy gaps hinder the implementation process. Therefore, to overcome these challenges, the political economy approach, which is closely related to climate resilience, could ensure effective integration of DRR and CCA by bringing institutional arrangements and efficient governance frameworks (Islam et al. 2020; Alam 2018). Poor people with high vulnerability to climate change events and without access to financial services have developed three ways to be resilient to floods, such as local flood protection dams, community organizations, working to relocate affected households, and seasonal migration (Sultana et al. 2020). People living in Bangladesh's coastal regions also develop their resilience and adaptation strategies to reduce the vulnerability of climate-related disasters. People in coastal areas adopt traditional community-driven adaptation strategies, such as changing crops to crops other than rice and livestock selection. Traditionally, they plant trees on the southwestern side of their farms to limit cyclones' speed and drainage around settlements to quickly remove saltwater, quickly rebuild their homes, and store dry food and water. There are other human, social, cultural, and financial strategies that people adopt to reduce vulnerability in coastal regions of Bangladesh: training facilities to develop awareness about the warning systems and the dangerous nature of disasters, covering them with the government old-age pension scheme, and facilitating migration with younger family members (Malak et al. 2020; Ahmed et al. 2019; Alam 2018).

Discussion

Climate change is seen as a global threat. The effects of climate change have exacerbated existing poverty in many parts of the world. People living in these regions face many challenges associated with extreme climatic events (Dulal et al. 2010). In this context, financial services and inclusion of vulnerable groups in service delivery would be among the most crucial adaptation measures to address the adverse effects of climate change. Financial inclusion of vulnerable groups contributes to building resilience to climate change. This would be a future research agenda for scientists and policymakers to address frequently observed climate-related extremes, especially in developing countries, through concerted international action and policy guidance (Adrian et al. 2020). This is because poor people in developing countries are the most vulnerable groups (Dulal et al. 2010) and have fewer movement opportunities (Martin and Bergamann 2017). In this sense, microfinance institutions (MFIs) can play a win-win role in building resilience to extreme climatic events for these people in the Global South, including Bangladesh and Nepal (Agrawala and Carraro 2010). This win-win relationship prompts various developing country stakeholders to focus on developing a financial solution based on low-carbon policies while ensuring their development (Hannam et al. 2015).

The conceptual framework of financial resilience, financial inclusion, and climate change impacts shows that community resilience through economic growth, equitable resource distribution and diversity, etc. can also help the poor, who are highly vulnerable to climate change, to rebuild their adaptive capacity to extreme climatic events. If income and resource diversity cannot be ensured, communities' social

resilience decreases and the risk of extreme climatic events increases. An excellent example of this is Southeast Asia, which are predominantly dependent on agriculture (Adger 2000). As extreme climatic events affect these countries' populations and their livelihoods, an integrated approach involving all stakeholders is needed to provide social support and financial services to vulnerable groups as they rebuild their traditional sources of income. While developing countries work to develop new insurance and financial services, infrastructure needs to be developed and resources mobilized at national and local levels. Vulnerable communities need financial support before and after climate-related disasters to ensure climate adaptation and poverty reduction (Bayer and Stigler 2015). This support can include financial and nonfinancial resources (Chirambo 2017), which can accelerate farmers' adaptive capacity by providing coping mechanisms such as improved irrigation and seeds, wildfire resilience, sustainable agricultural practices, and climate-smart agriculture (Oostendorp et al. 2019; Abraham and Fonta 2018). The international community should provide various services to developing countries that are highly affected by climate-related extreme events. Geocoding information can be used to classify the vulnerability and risk of extreme events to identify places that are already severely affected and other areas that could be severely affected by these events shortly. Financial contributions from international organizations for loss and damage compensation and reconstruction of various protective measures must be managed and used appropriately (Abraham and Fonta 2018).

In addition, while index-based insurance is not a panacea for risk management (Hazell and Hess 2010), it may be a potential enabler for drought risk management in the agricultural sector and rural areas in the drylands of the developing world where smallholder farmers have less access to agricultural insurance (Sibiko et al. 2018). Moreover, direct financial inclusion or insurance scheme has proven to be effective in building resilience to climate change impacts not only in the Global South but also in developed countries. For example, the United Kingdom and other EU countries have focused on public-private partnerships for flood insurance. These countries show success stories of insurance schemes in flood risk management and climate adaptation (López-Dóriga et al. 2019; Crick et al. 2018). However, a different scenario occurs in coastal areas of developing countries. For example, people in Bangladesh's coastal areas, whose livelihoods mainly depend on fishing or agriculture, are equally affected by climate vulnerability to excessive cyclones and floods (Islam 2016). Climate change insurance can be an important strategy for reducing climate risk and financing nature-based adaptation in many coastal areas (Reguero et al. 2020; Adzawla et al. 2019).

Now that we have discussed the impacts of CED, especially in developing countries, it is time to discuss the monitoring, functioning, and effectiveness of transnational carbon markets. However, institutional investors and infrastructure banks have failed to identify the climate risk associated with their investments and how to mitigate this risk to communities by influencing the infrastructure project (Ambrosio et al. 2020). This leads us to think about government fiscal policies for climate change adaptation in small open economies, where adaptation depends on the extent to which government policies can, on the one hand, reduce the negative

impact of climate change on the rate of capital depreciation and, on the other, include both preventive measures, i.e., infrastructure investments, and measures to mitigate climate change impacts. Because early adaptation measures are costly and developing countries lack fiscal resources, they rely on international assistance to adapt to climate change (Catalano et al. 2020). Like African countries, many Asian countries struggle with poverty and have less access to traditional financial services, which are not inclusive and cannot increase climate resilience. Therefore, many African and Asian countries view microfinance as an adaptive mechanism for building climate resilience (Chirambo 2017; Haworth et al. 2016; Agrawala and Carraro 2010). Moreover, although Islamic finance in countries with Muslim populations includes both Muslims and non-Muslims and requires Muslims to use a formal financial system, as Muslim leaders view climate change risk as a moral crisis, it has not yet been recognized in the basic principles of climate resilience and disaster risk management (Calderone et al. 2019).

