

White paper: Elevating the voices of affected people in climate adaptation

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Table of contents

Executive summary

1 What we know about climate exposure and vulnerability

People who live in poverty are the most exposed and the most vulnerable to climate shocks and stresses

Climate change especially impacts women

Financial services have a role to play, but more needs to be done

2 What we are learning about climate impact and vulnerable households

Climate shocks and stresses vary in frequency, size, and duration and create knock-on effects

Climate impacts have cross-cutting implications

A holistic systems view is required to best understand the effects on the most vulnerable

Responding to climate shocks and stresses depends on their type, size, frequency, duration, and timing

Maladaptation to climate change carries risks



3

Going beyond single solutions: Recommendations for a new approach

Do more to understand affected people's needs, aspirations, perceptions, and behaviors and recognize the close interrelationships between these factors

Take a multisectoral view of climate change

Include women in solution design and implementation



4

Implications for financial services providers

Barriers to financial inclusion persist

Context matters for solution design

No single financial product or service can address all needs for climate adaptation and resilience

The digital revolution could be key, but must be climate-proof

References

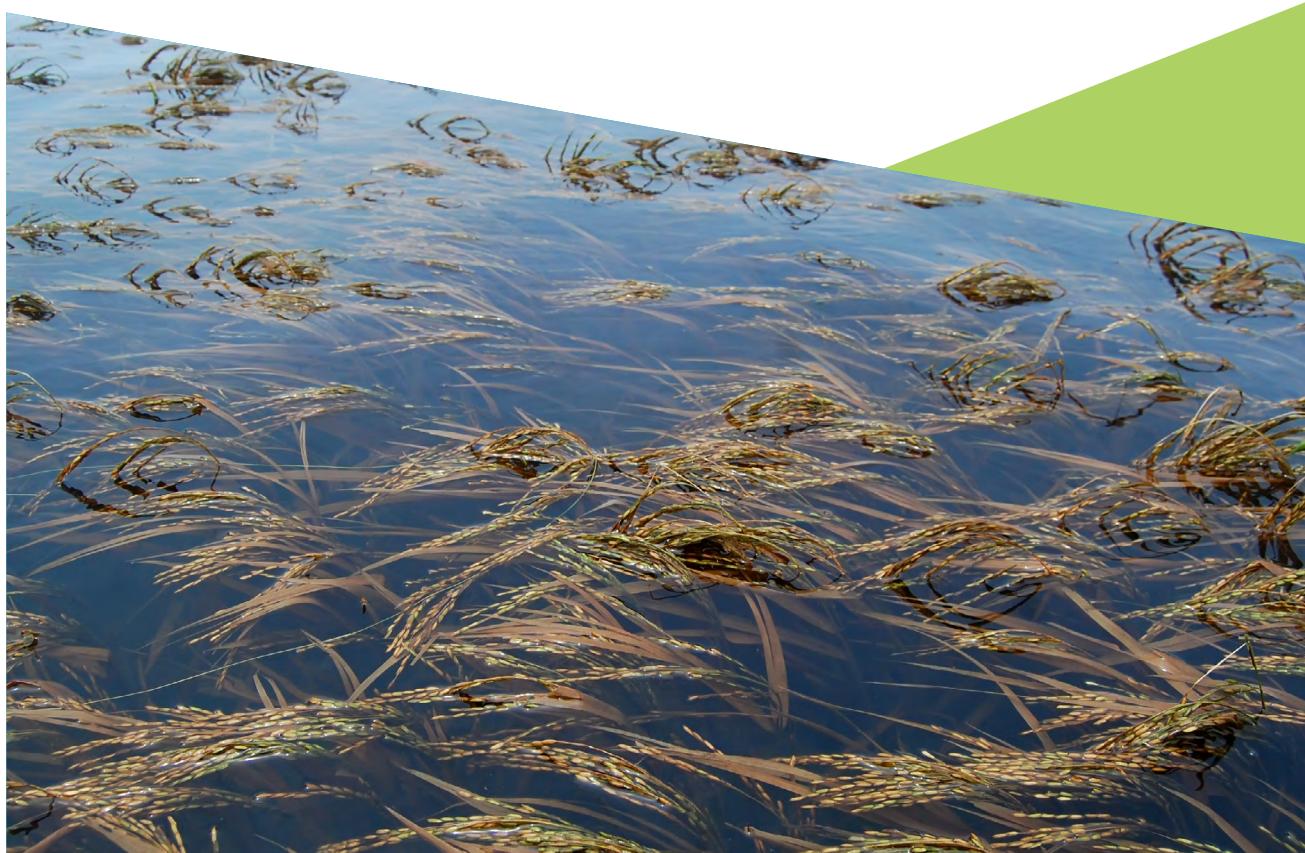


Executive summary

By 2030, half of the world's citizens could be exposed to heat, drought, and flood-related climate hazards that stem from the alarming rise in the earth's temperature of 1.5 degrees Celsius over preindustrial levels ([Bowcott et al., 2021](#)). Vulnerable populations are especially affected, as climate shocks and stresses impact where they live and their health, livelihoods, and access to essential services.

Existing research from development sectors, such as financial inclusion, agriculture, health, and food security, has provided important insights. It sheds light on the role financial services can play to build the resilience of those most exposed to climate shocks and stresses ([Zetterli, 2023](#); [Anderson et al., 2023](#)). However, while some research has focused on the impact of climate change on vulnerable individuals and the relevance of financial services in bolstering their resilience, fewer studies have included the actual perspectives of those directly impacted. This presents a challenge when we consider the role of solutions to address the challenges these individuals face because of climate shocks and stresses.

When the voices of affected individuals are not heard directly, the complexities of how they experience events can be misunderstood and oversimplified. Stakeholders may fail to adequately recognize existing approaches of adaptation and resilience they undertake to respond to climate events. Moreover, the first-, second-, and third-order effects¹ of climate shocks and stresses weave an intricate web around the most vulnerable populations. In a rush to create targeted “silver bullet” solutions, critical actors from across sectors may fail to appreciate these higher-order effects.



¹ These refer to the initial results of a climate shock or stress and the resultant longer-term effects that may extend and/or be adjacent to the climate event itself (e.g., flooding causing an increase of water-borne diseases)

Figure 1: Customer perspective: Vandana Devi



Vandana Devi:
Worried by climate change and struggling to build resilience.

Age: 35

Marital status: Married

Education: 10th Pass

Landholding: 1 acre

Type of land: Irrigated

Livestock: 2 cows, 1 buffalo

Type of house: Pucca

Smartphone access: Yes

Aspirations

- Aware of the climate changes in her district – floods, as well as drought and intense rainfall, often within the same cropping season
- Very eager to learn about the climate-resilient farming technologies
- Keen to have access to weather updates and forecast before sowing
- She wants her kids to study well and progress in life (choose non-farm livelihood / jobs) “with this weather, there is no good future in farming”

Adaptation to climate change

- Cultivates vegetables using hybrid seeds. These vegetables offset loss due to damage to principal crops.
- Rents pump @ INR 200 (USD 2.66) per hour for irrigation in dry periods
- Uses an increasing amount of fertilizers to increase the yield

Access to financial products

- Has taken loans through Kisan Credit Card (KCC), a subsidized loan product for farmers
- Accesses loans from microfinance institutions
- Has taken loans from self help groups SHGs and JEEViKA @ 1-2% interest per month for farming and building a brick house
- Saves INR 2,000-4,000 (USD 27-54) per month in a bank account
- Takes informal loans from moneylenders in the village @ 3% interest per month
- Has life insurance
- Husband sends remittances (INR 25,000 (USD 333) per month) to her bank account from Delhi

Usage of smartphones

- Makes calls and reads messages
- Uses WhatsApp for messaging and communication
- Does not use any digital payment application

Source: Ghosh et al., 2022

While financial services can play an important role in climate resilience strategies, how well highly vulnerable populations can use them depends on how effectively services respond to their expressed needs and individual contexts. This paper combines insights from a review of relevant literature with insights from focus group discussions and individual interviews of those most impacted by climate shocks and stresses.

Through these insights, it provides a broad look at how financial and nonfinancial products and services can support their resilience-building efforts. In doing so, it seeks to highlight the challenges that stakeholders must address to support the climate resilience of affected populations. The paper also examines where and how financial services can play a role in that journey.

The authors' experience, built on more than three decades of financial inclusion work, underscores the importance of listening to and understanding customers' voices. As they face climate shocks and stresses head-on, low- and middle-income individuals are adapting and building resilience. Only by listening to their perspectives and learning from their experiences, can the sector design products they will value and use.





1 What we know about climate exposure and vulnerability

People who live in poverty are the most exposed and the most vulnerable to climate shocks and stresses

“ Climate change and related hazards (e.g., droughts, floods, heat stress, etc.) affect many aspects of people’s lives—such as their health, access to food and housing, or their source of income, such as crops or fish stocks—and many will have to adapt their way of life in order to deal with these impacts. People who are poor and have few resources with which to adapt are thus much more seriously negatively affected by climate-related hazards.

– [\(Birkman et al., 2022\)](#)

Poor people face increased **vulnerability and exposure**² to climate shocks and stresses, based on the geography, social norms, and economic opportunities available to them. Their socioeconomic status leaves them with worse options, for instance, when it comes to where they live, which has implications for their exposure to climate risks. For instance, poor people are more likely to live in areas prone to flooding, mudslides, drought, and extreme temperatures simply because those areas are less desirable and, therefore, cheaper.

“ The weather is so variable—we do not know what to do. When we expect rain there is none, and then suddenly there is so much [rain] that all our crops are washed away. This is getting worse, and we are left helpless.

India, Male, Farmer (rice and wheat) 31-40 (Ghosh et al., 2022)

² The IPCC defines exposure as being in a geographical area where a climate hazard may occur and vulnerability as the propensity for adverse impact because of its occurrence. This distinction is important, since people can be exposed but not vulnerable. Being vulnerable however implies being exposed. ([Cardona et al., 2012](#)).

Figure 2. Different aspects and dimensions of vulnerability



Source: Birkman et al., 2022

Similarly, poor people are more likely to work in climate-exposed livelihoods, including agricultural and other outdoor manual labor activities, that make them susceptible to the negative effects of extreme heat and inclement weather. Extreme heat can reduce labor productivity due to work interruptions. This can impact workers' incomes, especially for those who do manual work outdoors. For example, in Dhaka, "extreme heat and humidity cause labor productivity-related losses greater than 8% of annual output generated in Dhaka today—and by 2050, this could increase to 10%" (Adrienne Arsht-Rockefeller Foundation Resilience Center, 2023).

Before [cyclone] Aila, around 800-880 kg of grain and rice would be grown per bigha [1 bigha = 1,600 square yards]. Now due to the changes in the salinity, we are only able to grow around 520-600 kg per bigha. Leafy vegetables do not grow well anymore. Due to that, I now harvest a variety of fish and grow a variety of different variants of crops and hybrid grains on our land.

Bangladesh, Male, Farmer, 31-40

While poor people experience greater climate exposure, they are also more vulnerable to the effects of climate shocks and stresses since they tend to have fewer resources, weaker prevention and coping mechanisms, and lower access to external support. "Vulnerability [to climate change] is higher in locations with poverty governance challenges and limited access to basic services and resources, violent conflict and high levels of climate-sensitive livelihoods" (IPCC, 2023).

The immediate and long-term repercussions of climate shocks and stresses drive up the prices of basic commodities and induce health risks brought about by waterborne disease and extreme weather. Such price rises occur particularly in areas with weak infrastructure and sanitation, where poor people are more likely to live—and impact livelihoods via reduced income-earning potential (Kabundi, et al., 2022).

The losses associated with climate shocks and stresses, therefore "affect poor people far more because their livelihoods depend on fewer assets, their consumption is closer to subsistence levels, they cannot rely on savings to smooth the impacts, their health and education are at greater risk, and they may need more time to recover and reconstruct their livelihoods" (Hallegatte et al. 2017).

I would say all the loans I got were wasted. The money we borrowed and used for work this year was wasted. However, we are still alive. But we did not achieve anything. What we lost this year is more than one million [Nigerian naira ≈ USD 1,250 at the time]. It is even more than that. We were dumbfounded at the amount we lost this year concerning cassava. It is difficult to talk about it.

