Food and Agriculture Organization of the United Nations

Social protection and the limits to climate adaptation

An exploration

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ABSTRACT


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Climate change is increasingly undermining small-scale agricultural livelihoods through both direct hazards and cascading impacts across interconnected biophysical and socioeconomic systems. While social protection systems can play a critical role in supporting inclusive and resilient climate adaptation, this exploratory study highlights that there are limits to what adaptation can achieve. As global warming intensifies, these limits will be reached in a growing range of social-ecological contexts, threatening the viability of smallholder and rural livelihoods. Yet this issue remains largely absent from current social protection policy and programming, which continue to focus primarily on incremental, short-term interventions and often fail to integrate long-term climate projections or broader social-ecological dynamics, increasing the risk of maladaptation.

The report explores scenarios both before and after limits to adaptation have been reached (pre-limits and post-limits scenarios) to clarify how social protection can better address the evolving risks facing smallholders. In pre-limits contexts, social protection programmes and policies should integrate climate science and agrifood-systems expertise, account for compounding and cascading impacts, and align more closely with national climate policy frameworks. When limits to adaptation are exceeded, social protection will need to shift its focus towards ensuring basic income security for those who remain *in situ*, while supporting planned mobility and providing assistance to migrants and host communities in areas of destination. The report concludes with a call for early, coordinated dialogue and action – rooted in scientific evidence, scenario modelling and cross-sectoral collaboration – to ensure that social protection systems are equipped to respond effectively and equitably as adaptation limits are approached and exceeded.

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PREFACE

This paper presents the findings of an exploratory study intended to stimulate deeper dialogue, research and – ultimately – investment into the issue of social protection in the context of the limits to climate adaptation. With a particular focus on small-scale agricultural livelihoods, the paper reviews core concepts related to adaptation limits in rural contexts before exploring a range of implications for social protection policy and programming. These include how to ensure income security as limits are approached; how to provide compensation for affected communities; how to support populations in transitioning to alternative agricultural systems or to diversify into non-agricultural livelihoods; and how to provide appropriate support in the context of climate-related mobility, including migration, relocation and resettlement. The paper also considers how best to support those who remain in place, whether voluntarily or involuntarily even though they are living in highly exposed locations. By doing so, it aims to encourage reflection on the development of appropriate policy, programming and financing responses to this issue at both national and international levels. It concludes with some initial recommendations on how to strengthen and enhance social protection systems in order to support rural communities as the limits to climate adaptation are reached and exceeded.

ABBREVIATIONS

AR6	IPCC Sixth Assessment Report
CROC	Climate Relocation of Communities (CROC) programme, Fiji
FAO	Food and Agriculture Organization of the United Nations
FRLD	Fund for responding to Loss and Damage
IPCC	Intergovernmental Panel on Climate Change
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change

EXECUTIVE SUMMARY

Climate change is already having a negative impact on small-scale agricultural livelihoods – including among smallholder farmers, pastoralists, fishers, foresters and landless labourers – through both direct effects (extreme weather events, rising temperatures, altered rainfall patterns) and indirect impacts on the biophysical and socioeconomic systems on which these livelihoods depend. Poor, vulnerable and at-risk populations are disproportionately affected. Social protection systems – aimed at protecting people against poverty, vulnerability and social exclusion – can therefore play an important role in advancing inclusive and resilient climate adaptation and just transitions in rural settings.

However, there are limits to the potential for adaptation to climate change. Defined as the point at which an actor's objectives – or system needs – can no longer be secured through adaptive actions, these limits may be hard (biophysical thresholds beyond which adaptation is impossible) or soft (constraints arising from financial, policy, governance, technological or power imbalances that prevent actors from accessing feasible adaptation options). As global warming increases, limits to adaptation will be reached in a growing number of social-ecological systems, with significant implications for the viability of agricultural livelihoods.

Despite growing bodies of evidence on both adaptation and limits to adaptation, little attention has been given to how social protection can support smallholders as limits to adaptation are approached or exceeded. Current social protection programming relating to climate adaptation typically focuses on incremental and short-term technical interventions within agricultural systems, often lacking integration with long-term climate projections or broader social-ecological dynamics. This can contribute to maladaptation, whereby interventions inadvertently increase long-term vulnerability or serve to exacerbate and entrench inequalities.