Migration is another important issue of great relevance to the effects of climate change and financial sustainability. While migration is considered a necessary adaptation strategy for areas suffering from frequent environmental disasters (Evertsen and Geest 2020), it sometimes exacerbates the vulnerability of those who migrate due to lack of financial support. Furthermore, migration as an adaptation strategy, especially in the case of migration to nearest cities, is gendered and depends on economic conditions and access to financial services. On the one hand, poor people and women migrate more than their male counterparts because they lack access to financial services in disaster-affected areas and are less resilient to the effects of climate change. On the other hand, women cannot migrate alone without male household members' consent because of sociocultural constraints (Evertsen and Geest 2020; Martin and Bergamann 2017; Islam 2016). This means that migration creates a double vulnerability for poor groups and women in disaster areas. There is another group of people who are also vulnerable to the effects of climate change, namely, the elderly, because they have less access to social and economic resources, have less physical and mental capacity, and depend on adult household members (Malak et al. 2020). Therefore, although poor people with high vulnerability at the local level are developing a range of climate disaster resilience options such as flood control dams, community-based organizations, seasonal migration, growing modified crops, planting trees around households, etc. (Sultana et al. 2020), their efforts will be in vain if there is no flow of funding from both developed countries and other actors to climate disaster areas in developing countries.

Based on the studies mentioned above, we can say that developed countries should address financial inclusion and climate change resilience issues in developing countries because developing countries are responsible for a tiny part of CO_2 emissions. Although it is challenging to create a new type of insurance and financial services in developing countries, it depends on developing infrastructure and resources and initiatives institutionalized by developing country governments, even at the local level. Since climate-affected countries often face climate change-related disasters that severely affect their lives and livelihoods, there should be

alternative solutions to assist and support those affected by such disasters to repair damage and obtain financial services for small businesses or short-term employment. This would be through an integrated approach in which all stakeholders can participate and where vulnerable groups can receive the social support and financial services needed to rebuild their traditional income sources.

Conclusion

The Millennium Development Goals (MDGs) were supposed to bring peace and prosperity to humanity, where poverty, unemployment, and inequality do not exist. However, climate change undermines these factors, exacerbates existing inequality and poverty, and hinders the MDGs' achievement. Thus, climate change is seen as an obstacle to achieving the Millennium Development Goals (MDGs) in many countries. Microfinance is recognized as an alternative adaptation tool that can increase resilience to the impacts of climate change. Microfinance brings positive changes in poverty and income levels and plays a role in inclusive growth based on climate resilience. The impacts of climate change could be reduced if microfinance and other services such as information, market access, drought-resistant crop varieties, and new technologies were made available to smallholder farmers. These activities can help farmers become more resilient to climate change. Microfinance also creates new jobs for youth and women, contributing to inclusive growth in countries where climate-related disasters are common. On the one hand, it helps communities build resilience to climate change's negative impacts. On the other hand, it promotes inclusive growth by creating new job opportunities. It has been argued that climate change adaptation requires costs that the poor, who are the most affected by climate change, cannot afford. Therefore, microfinance can play an important role in reducing poverty, ensuring food security, building climate resilience, transferring cutting-edge technologies and climate knowledge, and diversifying income. Furthermore, climate resilience can be built across five dimensions: natural, social, physical, economic, and institutional. It is also important to consider how financial services can contribute to climate resilience in affected communities. The question, then, is whether the inclusion of financial services can help develop markets that provide the greatest number of people with the most significant number of products at the lowest cost.

Financial services' role is significant in developing countries that are at high risk for climate change and CED. For example, both Ethiopia and Mali are highly dependent on rain-based agriculture. Thus, both countries are vulnerable to climate variability due to their high poverty levels. Since people living below the poverty line have less access to traditional financial services, which are not inclusive, they cannot increase their resilience to climate change. Therefore, developed countries should take responsibility for past carbon emissions and provide financial services to the poor in developing countries. In many African and Asian countries, financial services activities are low. Therefore, microfinance is the best choice for these countries to build their people's resilience to natural disasters and climate risks. Microfinance institutions are successful in building resilience to climate risks

because they can reach the very poor, especially women, who are the most vulnerable to the impacts of climate change. Besides, microfinance provides a flexible lending framework that encourages the poor to be more responsive to climate risks in their individual, household, and community activities. It can be concluded that financial inclusion is very successful in many ways, including climate resilience and adaptation.

Finally, climate change policy should focus on adapting to the increasing frequency and intensity of CED, and climate change index insurance may be a promising solution (Kath et al. 2018). In an insurance mechanism, measuring climate parameters such as precipitation and temperature helps determine losses and compensation. Climate extremes and disasters cause rural populations to lose their livelihood opportunities and crops. Vulnerable populations may consider taking out high-interest loans and reducing budgets for other basic needs to cope with adverse impacts. Those who depend on agriculture livelihoods may even consider reducing agriculture investments due to CED's increasing severity and intensity. The risk of loss and damage is high from extreme climatic events in developing countries. Climate change index insurance can improve operational efficiency so farmers can invest in agriculture, have food security, and transform traditional loss-based insurance (Amare et al. 2019).

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