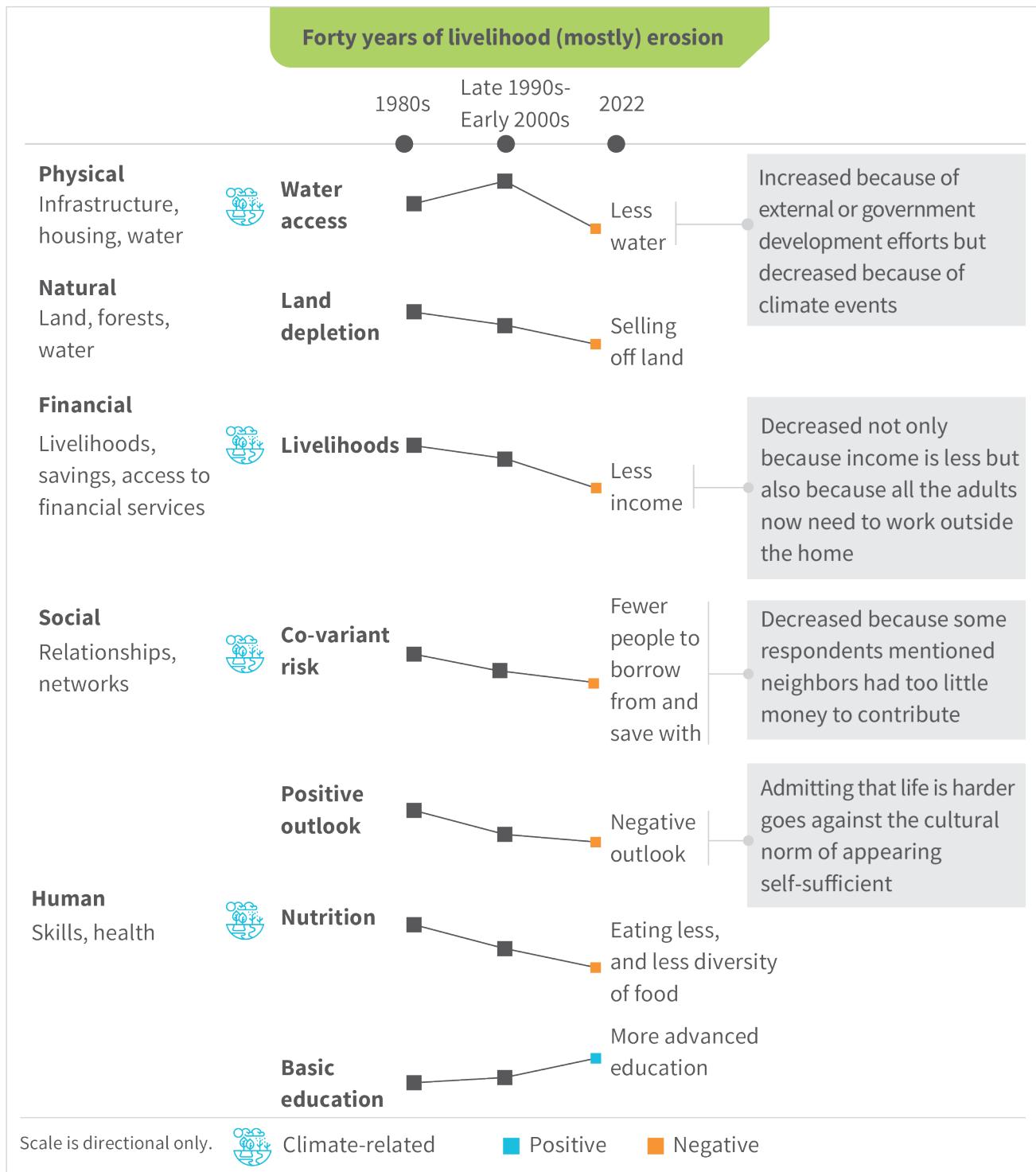
Nigeria, Female, Farmer 51-60

A way to assess the cumulative impact climate shocks and stresses have on poor people is to look at how they affect their livelihood capital and what that means for their vulnerability. This view shows that the impact extends beyond just financial risk and has broader implications. As discussed further in the section

on “A holistic systems view is required to best understand the effects on the most vulnerable”, a systems view is required to best understand the effects on the most vulnerable. The interplay between all five livelihood capitals is key to understanding poor households’ resilience and ability to adapt.

An example of how this can be assessed is by looking at the five livelihood assets in Figure 3. This view helps peel back the above-described layers of impact from climate shocks and stresses that vulnerable populations experience.

Figure 3: The effects of climate shocks and stresses, using the five livelihood assets



Source: Chamberlin, W. et al., 2024

Climate change especially impacts women

A gender focus on climate change is critical to understanding the barriers women face as they build resilience in the face of climate-related challenges. Overall, women experience higher exposure and greater vulnerability. They may have fewer tools and strategies to cope with climate-related risks ([Notta and Zetterli, 2023](#)). These disproportionate gender effects occur not because women “are inherently more at risk, but because of the intersection [of climatic shocks and stresses] with other social and economic inequalities, such as land ownership rights or patriarchal power structures” ([2X Climate Finance Taskforce, 2021](#)). Social norms affect roles and responsibilities in the household and the communities, influence the types of jobs women can access, and impact how they use adaptation strategies in response to climate risks ([Njuki, 2021](#)).

Figure 4. Illustrative examples of how women face higher exposure and greater vulnerability to climate hazards yet have fewer tools and strategies to manage them, including access to relevant financial products and services.



Source: [Notta and Zetterli 2023](#)

When it comes to building economic resilience for women, rural livelihoods are a significant source of income, as agriculture is the primary activity of 79% of economically active women in low-income countries ([Quisumbing et al., 2014](#)). Women are involved in all aspects of agricultural production. This includes paid and unpaid labor that involves processing, distribution, and a range of other non-farm activities in rural economies ([Anderson et al., 2023](#)).

Since the agricultural sector is particularly vulnerable to changes in heat, rainfall, and other weather patterns, this means climate change disproportionately impacts women's livelihoods. At the same time, this means women play a critical role in adapting to and mitigating the effects of climate shocks and stresses on agricultural production and food security. However, they often have fewer options for livelihood diversification outside of agriculture, often due to gender norms. ([Hernandez et al., 2018](#); [Katz, 2020](#)).

“

I lost the amount due to the wasted cassava. Of course, we have to cover the expenses for planting the cassava. The laborers for cassava may charge up to twelve thousand [Nigerian naira ≈ USD 15 at that time], for a big plot. The money we spent on planting the cassava is huge. Our money went to waste because we did not even recover the expenses we incurred while planting the cassava.

Nigeria, Female, Farmer, 31-40

”

Lost productivity from heat stress at work, particularly in developing countries, is expected to reach a staggering USD 4.2 trillion per year by 2030 ([Future Earth, 2019](#)). Women bear the brunt of this climate stress, too. Extreme heat impacts women disproportionately due to a combination of biological factors and social norms. Estimates show that 27,000 women die each year on average due to heat-related excess mortality ([Arsht-Rockefeller Foundation, 2023](#)). In India, this is projected to more than double to 73,500 by 2050 ([Arsht-Rockefeller Foundation, 2023](#)).

Pregnant and lactating mothers are extremely vulnerable to high temperatures. Exposure to prolonged periods of elevated temperatures is linked to adverse pregnancy outcomes, including stillbirth, congenital birth defects, and preterm deliveries ([Baharav et al., 2023](#)). Extreme heat also leads to women losing 19% of their paid working hours. Yet, for women in India, more than two-thirds of all heat-related productivity losses are from unpaid domestic labor. Extreme heat causes women to work longer to do the same tasks—women have to work as much as 90 minutes extra per day on average doing paid and unpaid work.

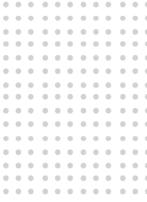
“

In the summer, I have to take several breaks to drink water. I also need to cover my head with a cloth due to social norms. I cannot remove the cloth around men I do not know. Sometimes, I have to take leave because the heat impacts my health. But I cannot do much about it, as this is the nature of my work.

India, Female, Informal sector worker, 31-40

”

Figure 5. Experiencing extreme heat first hand – Hema’s perspectives

 	<p>Hema is 43 years old and has been working at a clothing company, an MSME in Gurugram, for the past two years. She relocated from Bihar with her family. Her other coworkers are Shilpa from Bihar and Gurmi from Uttar Pradesh, who also migrated from their home states to earn their livelihood in the city.</p> <p>Heat-induced health impact: Hema said that they have to regularly deal with scorching workplace conditions, which often lead to dizziness, vomiting, diarrhea, weakness, and high fever. The employer too acknowledged similar health issues due to extreme heat.</p> <p>Escalating healthcare costs: These women often visit the local private hospital in case of small ailments, such as fever or weakness due to dehydration. While they feel this is better than resorting to medication through the advice of a local chemist, private hospitals are costly and that strains finances.</p> <p>Limited employer assistance: Although the employer provides aid during medical emergencies, significant financial burdens persist when family members fall ill. None of the women have access to insurance or have purchased it. Hema highlights that she struggles to navigate crowded government hospitals and incurs high private healthcare costs, which further impacts their savings.</p>
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Source: [\(MSC, 2024\)](#)

Women also face higher vulnerability to many indirect knock-on effects from climate change, which include an increased risk of gender-based violence and even higher mortality ([Soliman et al., 2022](#); [de la O Campos and Garner 2014](#); [Sorensen et al., 2018](#); [Fatema et al., 2019](#); [Sida, 2021](#)). In places where women are responsible for agriculture, when harvests are threatened or wiped out altogether, violence can ensue—often from within a woman’s own family ([Cwienk, 2020](#)). Increased drought and desertification can increase the distances women must go to fetch water, which exacerbates their risk of sexual assault ([Cwienk, 2020](#); [Castañeda et al., 2020](#)).

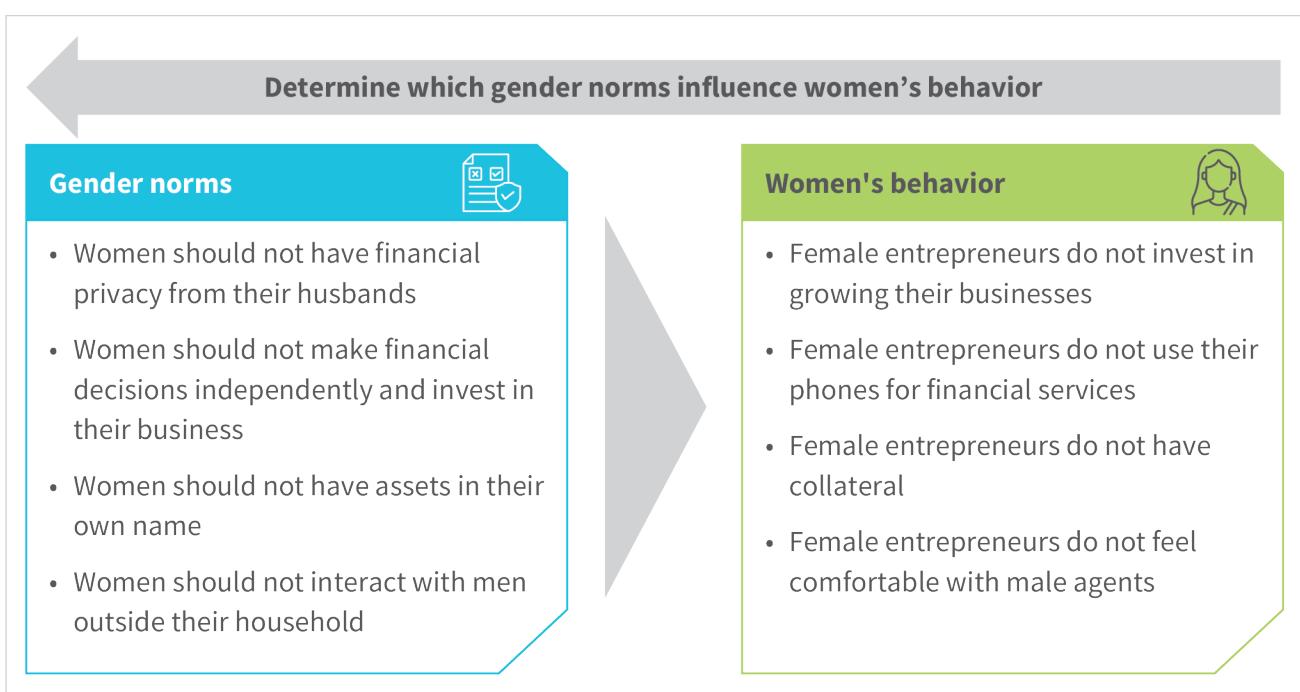
A recent UN Women report based on research in four Pacific Island countries also found that people searched online “more frequently for terms relating to gender-based violence during times of crisis.” This included “searches for phrases such as ‘abuse sexually,’ ‘beating wife,’ and ‘rape,’ in the local languages when people were displaced by natural disasters, or threatened by extreme weather, or confined to their homes by curfews or lockdowns.” ([Kaul and Duerto Valero, 2023](#)).

Girls are more likely to be forced into child marriage in areas with the rising effects of climate change and related environmental crises ([UNFPA ESARO, 2022](#)). “Extreme weather events driven by climate change increase a girl’s risk, with every 10% deviation in rainfall connected to around a 1% increase in the prevalence of child marriage” ([UNICEF, 2023](#)). According to Niaz Asadullah, an economist at Monash University in Malaysia, young girls in Bangladesh have been forced to marry in the aftermath of extreme floods because “it means one less mouth to feed” ([Rodrigues, 2022](#)). Subsequent impacts of child marriage include increased sexual violence, early motherhood and anemia among mothers, child malnutrition, and mental stress. Dealing with these impacts remains difficult because climate shocks and stresses worsen health risks for women and complicate the subsequent care they receive.