This report finds that the concept of adaptation limits remains largely absent from the global discourse on social protection, from the position papers or policies of major development partners and from climate-relevant social protection programmes. While limits to adaptation were recognized in the Intergovernmental Panel on Climate Change's Sixth Assessment Report and increasingly feature in discussions on climate-related loss and damage, these insights have not yet translated into social protection policy or programme design.

To address this gap, this report proposes distinguishing between scenarios before and after limits to adaptation have been reached (pre-limits and post-limits scenarios), each of which have distinct implications for social protection. In pre-limits contexts, social protection may continue to promote climate-adaptive agricultural practices, livelihood diversification and natural resource management. But to remain effective as limits approach programmes must: integrate climate science and agrifood-systems expertise; account for compounding and cascading climate impacts across interconnected systems; anticipate soft and hard limits and potential regime shifts; assess

and hard limits and potential regime shifts; assess distributional impacts to reduce maladaptation; and align with broader climate policy frameworks (e.g. nationally determined contributions and National Adaptation Plans). This will require large-scale, long-term, climate-informed social protection programming supported by interoperable systems capable of rapid scale-up and enhanced cross-sectoral coordination.

When limits to adaptation are reached and livelihoods become non-viable, conventional adaptation-oriented social protection will be insufficient. In these contexts, the focus of social protection will need to shift towards ensuring basic income security for those remaining *in situ* (by choice or otherwise); supporting planned relocation or other mobility pathways through transfers and transitional services; and providing continued assistance and economic inclusion in areas receiving migrants while ensuring equitable provision for migrants and host communities. Operationalizing these functions will require new policy and legislative frameworks, internal and cross-border mobility and portability arrangements, interoperable identification and registration systems, and significantly expanded financing, including through loss and damage mechanisms.

Ultimately, the report concludes that social protection must begin to take account of the limits to climate adaptation for smallholders and vulnerable rural populations. This will require grounding policy and programming in scientific evidence and scenario modelling and recognizing the interconnectedness of agricultural livelihoods with wider social-ecological systems. Many of the recommendations in the report are relevant even where limits may not be reached soon, since business-as-usual approaches will not suffice in many vulnerable contexts. A dialogue between key stakeholders on the role of social protection in the context of limits to adaptation – combined with increased research and investment to develop effective responses – is thus urgently needed as early preparation will place countries and the global community in a better position to respond effectively and equitably to this challenge.

1. Introduction

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Climate change is already having harmful effects on people who depend on small-scale agriculture for their livelihoods. This includes smallholder farmers, foresters, fishers, pastoralists, landless labourers and other small-scale food producers engaged in various ways in agrifood systems. For the sake of brevity, this report refers to these groups as smallholders.

Climate change damages rural livelihoods both directly, through the increasing intensity and frequency of extreme weather events, rising temperatures and changes in rainfall patterns, and indirectly, through its impacts on the biophysical and socioeconomic systems on which rural livelihoods depend. Poor, vulnerable and at-risk populations are disproportionately affected by these impacts.

Social protection – national policies and programmes aimed at preventing or protecting people against poverty, vulnerability and social exclusion throughout the life cycle – has a key role to play in responding to these challenges. It can do this by advancing inclusive and resilient climate adaptation, mitigation and just transitions in rural settings (Aleksandrova, 2019; Bhalla *et al.*, 2024; Costella *et al.*, 2023; FAO and RCCC, 2019; ILO, 2024; IPCC, 2022a; Tenzing, 2020).

However, there are limits to the potential for adaptation to climate change. The term "limit to adaptation" refers to "the point beyond which efforts to adapt become ineffective or impossible, […] the thresholds beyond which adaptation strategies cease to deliver desired outcomes, and the boundaries of our ability to adjust to the impacts of climate change" (Sustainability Directory, 2025). The 2022 Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) (IPCC, 2022a) stated that limits to adaptation will be reached in a growing number of social-ecological systems[1] as global warming increases, with adverse implications for the ongoing viability of agricultural livelihoods that form part of these systems, and that this is already happening in many parts of the world (Future Earth, The Earth League and WCRP, 2022; Martin *et al.*, 2022).

Little attention has been given to how social protection can assist smallholders in coping with and responding to adaptation limits.

Despite growing bodies of evidence on both the contribution of social protection to successful adaptation (see for example, Aleksandrova, 2019; Bhalla *et al.*, 2024; Costella *et al.*, 2023; Tenzing, 2020) and the limits to adaptation (see for example, Addison *et al.*, 2022; Simpson *et al.*, 2023), little attention has been given to how social protection can assist smallholders in coping with and responding to adaptation limits.

Unless limits to adaptation are addressed in the design of social protection programmes, resulting interventions may be less effective as these limits are reached and may even contribute to maladaptive outcomes that are detrimental to the welfare of recipients and wider communities.

[1] Smallholder livelihoods, and the agricultural systems on which they are dependent, exist within social-ecological systems that comprise the multiple, interdependent biophysical and human systems that condition and enable existence (Bott, 2022).

The aim of this paper is to stimulate thinking on these issues among those involved in both social protection and climate policymaking by addressing four questions:

- What is meant by "limits of adaptation" and what is currently known about their projected impacts on agricultural livelihoods?
- How is this issue incorporated in the global policy agenda on addressing the impacts of climate change?
- To what extent are the limits of adaptation reflected in current social protection frameworks, policies and programmes?
- What are the implications of adaptation limits for social protection systems in addressing the needs of rural populations in low- and middle-income countries?

METHODOLOGY

This report is based on a literature review and key informant interviews with a range of experts working on social protection, agrifood systems and climate policy and programming.

The literature review encompassed both grey and peer-reviewed literature exploring the issue of limits to adaptation. Literature was identified using a combination of search techniques. These included searches of Google Scholar using the terms "limits to adaptation" and "hard limits" in combination with other relevant key words (climate, livelihoods, agriculture etc.);[2] a search of key institutional websites[3] and reports to identify relevant literature and definitions of "limits to adaptation", "hard limits", "soft limits", "transformative adaptation", "incremental adaptation" and "maladaptation"; and a review of seminal references shared by experts in the fields of climate adaptation, social protection and climate science.

Given the large number of documents identified in the Google Scholar search, articles for review were limited to those produced between 2019 and 2024; cited 20 times or more; with clear relevance based on their titles; and included in the first five pages of the Google Scholar searches.

This resulted in the identification of 270 documents. The abstracts of these were reviewed and those found to be relevant were included in the final reference list, together with a number of foundational documents published prior to 2019. This gave a final list of 85 references. An annotated bibliography and a list of country-specific studies were also produced to facilitate future research on this topic.[4]

Institutional documents on climate and social protection were identified through a search on Google using the search string "Agency name" AND social protection AND climate change. The first item from the search result was selected (disregarding region and country-specific documents) and these documents were then searched for mentions of "limit to adaptation", "limits to adaptation", "adaptation limit" and "hard limit".

In addition to the literature review, the report integrates findings from a series of key informant interviews with 16 experts from the social

[2] Searches were made of the title and body text of all documents. Different search strings returned the following number of hits: "limits to adaptation" AND climate AND livelihoods AND production = 3 490 hits; "limits to adaptation" AND climate AND livelihoods AND production AND agriculture = 2 470 hits; "limits to adaptation" AND climate AND livelihoods AND agriculture = 3 400 hits; "hard limits" AND climate AND livelihoods AND production = 557 hits; "hard limits" AND climate AND livelihoods AND production AND agriculture = 467 hits; "hard limits" AND climate AND livelihoods AND agriculture = 480 hits.

[3] Food and Agriculture Organization of the United Nations (FAO), Global Environment Facility (GEF), Green Climate Fund (GCF), Intergovernmental Panel on Climate Change (IPCC), International Food Policy Research Institute (IFPRI), International Fund for Agricultural Development (IFAD), International Institute for Environment and Development (IIED), United Nations Framework Convention on Climate Change (UNFCCC), World Food Programme (WFP).

[4] These are available on request by writing to the authors.

protection, climate and agrifood sectors.[5] Key informants were provided with background to the research, including the four questions the paper sought to address. Interviews were qualitative and open-ended in nature to reflect the diverse range of expertise across the interviewees.

STRUCTURE OF REPORT

This report begins by discussing the core concepts of climate adaptation, limits to adaptation (including hard and soft limits) and maladaptation. It then examines how these limits are addressed in key global policy agendas relevant to social protection and rural smallholder livelihoods in the context of climate change. The report's penultimate section explores the implications of limits to adaptation for social protection systems, distinguishing between considerations before limits are reached and after they have been reached. It then concludes with a set of initial recommendations based on the review's findings.

[5] An initial list of interviewees was supplemented by suggestions from the five experts consulted at the outset of the study.