Women and girls also face disproportionate healthcare-related risks because of climate shocks and stresses. Their increased exposure exacerbates the likelihood of climate-induced illnesses, for instance, those caused by extreme heat and vector-borne illnesses. Additionally, increased salinity in coastal waterways causes an increase in urinary tract infections and negatively impacts fertility. After a disaster, women and girls are often less able to access necessary healthcare, which increases their health risks and decreases their chances for recovery ([Yashwant, 2023](#)).

When it comes to decision-making in response to climate events, women may face constraints or are compelled to make choices that negatively impact their path to resilience (see Figure 6). For example, when agricultural approaches require adaptation, women often lack the full authority to make farming decisions on their household's behalf. Social and cultural norms may also preclude them from accessing resources that support livelihood adaptation ([Mwakanyamale et al., 2021](#); [de la O Campos and Garner, 2014](#)). For women, the decision-making process extends beyond asset management into household needs management. Case studies from Lesotho and Nigeria, for example, showed that when resources were constrained, women decreased food consumption more than men did, even while pregnant.

Figure 6. Understanding the link between gender norms and women's behaviors



Source: [Koning et al., 2021](#)

Financial services have a role to play, but more needs to be done

Both informal and formal financial services play a critical role in the resilience-building and adaptive strategies adopted by those vulnerable to climate change ([Zetterli, 2023](#)). Access to financial services helps vulnerable communities improve resilience to climate change as it allows them to diversify their livelihoods, insure against risk, and make investments that improve their adaptive capabilities. For example, microfinance institutions (MFIs) have been shown to play a significant role in building poor people's resilience in Ethiopia, Mali, and Myanmar. These MFIs provide increased outreach to the unbanked through savings, loans, and, in some instances, microinsurance ([Haworth et al., 2016](#)). Some examples of the products and service delivery approaches that play a role include:

Savings provide a crucial cushion and allow households to weather storms and floods ([Wright, 1999](#)). Formal savings can help avoid negative coping strategies, such as sale of assets or reduced food consumption ([Anderson et al., 2023](#)). Households can also use savings as collateral for different types of credit.

“

It was the money I saved through savings contributions [to savings groups] that I used to help my goats in the year 2021. It was also those monies that I made from selling goats in 2020. I sold many of my goats, the matured ones, during the Christmas season of 2020. I did not spend all the money I made from the sales of those goats. I saved a lot of money in the bank in addition to the money I got from savings group contributions. So, during the hot season, I used this money to help myself, and also the goats, by buying things that I used to protect them and feeds that I used to take care of them so that they would be able to survive those times.

”

Nigeria, Female, Farmer, 31-40

Credit can enable people to invest in assets or technologies that reduce their climate risk. It is often vital for people to rebuild livelihoods, replace productive assets, and repair housing ([Fenton et al. 2017](#)). A growing range of digital financial services, such as PAYGO for asset acquisition ([Waldrone et al., 2018](#)) and payments and credit services embedded in value chains ([Mattern and Ramirez, 2017](#)), provide important opportunities for communities affected by climate change.

Yet climate change amplifies risk for lenders, particularly in agriculture. A judicious mix of support will need to be in place to reduce risk for the retail lenders that serve affected people. This support includes financing from reformed multilateral development banks, increased international development assistance (IDA) ([The Bill & Melinda Gates Foundation, 2023](#)), and the adaptation and loss and damage funds affluent nations have promised ([United Nations Environment Programme, 2022](#)).

Insurance provides cover and compensation for livelihoods and assets lost to climate events. Weather index insurance against events that cause loss is expected to provide a better alternative to traditional agricultural insurance in lower-income countries ([Pankey and Sharma, 2020](#)). The [R4 Rural Resilience Initiative](#) in Ethiopia is one of the most successful examples of weather index insurance programs ([United Nations Environment Programme, 2023](#)) that targets rainfed smallholder farmers. Evidence from the study suggests that the program benefited vulnerable groups, particularly female farmers:

“

Relative to participating male-headed households, female-headed households have increased their investments at a higher rate, taken out more loans, decreased the amount of land they sharecropped, increased their investments in hired labour, and increased their total planted land in response to insurance

(Haworth et al., 2016).

”

Payments: Digital payments systems have enabled rapid movement of financial resources to affected areas, including through personal remittances ([Sharma, 2021](#)). Many countries, including Bangladesh, [Ethiopia](#), Kenya, Madagascar, and Niger, have used government social safety net payments as a mechanism to help vulnerable people cope with climate change's impacts, such as food insecurity, droughts, and cyclones ([World Bank, 2020](#)). This highlights the importance of effective and inclusive digital payments systems to send money to affected communities, ideally before rapid onset events.

Besides formal financial services, **community-based and informal financial services** have been useful in building poor people's climate resilience. Such services include village savings and loan associations (VSLAs) and rotating savings and credit associations (ROSCAs). For instance, in Tanzania, small farmers formed ROSCAs to diversify their livelihoods and adapt to climate change's effects. Group members reported that their family and general status improved after they took up beekeeping as a climate-adaptive livelihood ([Danny et al., 2022](#)).

We live in a very remote area, which is heavily affected by cyclones. If a person falls sick, we need to travel 30 km and cross a river to visit a doctor. So, we are always cautious about such disasters, and we never know when we might need money. We always try to save something from our income, even if it is very difficult, and save it in the *samiti* [MFI or NGO offering microloans]; we also take loans from the *samiti* to keep as savings because we never know when such a disaster might occur. We spend those savings first when such things happen.

Bangladesh, Male, Farmer, 41-50

Yet many remain unable to access and use the financial services they need to respond to climate change. 1.4 billion individuals remain excluded from the formal financial system, and most of them live in highly climate-vulnerable conditions. Furthermore, almost none of the financial services for low- and moderate-income people have been designed for climate change and few providers have prioritized offerings for adaptation and resilience ([Zetterli, 2023](#)).

The availability and applicability of financial services for women, in particular, remains a challenge to be addressed. Women have less access to formal financial services. Only 20% of women in low-income countries own accounts at financial institutions compared to 28% of men ([Notta and Zetterli, 2023](#)). The barriers to accessing and using digital financial services persist, especially for women ([Wright, 2017](#)). "Rural women tend to have lower levels of literacy and numeracy and earn less income than rural men, making mobile phones, airtime, and data less accessible and affordable. These factors, along with cultural norms that limit women's privacy and mobility, also constrain their ability to use fully digital services." ([Anderson et al., 2023](#))



2

What we are learning about climate impact and vulnerable households

Climate risks are unpredictable in their timing, duration, frequency, severity, and even in their impacts. As a result, we can highlight some critical lessons, as they have implications for how solutions are designed and implemented.

Climate shocks and stresses vary in frequency, size, and duration and create knock-on effects

We have experienced drought before, but now it is happening almost every year. I do not know how we are going to survive the coming winter.

- (Onta and Resurreccion, 2011)

As climate change increases the frequency and severity of climate shocks and stresses, the cycle of once-predictable events becomes unpredictable. Vulnerable people are left with little time to prepare for climate-related events—let alone cope with, recover from, and adapt to them (see Figure 7 for examples).

Figure 7. Impact of cyclones on rice farmer livelihoods in southwest Bangladesh

Increasingly frequent and intense cyclones have exacerbated the fragility of livelihoods of rice farmers in south-west Bangladesh



Rice cultivation is the most affected livelihood:

- The frequent and intense cyclones resulting in storm surges, coastal flooding, and inundating low-lying areas with saline water, have wreaked havoc on paddy cultivation in the region.
- The first order of damage is due to the storms. The secondary damages are the resulting salinity that has rendered most of the arable lands unsuitable for rice cultivation.
- About 21% (49) of the responses to the question on the direct and indirect impacts of climate change noted that rice cultivation is the most affected livelihood.
- In south-west Bangladesh, cyclones and storm surges, and the resulting coastal flooding and salinity, have rendered about 128,000 ha of land, unusable, leaving more than a million people without a livelihood.



The freshwater fishery is the second-most affected livelihood:

- Freshwater fisheries that support the livelihoods of small and marginal farmers in south west Bangladesh are also adversely affected due to these frequent cyclones and storm surges
- The storm surges have inundated local ponds with saline water, killing the freshwater fish. About 10% (23) of responses indicated that the impact of salinity on freshwater fishing has been devastating.



Impact on cattle is also evident:

- Cattle and goats feeding on saline grass are frequently falling sick
- Although not directly attributable to salinity, but increased heat and humidity have increased the incidences of diseases among cattle.
- A few respondents also mentioned that their cattle died during cyclone Amphan (2020) when the sheds collapsed on the animals.
- About 7% (16) responses elicited that these cyclones and its aftermaths have been detrimental to livestock health and productivity.

“

The problem is that the farm did not get the rain when it was supposed to. When the rain came, it was too much.

Nigeria, Female, Farmer, 41-50

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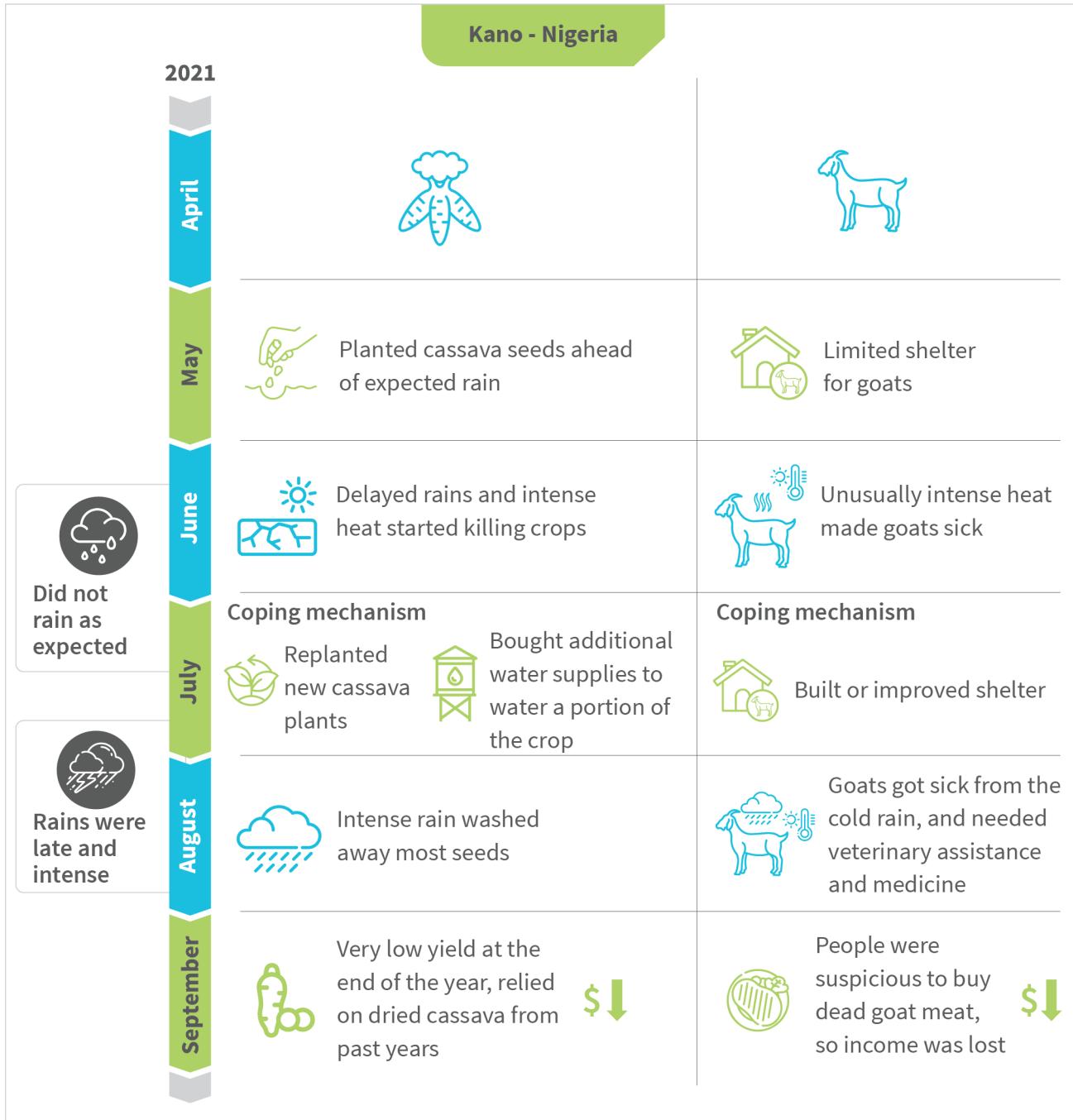
Slow-onset stress changes, such as desertification, soil salination, and variable weather, affect households in ways that differ greatly from sudden-shock events, such as cyclones and floods. The former, by definition, are incremental and less dramatic. Since changes are insidious, communities often struggle to identify the actual impacts of these types of events. However, as people learn to recognize their effects, they typically have more time to respond to them—and often do so by further diversifying income sources.

Rapid onset events, by contrast, carry clear and immediate impacts and often do not permit similar household responses. As these events hit with greater frequency and ferocity, many households find their established coping responses increasingly challenged. Some rapid onset events also exacerbate slow onset changes. For example, cyclone-induced tidal surges often accelerate the salination of soil resulting from the rise in sea level.

Research by CGAP, MSC, and Decodis in Bangladesh, [India](#), and Nigeria sought to understand the perspectives of people affected by climate change. It highlights how varying frequencies, sizes, durations, and sequences of climate events can bring about extremely different effects. Localized flooding can have marginal—and possibly even beneficial—effects on households, as it deposits fertile topsoil on agricultural land. In contrast, the severe long-term flooding that occurred in Pakistan and Nigeria in 2022 significantly disrupted livelihoods, markets, education, and health services. Similarly, farmers can often manage one-off drought occurrences, whereas repeated droughts that persist across several growing seasons can be devastating and impoverish them in the long term. Often, the combination of multiple shocks amplifies the impact: In both Nigeria and India, farmers were hit with drought in a single growing season, followed by intense rainfall and then drought again. This type of sequential extreme debilitates farmers' ability to plan, plant, and tend to crops and ensure healthy livestock (see Figure 8).



Figure 8. Combinations of severe weather patterns within a single cropping season reduce income



Source: Decodis, MSC, 2024

Alongside variations in duration and onset, the effects of climate change occur at levels that lead to first-, second-, and third-order effects. Between 2018 and 2019, for example, a lengthy drought period in northern Kenya weakened livestock herds, which made it difficult for pastoralists to find grazing areas and profit from livestock sales. The second- and third-order effects of the drought included social unrest, weakened livestock, and an outbreak of a parasitic disease that caused a number of deaths in pastoralist communities (Okeyo, 2019).

Such secondary and tertiary knock-on effects can be seen as a result of other types of climate-induced shocks and stresses. For example, floods with a high impact on urban populations can cause health problems, such as skin and intestinal disease, bronchitis, and chronic cough—especially among children under five (Hallegatte et al., 2017; Winsemius et al., 2018).

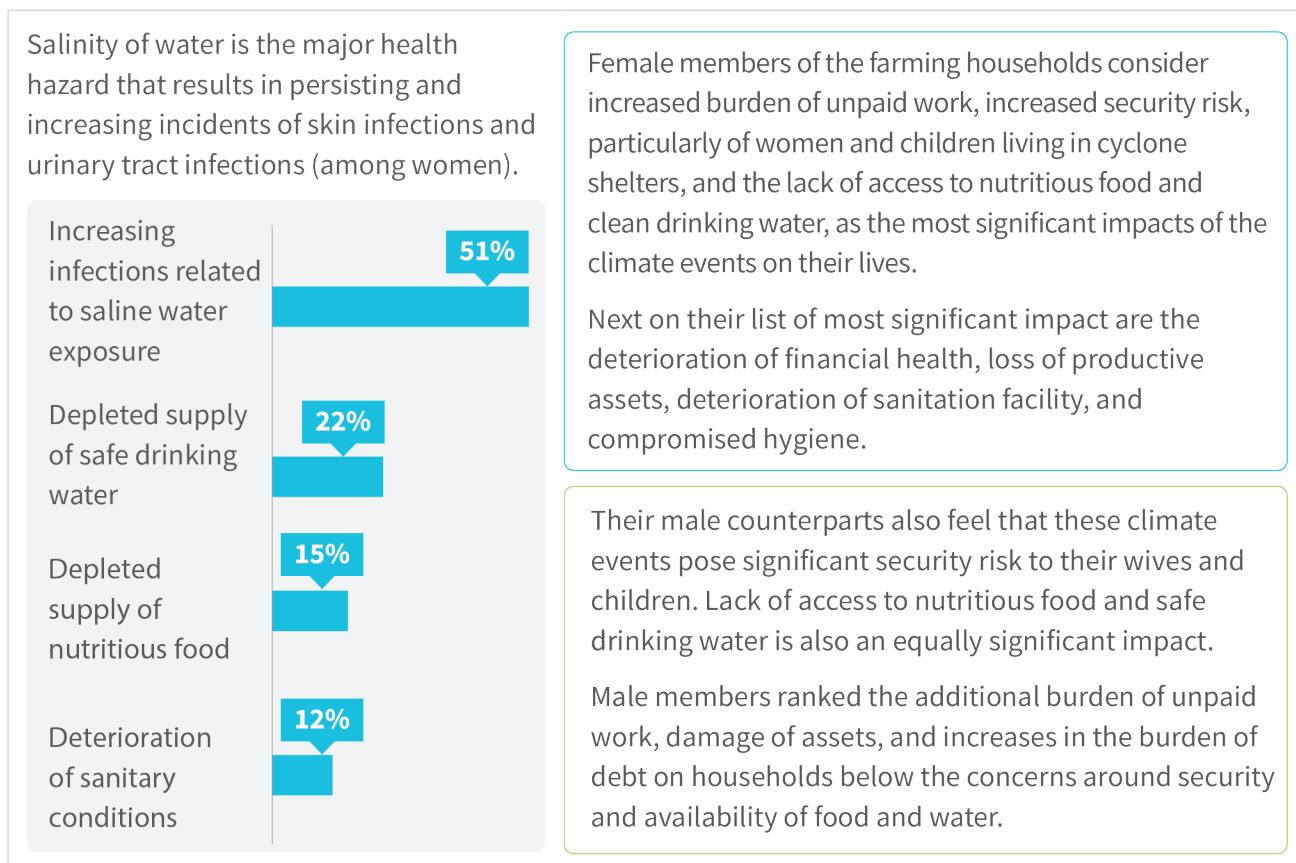
Climate impacts have cross-cutting implications

Climate change has impacts and implications on several crucial aspects of the lives of poor people, including livelihoods, health, and social equality.

Impacts on livelihoods

People who live in poverty often directly depend on natural resources—either as primary or supplementary sources of food, fodder, building materials, and fuel ([Nyong, 2005](#)). Climate-induced changes can dramatically affect livelihoods in developing countries in terms of crop yields, ecosystem boundaries, and ranges of species. Poor people often depend heavily on climate-sensitive sectors, such as fisheries and agriculture, and have limited capacity to anticipate and respond to the direct and indirect impacts of climate change.

Figure 9. Cyclones, storm surges, flooding, and salinity upend the physical and financial health of the affected rice farming communities



Source: [Decodis, MSC, 2024](#)

Climate impacts on livelihoods range from primary impacts, such as loss of agricultural areas devastated by climatic events, to secondary impacts, such as loss of topsoil, increasing soil salinity, and loss of agricultural yields due to rising temperatures ([Nelson et al., 2009](#)). The fisheries sector is subject to adverse impacts as well, with Bangladesh, Belize, China, Costa Rica, Ecuador, Egypt, Honduras, the Lao People's Democratic Republic, Nigeria, and Uganda found to be particularly vulnerable ([Barange et al., 2018](#)).

Short-term climate change impacts on aquaculture may include loss of production and increased risk of diseases, parasites, and harmful algal blooms. Long-term impacts can include reduced availability of wild seed—a consequence that arises from the destruction of suitable breeding waters and migration.

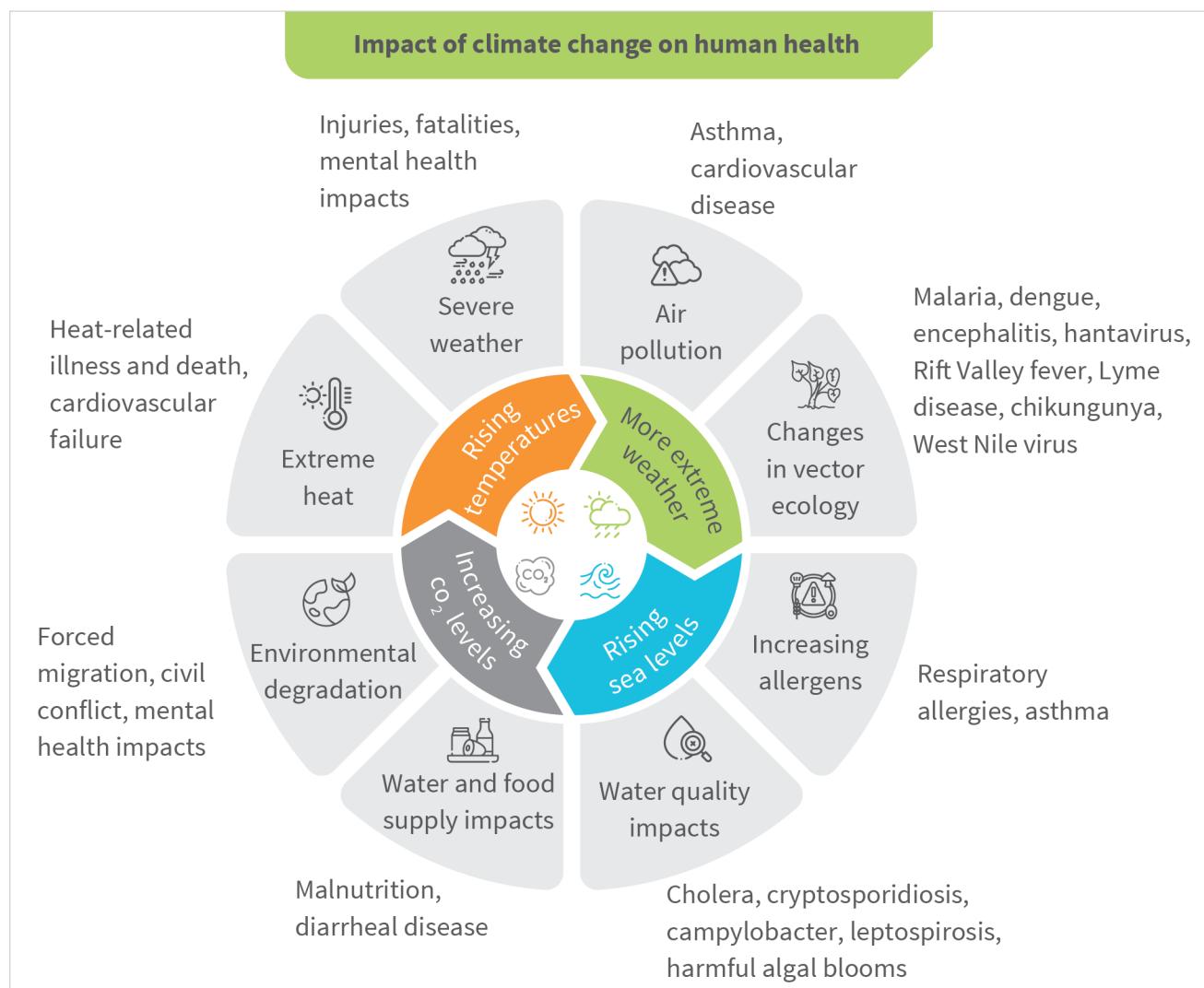
Floods come every year. But this year, the situation is worse. My house is badly affected by this year's flood, and many rice paddies got washed away.

Bangladesh, Female, Migrant who has now moved to Dhaka, 31-40

Impacts on health

Climate change can also present various challenges to a population's health. The greatest harm continues to be seen where exposure and susceptibility are high, often in countries that have themselves contributed the least to climate change (Haines and Ebi, 2017).

Figure 10: Impact of climate change on human health



Source: Centers for Disease Control and Prevention, 2022

Climate-sensitive health risks are wide-ranging. They include injury and death from extreme events, such as heatwaves, storms, and floods; infectious diseases, such as food-, water-, and vector-borne illnesses; and food and water insecurity. Poor air quality due to increasing wildfire incidents has become a factor in associated health impacts including respiratory diseases. Kovats et al. (2003) note the various impacts climate change implications have on health. Table 1 (below) has been adapted from the paper.

Table 1. Projected health impacts of climate change

Health outcome	Effects of climate change
Cardiovascular and respiratory diseases	<ul style="list-style-type: none"> Heat waves cause short-term increases in mortality. Deaths from heat stroke increase during heat waves. Weather affects concentrations of harmful air pollutants.
Allergic rhinitis	<ul style="list-style-type: none"> Weather affects the distribution, seasonality, and production of aeroallergens.
Deaths and injuries, infectious diseases, and mental disorders	<ul style="list-style-type: none"> Floods, landslides, and windstorms cause death and injuries. Flooding disrupts water supply and sanitation systems and may damage transport systems and healthcare infrastructure. Floods may provide breeding sites for mosquito vectors. Floods may increase post-traumatic stress disorders.
Starvation, malnutrition, and diarrheal and respiratory diseases	<ul style="list-style-type: none"> Drought reduces water availability for hygiene. Drought increases the risk of forest fires, which adversely affects air quality. Climate change may decrease food supplies (crop yields and fish stocks) or access to food supplies.
Mosquito-, tick-, and rodent-borne diseases	<ul style="list-style-type: none"> Higher temperatures shorten the development time of pathogens in vectors and increase the potential of transmission to humans. Each vector species has specific climate conditions (temperature and humidity) to be sufficiently abundant to maintain transmission.
Waterborne and food-borne diseases	<ul style="list-style-type: none"> Survival of disease-causing organisms is related to temperature. Climate conditions affect water availability and quality. Extreme rainfall can affect the transport of disease-causing organisms into the water supply.