2.Core concepts:
Climate adaptation, limits to adaptation and maladaptation

This section discusses the core concepts addressed by this paper in the context of smallholders and agricultural livelihoods.

CLIMATE ADAPTATION

The United Nations Framework Convention on Climate Change (UNFCCC, n.d.) defines adaptation as "adjustments in ecological, social or economic systems in response to actual or expected climate stimuli and their effects." Such adjustments are essential in reducing climate vulnerability and risks. For example, UNDP (2024) defines adaptation to climate change as "actions that help reduce vulnerability to the current or expected impacts of climate change like weather extremes and hazards, sea-level rise, biodiversity loss or food and water insecurity." Similarly, climate-change adaptation can be understood as "a process of avoiding, resisting, and recovering from the negative impacts of climate risks" (Lipper and Cavatassi, 2024) and as a form of climate risk reduction (Simpson *et al*., 2023).

Climate adaptation may occur in both human and natural systems, a distinction reflected in the widely recognized definition developed by the IPCC: "In human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects…" (IPCC, 2022b).

The concepts of climate adaptation and resilience are closely linked, with climate adaptation referring to the process of adjusting to actual or expected climate-driven shocks and stressors, while resilience refers to the ability to prepare for, cope with and recover from these impacts (Adaptation & Resilience Investors Collaborative, 2024).

Adaptation responses

Smallholders face multiple intersecting adaptation challenges driven by threats from climate change to ecosystems and human systems, inadequate policies to deal with their situation, and ongoing poverty which results in a lack of resources to adapt (even if it were possible). These operate at individual, household, community and society-wide levels and together represent profound challenges to smallholder adaptative capacity.

Climate adaptation responses may be either proactive (anticipatory) or reactive (IPCC, 2022a) and may be "incremental" or "transformative" in nature. Incremental adaptation refers to small changes to existing systems that maintain "the essence and integrity of a system or process at a given scale", while transformative adaptation "changes the fundamental attributes of a social-ecological system" (IPCC, 2014). Transformative adaptation thus refers to more profound changes to systems and practices (Juhola *et al*., 2022; Schipper, 2020).[6] In the context of smallholder livelihoods, adaptation responses range from solutions that are predominantly technical or technological (such as changes in forms of irrigation or the adoption of new drought-resistant crop varieties) (Tenzing, 2020) to the adoption of diversified or alternative on-farm and off-farm livelihoods, as illustrated in *Table 1.*

[6] It is important to note that the concept of transformative adaptation is not analogous to the widely used concept of transformative social protection (Devereux and Sabates-Wheeler, 2004) and therefore does not necessarily imply "structural change that reduces entrenched social inequalities at the root of vulnerability to climate change" (Tenzing, 2020). However, increasingly there are calls to incorporate approaches that change power hierarchies and challenge inequalities – including gender inequalities (Gonda, 2019; Huyer, 2016; Ravera *et al*., 2016; Resurrección *et al*., 2019) – through transformational or transformative adaptation (Pelling, Brien and Matyas, 2015; Taylor *et al*., 2025).

Table 1 Examples of incremental and transformative adaptation across different systems

	ADAPTATION WITHIN SYSTEM (INCREMENTAL)	ADAPTATION BY CHANGING THE SYSTEM (TRANSFORMATIVE)
AGRICULTURAL SYSTEM	Change crop variety, shifting from traditional varieties to cultivars that have increased resilience to heat stress, shock or drought Change or vary planting time Adopt water-efficient technologies to harvest water or conserve soil moisture	Change to more climate-resilient crops (e.g. shift from rice to sorghum) Change to more climate-resilient livestock species (e.g. from cattle to small ruminants) Change in approach to water supply and management (e.g. shift from rainfed to irrigated approaches)
SMALLHOLDER LIVEHOODS SYSTEM	Partial diversification to non-agricultural activities Temporary labour migration	Permanent labour migration of some household members Change in livehood strategy
SOCIAL-ECOLOGICAL SYSTEM	Incremental and transformative adaptation across multiple human and biophysical systems (e.g. health care, infrastructure, food security)	

Source: Authors, drawing on Tenzing, J.D. 2020. Integrating social protection and climate change adaptation: *A review. WIREs Climate Change,* 11(2): e626. **https://doi.org/10.1002/wcc.626** and Bates, B.C., Kundzewicz, Z.W., Wu, S. & Palutikof, J.P., eds. 2008. *Climate change and water.* Technical Paper of the Intergovernmental Panel on Climate Change. Geneva, IPCC Secretariat. https://tinyurl.com/heksy86s.