Source: Adapted from Kovats, K., L., Ebi and B. Menne. 2003. *Methods of Assessing Human Health Vulnerability and Public Health Adaptation to Climate Change*. Geneva: World Health Organization. www.who.dk/document/E81923.pdf

Climate change is expected to lead to a rise in vector-borne diseases. Environmental factors, such as land use and climate change-related impacts on ecosystems, can create suitable vector habitats that lead to their rise ([Watts et al., 2019](#)). Multiple factors also contribute to the incidence of climate-sensitive infectious diseases, such as malaria, dengue fever, Lyme disease, West Nile virus, and diarrheal diseases.

Impacts on social equality

Climate change is on a trajectory to exacerbate social inequality ([Islam and Winkel, 2017](#)). Empirical evidence suggests grave impacts on already vulnerable populations ([IPCC, 2022](#)). In Southeast Asia, where increasingly unpredictable monsoon rainfall and drought have made farming more difficult, the World Bank points to the more than 8 million people who have moved toward the Middle East, Europe, and North America ([World Bank, 2018](#)).

“

Climate change has wrecked everything. Our people live in other towns and cities like refugees. All I wanted was to grow old with my children and their children. But now they are gone, and I do not think they will ever return.

- (Randall, 2024)

”

People undertake climate change-induced migration for various reasons, which include the pursuit of better economic opportunities. Migration can lead to future conflict. Previous work ([Hsiang et al., 2013](#)) showed a correlation between climate disasters and conflict, but recent evidence ([Ide et al., 2020](#)) shows that these disasters preceded it. This suggests a causal link: An increase in natural disasters due to global warming can be a “threat multiplier” for armed violence ([Schlanger, 2014](#)).

“

Yes, I had to migrate for income. For almost 1-1.5 years, I had to rent a place outside and look for other work. No crops have grown on my land for over two years. What else can I say about living in poverty? It is like this.

Bangladesh, Male, Farmer, 31-40

”

A holistic systems view is required to best understand the effects on the most vulnerable

While the effects of climate shocks and stresses often have the most pronounced impact on the most vulnerable, they also affect the enabling environment of critical resources that support the resilience of these people. For example, when a climate shock or stress occurs, the coping mechanisms and resilience of poor people do not depend on their personal financial and other resources alone. Their coping mechanisms and resilience also rely heavily on community-level resources alongside market-level resources, such as suppliers, trading centers, and healthcare providers, and state or national-level resources, such as government agencies and safety nets, among others.

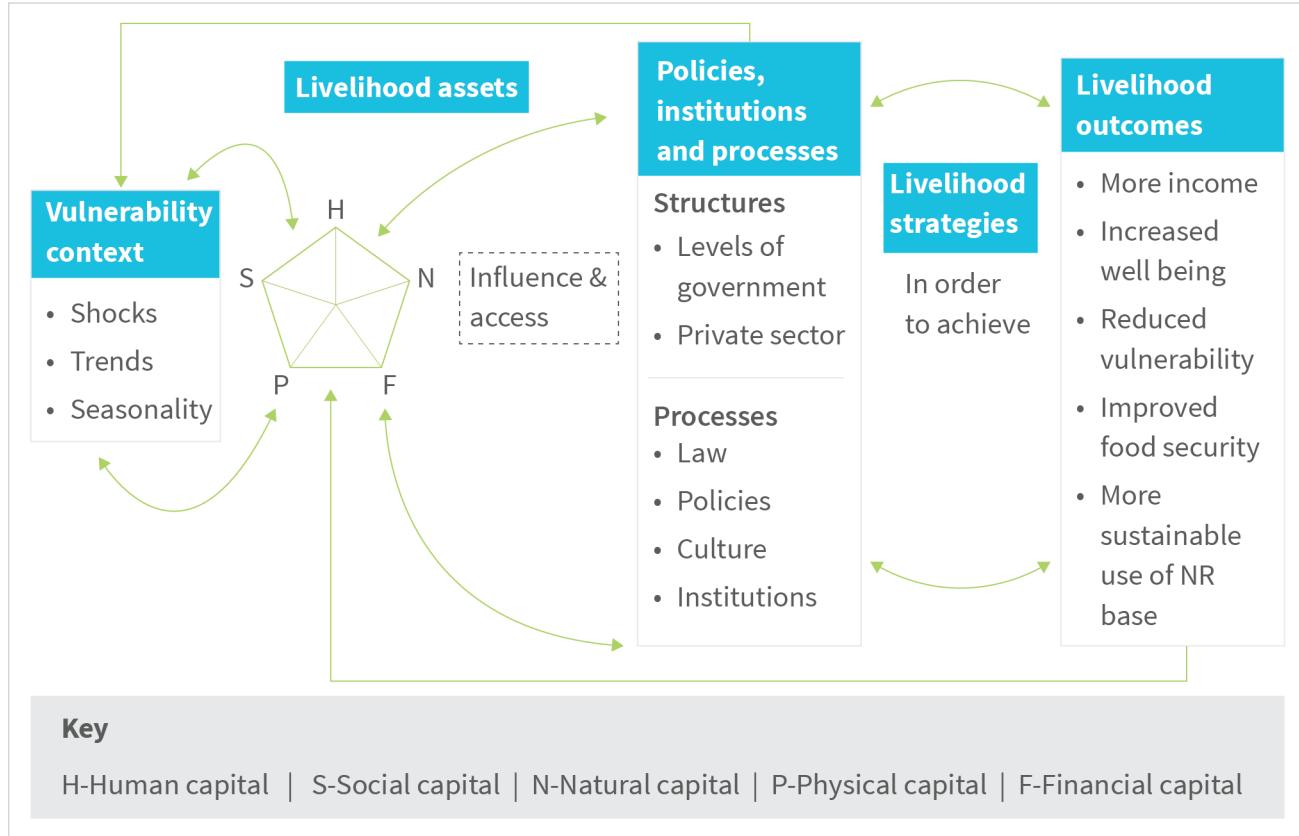
If a large-scale climate event occurs, it affects the individual and also affects these other critical parts of a system. Therefore, it is important to take a systems view of the impact of these events. Doing so also helps us understand the impact on other sources of resilience, such as neighbors, savings groups, financial institutions, agricultural off-takers, or health clinics. A systems view also uncovers the subsequent consequences of the individual's ability to respond to the needs of those most exposed. At a high level, a systems view includes the following layers:

- **Micro level:** The individual's and household's most immediate source of resilience is their innate and accumulated capabilities and resources.
- **Meso level:** The household's resilience depends on employers, suppliers, or economic markets, as well as on providers of healthcare and other key services.
- **Macro level:** In many contexts, a substantial source of resilience is seen at the national level. It includes government agencies, policies, regulations, safety nets, and social programs. It also includes the functioning and stability of the macro economy.

Climate shocks and stresses may impact these levels in consistent or distinct ways by, in turn, impacting the resilience of the most vulnerable. Failure to understand how a large-scale climate event is protracted and compounded by the lingering effects of adjacent shocks, such as the COVID-19 pandemic, can threaten a system's stability as a whole. This can lead to a shortsighted perspective or limited understanding of how systems can respond to support the short- and long-term needs of the most vulnerable.

DFID's 1999 sustainable livelihoods framework ([DFID, 1999](#)) identifies and uses five micro-level livelihood assets—human, natural, financial, social, and physical capital. It provides one way to examine the implications of climate shocks and stresses with a systems view in mind. The framework highlights the importance of understanding the context. In this case, the context is primarily climate change and the meso and macro policies and institutions that create the structures and processes within which livelihood strategies must be established (see Figure 11).

Figure 11. DFID's sustainable livelihoods framework



Source: DFID, 1999

“

The livelihoods approach puts people at the center of development.... Sustainable poverty reduction will be achieved only if external support (i.e., support from outside the household) works with people in a way that is congruent with their current livelihood strategies, social environments, and ability to adapt. People—rather than the resources they use or the governments that serve them—are the priority concern.

—DFID, 1999

”

Given climate change's growing impact, the framework and its focus on affected people is particularly suitable. The five types of capital can enable or obstruct both planned and autonomous adaptation (see Box 1.).

Box 1. Planned adaptation vs. autonomous adaptation

Locally-led adaptation combines planned and autonomous adaptation

Planned adaptation refers to the proactive strategic measures public agencies or organizations take based on anticipated changes or risks. Measures are usually the result of policy decisions and are backed by research, which renders them comprehensive and frequently, but not always, more reliable. However, measures may be slow, costly, and may not perfectly address local needs and specific communities or predict future scenarios.

Autonomous adaptation refers to spontaneous changes made by individuals or communities in response to observed or expected environmental changes. This type of adaptation is quick, flexible, and allows for solutions tailored to specific local needs. However, they may be short-sighted, lack the resources for larger systemic issues, and even exacerbate problems if not carefully managed (see section on "Maladaptation" below).

Successful adaptation typically involves a combination of planned and autonomous actions that use the strategic direction of planned adaptations with the speed and flexibility of autonomous adaptations—both informed by the voices of affected people. ([Burton et al., 2001](#))

Now commonly known as "locally-led adaptation," this approach is increasingly recognized as the key to successfully responding to the climate change in the face of hyper-local challenges. See the [CIFAR Alliance/MSC white paper on locally-led adaptation](#).

Responding to climate shocks and stresses depends on their type, size, frequency, duration, and timing

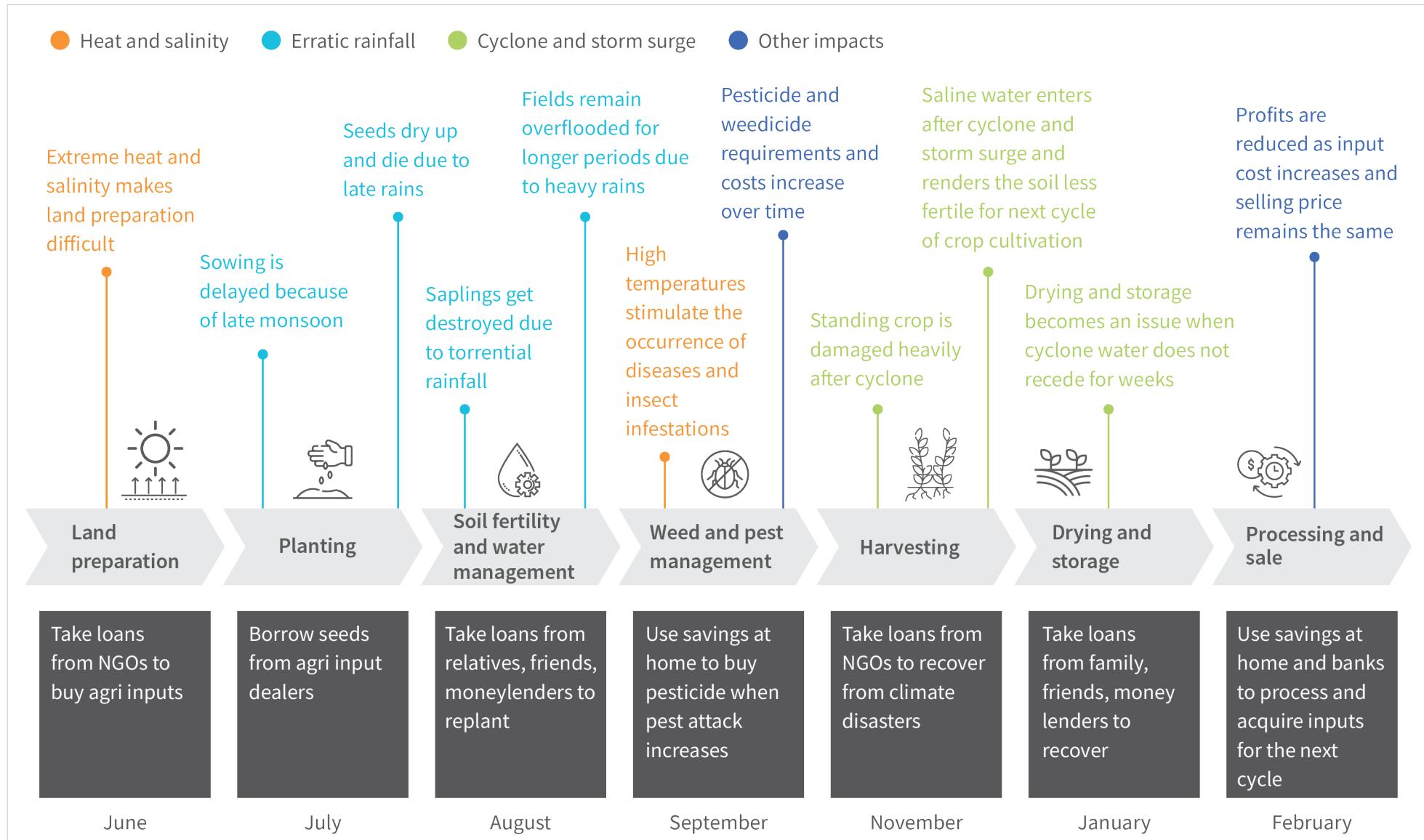
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The rain was too heavy. It brought part of the house down—one of the rooms. Now, I am left with two rooms. It is still under repairs... they used zinc to cover the place for me. When I have money, I give them to buy one or two bags of cement to work on it.

Nigeria, Female, Farmer, 41-50

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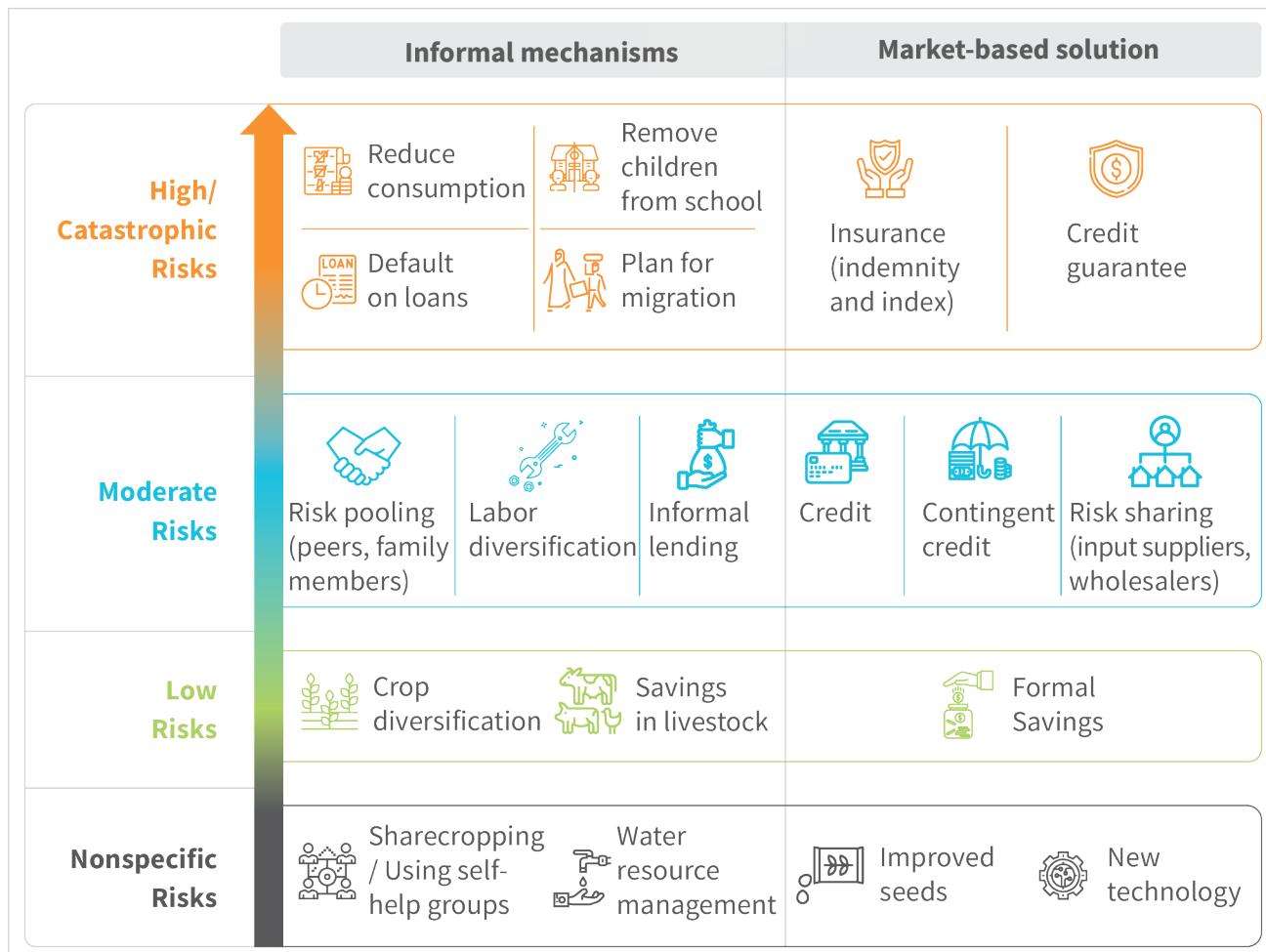
As people seek out ways to respond to climate shocks and stresses, they draw upon a variety of resources to support their efforts to adapt and build resilience. The reason for this is that what people respond to due to a climate shock or stress will change over time, as shown in the example of rice farmers in Bangladesh in Figure 12.

Figure 12. Impact of and response to climate variability in the *Aman* rice cultivation cycle

Source: Decodis, MSC, 2024

The strategies families use vary significantly depending on the nature, magnitude, and timing of each climate event and whether it appears to be a one-time occurrence, a recurring challenge, or a slow-onset event. The five types of capital of the household (see Figure 11) play an important role to determine response. The World Bank presented a stylized characterization of the types of responses to climate events as part of its [Strengthening Financial Resilience in Agriculture: Knowledge Exchange Series](#) (see Figure 13) ([Financial Protection Forum - Managed by World Bank Group, 2022](#)). This view shows us financial services can play a strong indirect role even when resilience strategies are initially nonfinancial.

Figure 13. Informal risk management mechanisms and market-based solutions



Source: [Financial Protection Forum - Managed by World Bank Group, 2022](#)

“

It took us almost six months to repair our house. We are a poor family. In our family, other than the children, everyone who was old enough to work migrated to other areas for income. Some of us worked as laborers in other people's homes, and some of us worked on others' land. Like that, slowly, we made repairs and built small houses.

Bangladesh, Male, Farmer, 21-30

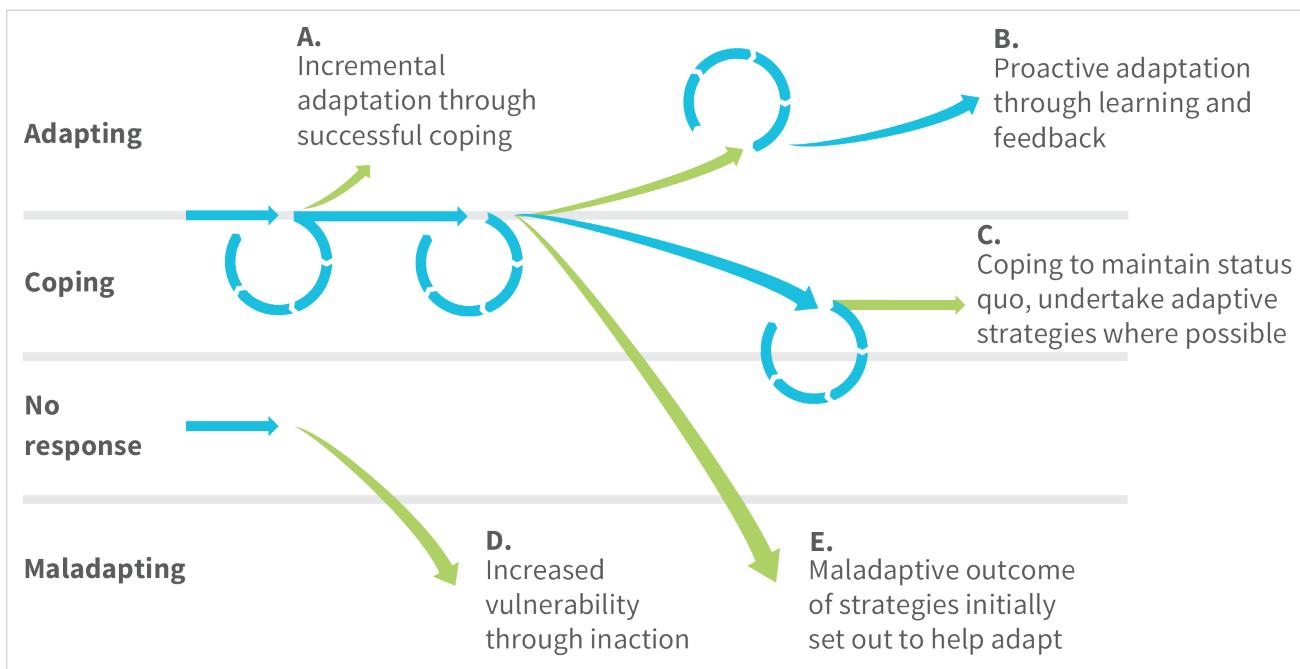
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Maladaptation to climate change carries risks

Those most susceptible to the effects of climate shocks and stresses can find it risky to plan and implement adaptation strategies, especially if they are based on limited knowledge and viewed through a lens of cultural and sociological bias. Certain strategies may make a situation worse and trigger “maladaptation”—when “an adaptation strategy aimed at a group of people makes them more vulnerable to climate change than they were before” or when “that strategy redistributes vulnerability so that others who were not beneficiaries of an adaptation strategy instead become more vulnerable to climate change than they were before the strategy was implemented” ([Schipper, 2020](#)).

Besides wasting precious time and resources, maladaptation can make people even more vulnerable to climate change ([Schipper, 2020](#)). As a result, adaptation strategies often fail even when social inertia is overcome in efforts to adapt to climate change.

Figure 14. Adaptation and maladaptation outcomes over time



Source: [Schipper, 2020](#)

The literature on maladaptation highlights the importance of understanding the context to ensure that adaptation strategies address both the symptoms and the causes of vulnerability. It is also essential to ensure that communities most vulnerable to climate change are not excluded from planned adaptation projects and strategies. Since such communities are often marginalized, their voices are rarely heard – hence the growing emphasis on locally-led adaptation ([MSC, 2024](#)).

Maladaptation can occur when program design does not consider contextual insights. For example, a paper by [Fenton et al., 2017](#) showed how microfinance can facilitate adaptation by enhancing adaptive capacity, but can also lead to maladaptive outcomes through over-indebtedness. It notes the importance of improved product design and integration of microfinance into top-down adaptation programs, such as those undertaken by the public sector. Yet despite this integration, these run the risk of not being able to sufficiently reach the local level and support household adaption. In another study, as part of an adaptation strategy, women in Peru were given access to microcredit to start projects. However, the project saw corresponding increases in domestic violence as some men became jealous of the women's success ([Schipper, 2020](#)).

Adaptations meant to address climate impact on livelihoods can also have negative consequences. In northern Ghana, for example, farmers migrated away from rural areas in search of employment that would provide additional income. However, this shift led to a labor shortage when farming conditions improved. In other words, not enough people remained in rural areas to ensure a successful harvest ([Schipper, 2020](#)).

Maladaptation can occur with both planned and autonomous adaptation—and for different reasons. With planned strategies, maladaptation may result from poor design and a lack of contextual experience or insights. In autonomous adaption strategies, maladaptation more often occurs due to limited information that leads to “poor choices, lack of support networks to fall back on, and insufficient capacity to undertake new employment or follow through with the strategies” ([Schipper, 2020](#)).



3

Going beyond single solutions: Recommendations for a new approach



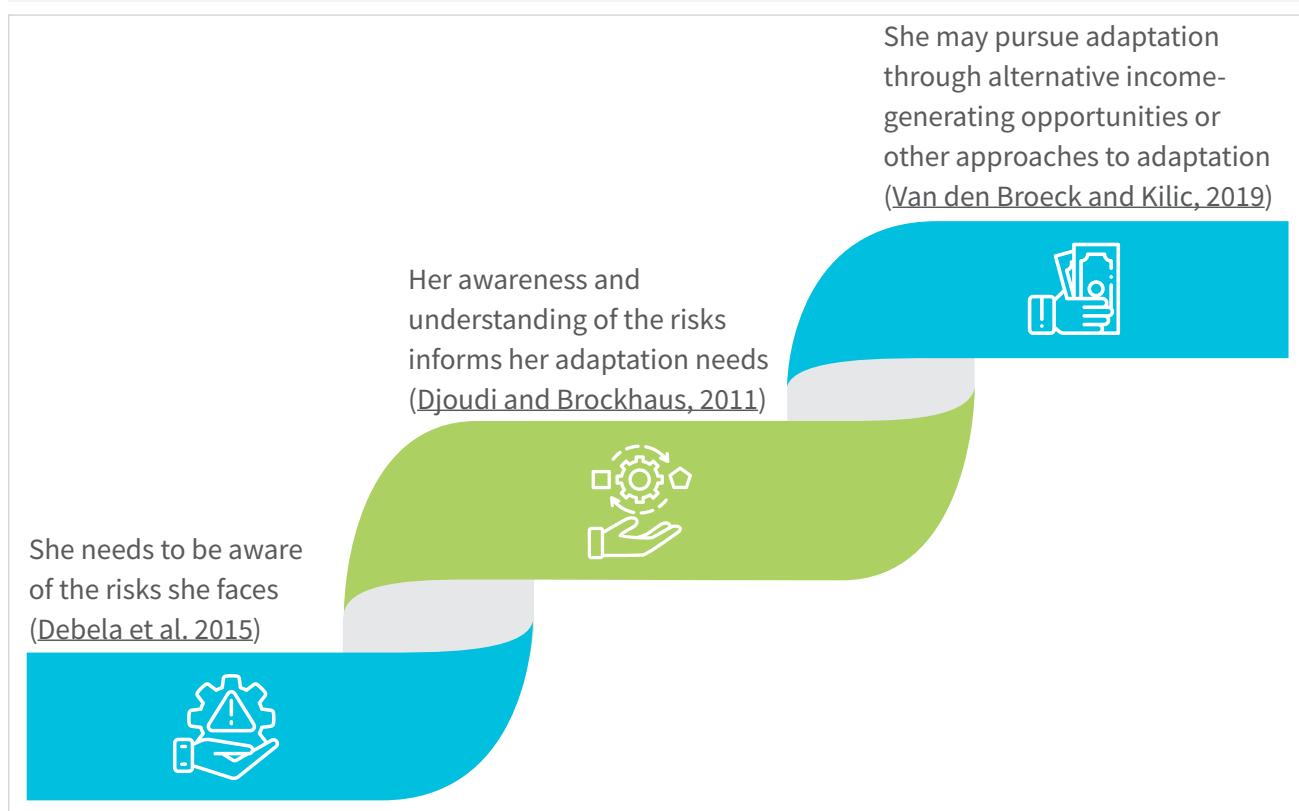
More needs to be done, given the complex and unpredictable nature of climate shocks and stresses. Such efforts should ensure that solutions, including financial solutions, can truly respond to the lived experiences and needs of those most exposed to these impacts. The following section presents a set of recommendations relevant to the financial sector and other development sectors that have tried to integrate financial services as part of their climate response.

Do more to understand affected people's needs, aspirations, perceptions, and behaviors and recognize the close interrelationships between these factors

People's needs, aspirations, perceptions, and behaviors profoundly affect how they respond to climate change-driven stresses and shocks, including their willingness and ability to get help from the community and government agencies. Stakeholders must understand these factors as essential to the design interventions relevant to vulnerable populations and thus provide real impact.

Solution sets must respond to people's perceptions about the threat of climate change and their ambitions around adaptation. Perceptions about climate shocks and stresses and available response or support options vary by gender, geography, and various other dimensions.

Figure 15. Understanding how customer perception informs paths to adaptation



Source: Authors

Placing the end client (the user) at the center of a business is a widely accepted best practice ([Harvard Business School, 2000](#)) that yields more engaged and loyal customers. Decades of experience have shown that a client-centric approach in the design and delivery of financial services improves their use and impact ([Wright, 2010](#); [CGAP Customer-Centric Guide 2018](#)). This same approach applies to the delivery of products and services to address climate change ([Giri and Aadil, 2021](#)). A deep understanding of how people think and behave is essential to design solutions that will help vulnerable communities respond to climate change and

increase their uptake and use. This insight is critical to mitigate the risks of maladaptation that may arise from unsuitable design or implementation of the adaptive strategies and solutions offered (Schipper, 2020).

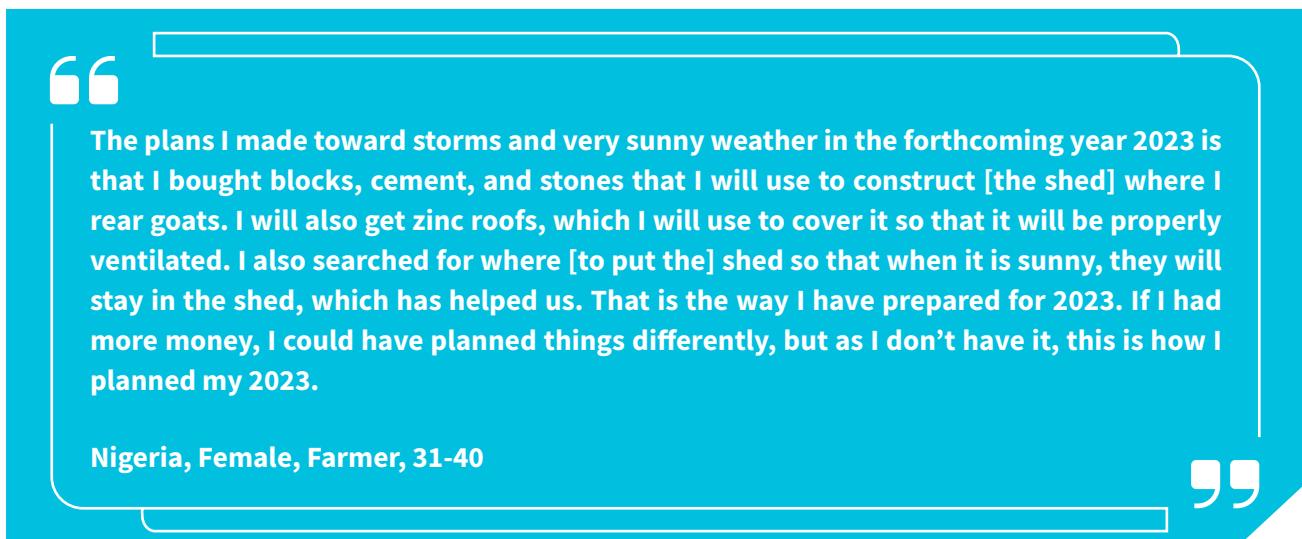
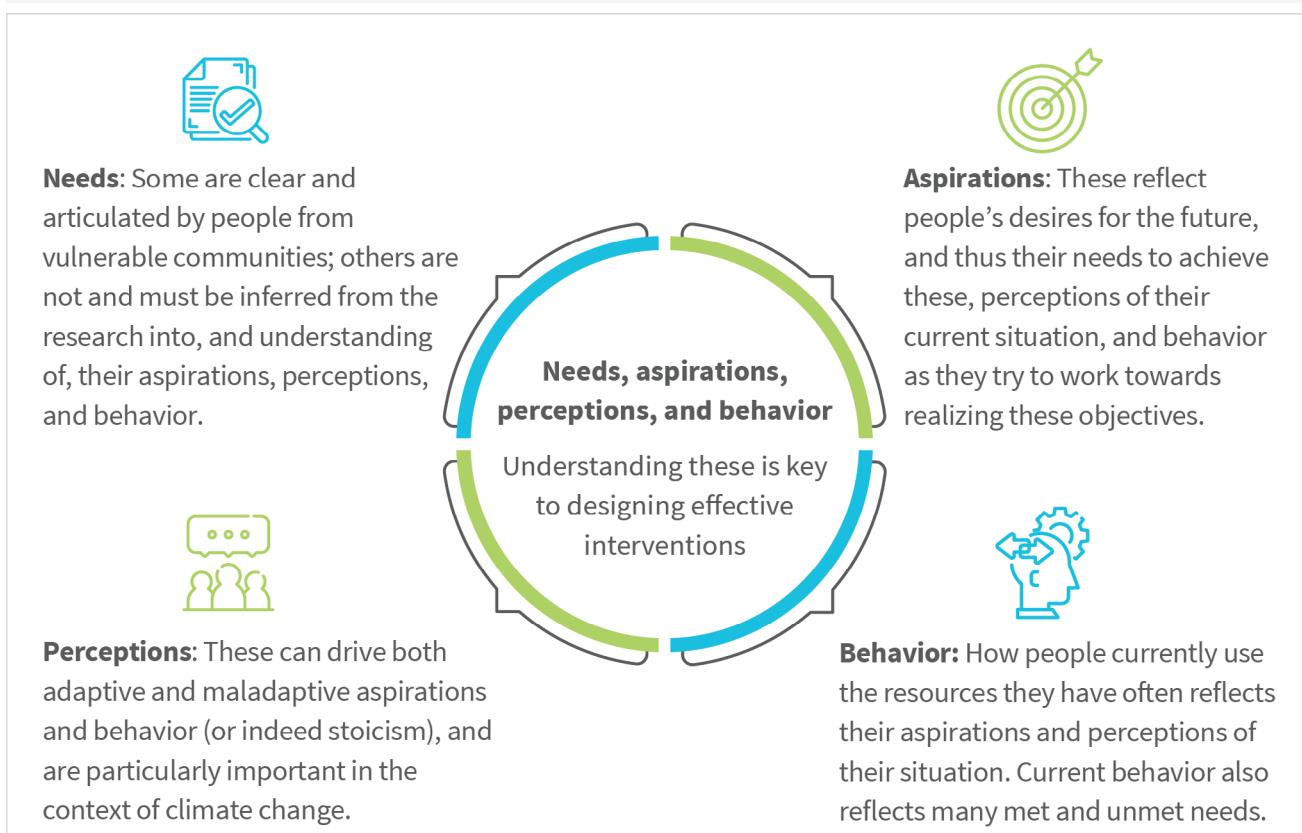


Figure 16. The four factors that inform effective intervention design



Source: Authors

For example, MSC's recent research in India's Bihar state found that smallholder farmers needed ways to reduce water loss in their rice paddies in the face of growing heat and droughts. While many farmers recognized and aspired to achieve a positive outcome, others were trapped in inertia, status quo bias, or mistrust of outsiders, and thus continued practices they had used for generations. Further, while local agricultural institutes advocated zero-tillage approaches that allowed stalks from previous harvests to protect the soil, some farmers did not perceive them as relevant and continued traditional practices.

“These farming practices have been in our family for generations—we cannot risk trying new ideas. We have heard of so many people trying new things and failing. We feel what we do is what is right for our farms.

India, Male, Farmer, 41-50

A patient and empathetic approach from researchers is imperative to gain a deep and nuanced understanding of complex factors, such as those faced by farmers in India. The approach also calls for in-depth knowledge of local languages, communities, and sociocultural norms. Employing methods similar to Robert Chamber's acclaimed Participatory Rural Appraisal approach or built upon it will likely suit the intended outcomes. Such methods intentionally seek to support local individuals to analyze and share their outcomes and plan their activities (Sontakki et al., 2019), and are core to locally-led adaptation.

Take a multisectoral view of climate change

A multisectoral approach and the development of comprehensive responses are vital, given the diversity of climate change risks and the complexity and interrelated nature of their impacts. This means when solutions are undertaken, while any sector can lead them, their design and approach should reflect the multisectoral implications of climate shocks and stresses. These approaches necessarily involve mitigation, resilience, and adaptation that require changes to individual, household, and community behaviors and changes to agricultural, enterprise, health, and transportation practices. Although not revelatory, the idea of a multisectoral view should be emphasized, given that traditional sectorally-focused development silos continue to prevail and remain easier to implement yet consequentially ignore the comprehensive impacts of climate shocks and stresses.

“Interdependence between different sectors means that poor health, food insecurity, and poverty cannot be tackled effectively by addressing one sector in isolation. Influencing sustainable and positive change means adopting a holistic, multisectoral approach to development.

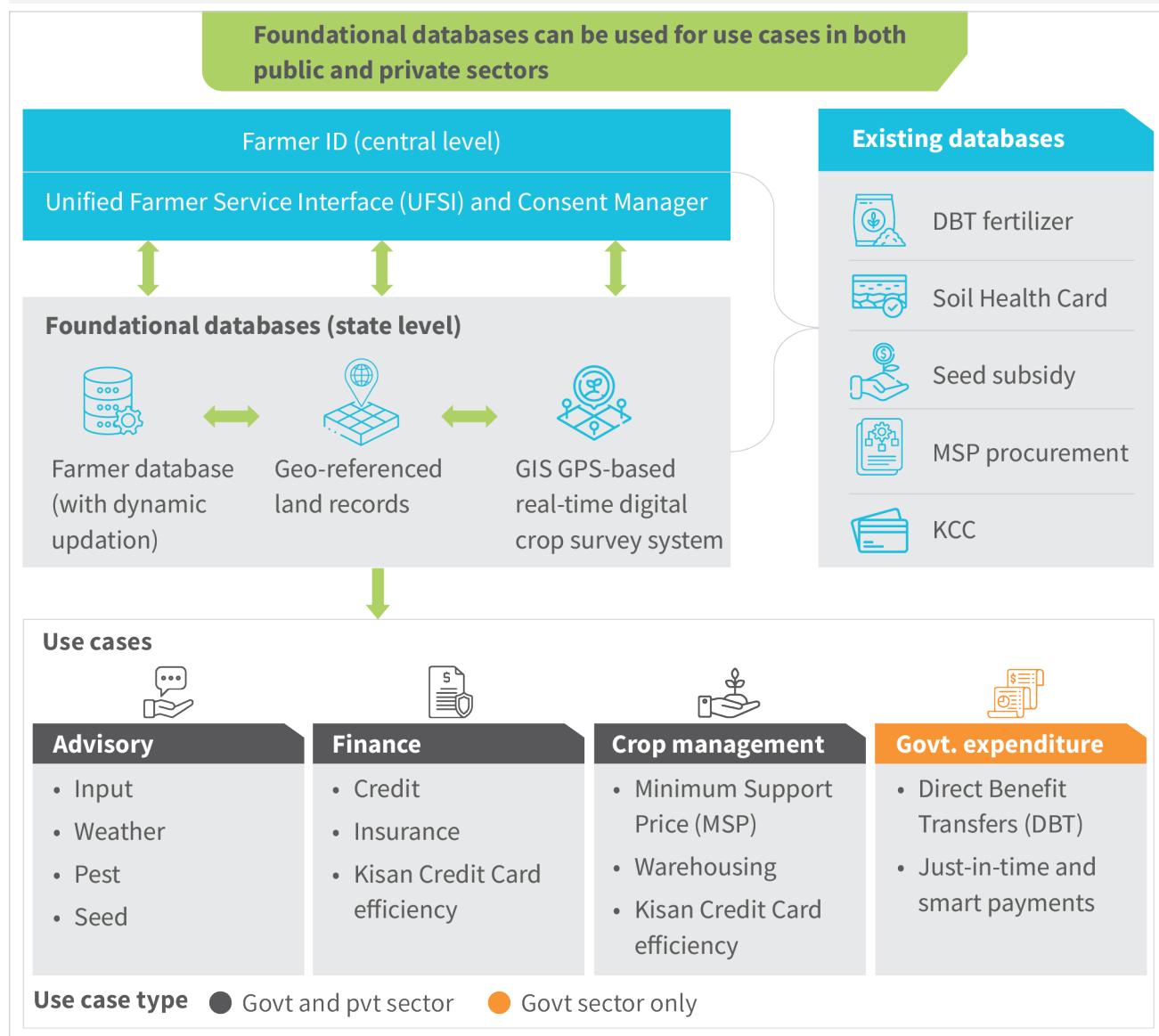
-MDG Center, East and Southern Africa, 2007

Effective multisectoral approaches require collaboration between government and nongovernmental organizations backed by academic research and the private sector. Approaches should involve global, regional, national, and community initiatives. Each multistakeholder and multisector initiative must provide equally beneficial solutions built on long-term relationships among partners that share risks and rewards. Also necessary are the exchange of skills, the convergence of social, human, and financial capital, and a range of technologies to deliver impactful solutions not bound by traditional development silos (Ekesa et al., 2023).

Additionally, NGOs should consider climate from an integrated programming perspective that extends beyond livelihoods. This is more complex and time-intensive than traditional programming but is important for the sustainability of any climate adaptation or mitigation effort.

Digital solutions can play an important role to facilitate multisectoral approaches—both as a means of advocacy to optimize practices and as an enabler of choice and, thereby, efficiency for marketing, logistics, and financial services. For example, the AgriStack and Digital Farmers' Service under development in India will ultimately use farmers' land location and ownership, cropping patterns, and soil health analysis to advise on suitable seeds, fertilizers, and pesticides. These services will also enable ag-advisories, market and logistics information, options for a range of financial services, and government benefits, including support through direct benefit transfers (see Figure 17).

Figure 17. Agristack will be used to develop multiple use cases across public and private sectors through existing databases and systems.



Source: MSC, 2024, AgriStack – A DPI for farmers and the agriculture ecosystem

Include women in solution design and implementation

Crucially, women must play an active role in climate adaptation and resilience-building strategies. Solutions to support women's approaches to climate adaptation and resilience building should include them in the design and implementation to understand their distinct needs and aspirations better. Evidence shows that women may have different priorities to pursue in adaptation, given differences in household financial decision-making. For example, after a drought in Mali, women sought products to help pay school fees, whereas men sought products to help them replace lost income ([Djoudi and Brockhaus, 2011](#)).

Besides designing solutions, women should also be engaged in their implementation. Communities perform better during natural disasters when women are involved in leadership roles related to early warning systems and reconstruction ([Sida, 2021](#)). Women are also effective community mobilizers. For example, their participation in village forestry committees in Nepal improved program implementation results ([Ghimire, 2020](#)).

Beyond these types of community and social resilience, farm production and food security can improve in times of high food prices and price volatility if female farmers can have better access to financial solutions that consider female asset limitations and risk aversion ([de la O Campos et al., 2014](#)). For instance, financial services that support the purchase of a rainwater harvesting tank can provide a household with easy access to water for domestic use. Such a measure can eliminate the time-consuming daily task of carrying water, which typically falls on women and children.



4 Implications for financial services providers



While vulnerable individuals and households likely rely on several strategies to adapt to climate shocks and stresses, financial services can play an important role in the solution sets they choose. However, it is important to note several key lessons:

Barriers to financial inclusion persist

While many see the potential of financial services to support vulnerable people, real barriers impede the provision of relevant services to bolster climate resilience. In addition, while the most promising solutions to reach low-income people at scale often rely on a digital financial ecosystem, digital financial solutions in many countries are still insufficient, inaccessible, unaffordable, or lack resilience to climate risks.

Persistent barriers exist around cash-in and cash-out (CICO) networks in terms of access and liquidity along with barriers around customer numeracy and literacy—especially for women. Barriers include high delivery costs, inadequate provider capacity, climate risk modeling issues, high basis risk in insurance products, and failures to design solutions specifically for women’s needs. These issues will need to be overcome for financial services to contribute more effectively to climate adaptation and resilience.

Context matters for solution design

Climate shocks and stresses carry different impacts based on geography, type of event, and timeframe. The financial service needs of vulnerable households also tend to vary considerably before, during, and after shocks or stresses occur. Financial solution design and delivery must recognize contextual distinctions to ensure relevant responses – see Figure 18.

As CGAP has pointed out, “Long-term adaptation to water scarcity for a cassava farmer in Northern Nigeria, for example, is very different from the urgent coping response to a cyclone by an urban market trader in Dhaka. The strategies each pursues are likely to be very different and require very different things from the financial sector: One may need a three-year investment loan to build a solar-powered irrigation system, while the other needs flood insurance, facilitation of inward remittances from family, and short-term working capital to rebuild damaged inventories after the storm” ([Zetterli, 2023](#)).



Figure 18: Variation in client coping strategies across four countries

Client strategies for coping with a loss (Ex post)					
Strategy	Bangladesh	Bolivia	The Philippines	Uganda	
Draw on financial assets	<ul style="list-style-type: none"> Increase line of credit from BRAC Use BRAC savings Use cash savings 	<ul style="list-style-type: none"> Withdraw from savings 	<ul style="list-style-type: none"> Borrow from moneylender Use CARD Bank multipurpose loans 	<ul style="list-style-type: none"> Withdraw from savings Borrow from relatives 	
Draw on physical assets	<ul style="list-style-type: none"> Draw down food stocks 	<ul style="list-style-type: none"> Sell assets (more likely among poor borrowers) 	<ul style="list-style-type: none"> Sell productive assets (such as selling pigs early, before they are mature) 	<ul style="list-style-type: none"> Borrow against mortgaged assets and sell assets Sell off stock from business (draw down working capital) 	
Draw on human assets		<ul style="list-style-type: none"> Migrate to find new income opportunities 	<ul style="list-style-type: none"> Mobilize family labor 	<ul style="list-style-type: none"> Relocate back to village Work harder Withdraw children from school 	
	<ul style="list-style-type: none"> Cut back daily consumption 	<ul style="list-style-type: none"> Cut education expenditures (more likely among poorer borrowers) 		<ul style="list-style-type: none"> Minimize expenditure Reduce number of meals per day Move to cheaper accommodations 	

Source: (Sebestad and Cohen, 2000)

No single financial product or service can address all needs for climate adaptation and resilience

An adequate response to a climate event typically involves multiple financial solutions. Parametric rainfall insurance, for instance, may be considered the most effective financial instrument to help smallholder farmers cope during a drought. However, credit products that enable *ex ante* investment in irrigation and drought-resistant varieties could be even more effective and could even render insurance moot. Similarly, since agricultural shocks can have a prolonged impact on multiple growing seasons, lending products that allow rural households to restart their livelihoods quickly and fully may be critical to lowering the ultimate welfare impact. The most effective solutions may not even involve financial services provision to households but rather to the market intermediaries and other actors their resilience depends on.

Because of these innovations, the roles women play to address climate change could improve as they gain better access to formal financial services. For example, they could engage in biodiversity conservation,

land management, and reforestation ([Sida, 2021](#)). Financial services for equipment could also help women access environmentally friendly technologies, such as better water harvesting and clean cooking facilities—both relevant to reducing climate change’s impacts in the long run ([Ströh de Martinez et al., 2016](#)).

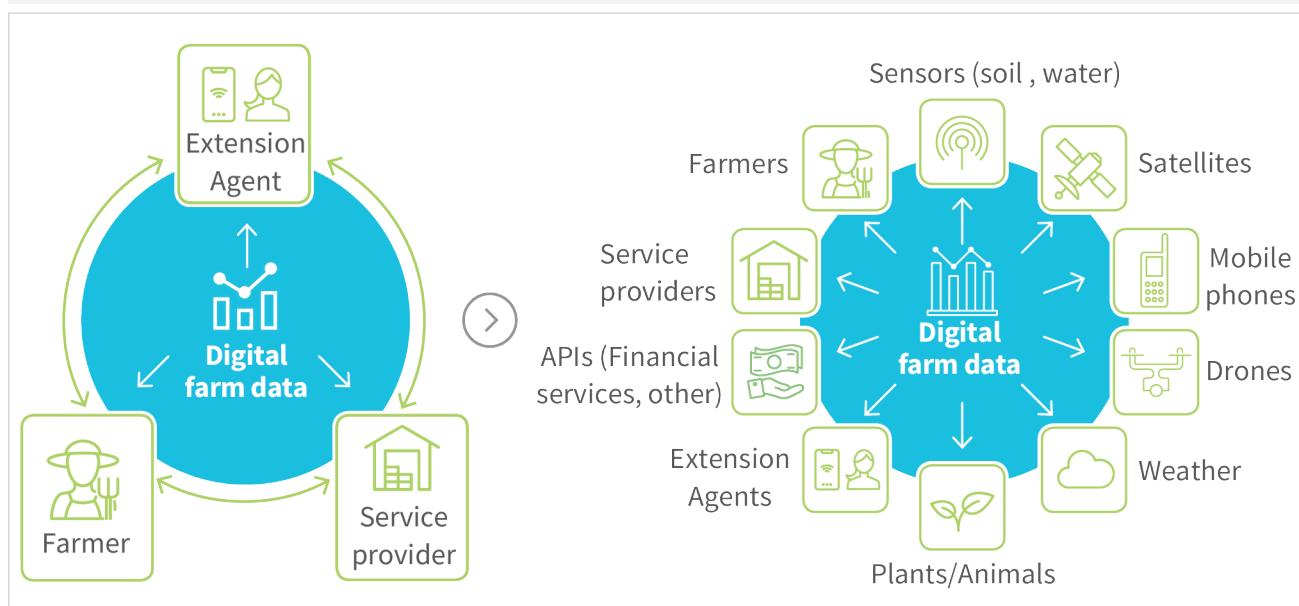
The digital revolution could be key, but must be climate-proof

Innovative business models have made it easier for providers to reach customers, especially women at the last mile, through a combination of digital data, digital financial services, mobile channels, and platform approaches with in-person support and expertise. These models also address their mobility, time, and privacy concerns ([Anderson et al., 2023](#)). However, the uptake and usage of these digital tools remain limited. Only 13% of smallholder farmers in Sub-Saharan Africa have registered for any digital service—including financial services—and only 5% are active ([Chandra., R., and Collis, S., 2021](#)).

As the Climate Resilient Agriculture (CRAg) working group of the [CIFAR Alliance](#) notes in its whitepaper, “Even where innovations are ostensibly well engineered for the context, frameworks of understanding, values, and risk perceptions play a significant role in shaping the diffusion of innovation and hence the adoption of productivity and resilience enhancing technologies” ([CIFAR Alliance Climate Resilient Agriculture \(CRAg\) Working Group, 2023](#)). We need to work hard to understand the needs, aspirations, perceptions, and behaviors that govern the adoption of technologies.

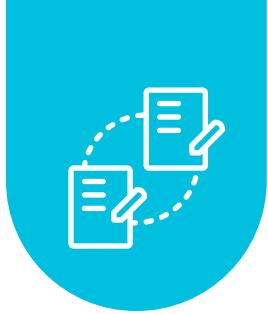
While digital solutions have many advantages, they can also be prone to weather shocks, such as high winds, flooding, or severe precipitation that damage electricity grids, disrupt telecommunications, and displace agent networks or other key distribution channels. Digital financial services ecosystems, therefore, must crucially grow more climate-resilient and adapt to the changing weather conditions.

Figure 19: Evolution of smallholder farming to data-driven agriculture



Source: ([Sharma, 2021](#))

Key lessons, such as these, can help financial service providers design and deliver financial services that address specific climate-related impacts for vulnerable populations.



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