In practice, the extent to which adaptative interventions lead to incremental or transformative outcomes depends on their depth, scope and speed *(Table 2)*. The table shows how more transformative interventions have a greater potential to address limits to adaptation (IPCC, 2022a). However, it also indicates the challenges that individual households may face in adopting transformative interventions without appropriate incentives and support from public actors, given the need for deeper structural reforms and accompanying changes in mindset and practices to achieve widespread, coordinated and substantive adaptation responses.

Table 2 A systematic framework for tracking adaptation progress and assessing the state of adaptation-related responses

TRANSFORMATIVE POTENTIAL OF ADAPTATION	DIMENSIONS				
	OVERALL	DEPTH	SCOPE	SPEED	LIMITS
LOW	Adaptation is minor, sporadic and poorly coordinated	Adaptations are largely expansions of existing practices, with minimal change in underlying values, assumptions or norms	Adaptations are largely localized and fragmented, with limited coordination or mainstreaming across sectors, jurisdictions or levels of governance	Adaptations are implemented slowly	Adaptations do not substantively challenge soft limits
MEDIUM	Adaptation is expanding and increasingly coordinated	Adaptations reflect a moderate shift away from existing practices, norms or structures	Adaptations affect wider geographic areas, multiple areas and sectors or are mainstreamed and coordinated across multiple dimensions	Adaptations are implemented moderately quickly	Adaptations may overcome some soft limits but do not challenge hard limits
HIGH	Adaptation is widespread and implemented at or near its full potential across multiple dimensions	Adaptations reflect entirely new practices involving deep structural reform, complete change in mindset, major shifts in perceptions or values, and changing institutional or behavioural norms	Adaptations are widespread and substantial, including most possible sectors, levels of governance and actors	Change is rapid for a given context	Adaptations overcome many soft limits and challenge hard limits

Source: Adapted from Intergovernmental Panel on Climate Change. 2022. *Climate Change 2022: Impacts, adaptation, and vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.* [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge, UK, Cambridge University Press. https://dx.doi.org/10.1017/9781009325844

Both incremental and transformative adaptation can help smallholders respond to climate-induced changes by shaping agricultural and broader social-ecological systems. However, a review of adaptation literature carried out for the IPCC Sixth Assessment Report found that most climate adaptation actions being implemented involve only "minor modifications to usual practices taken to address extreme weather conditions", such as changing crop varieties or the timing of planting, the adoption of new types of irrigation or pursuing supplementary livelihoods (IPCC, 2022a). Rather than resulting in "radical or novel shifts in practice or values", these interventions are mostly "low depth" in character and, as the report notes, often narrowly focused on actions within a specific sector or geographical location (ibid.).

Their limited scope means that such interventions may support individual households or communities in incremental adaptation but fail to address the broader, complex, interconnected challenges resulting from climate change that also affect livelihoods. This is also typical of most adaptation activity related to social protection, which tends to focus on localized technical innovations in a particular sector rather than addressing broader social-ecological systems challenges, where large-scale and systemic public action – as opposed to more fragmented, locally-resourced approaches – is most essential. It is also seldom informed by longer-term projections on how the climate is expected to change (Aleksandrova, 2019).

LIMITS TO ADAPTATION

Limits to adaptation arise "when the prevailing system cannot be secured from climate risks" (Lipper and Cavatassi, 2024). They can be defined as "the point at which an actor's objectives (or system needs) cannot be secured from intolerable risks through adaptive actions" (IPCC, 2022a) or, more simply, as the stage at which needs can no longer be met through incremental or transformative adaptation (FAO, 2023a). Once limits are reached, systems fail and the resulting situation is "intolerable", representing an existential breakdown of the system (IPCC, 2022a). At this point, no further measures can be taken to prevent significant harm or damage and the system collapses. This may drive regime shifts – "large, persistent, often abrupt changes in the structure and function of social-ecological systems" (Stockholm Resilience Centre, n.d.). If these limits are reached and alternative non-agricultural livelihoods are unavailable, individuals, households and potentially whole communities experience the collapse of their social-ecological context and enter an impoverished state in which their needs can no longer be met (FAO, 2023a) and in which climate risks are described as intolerable in the literature (Dow, Berkhout and Preston, 2013; Dow *et al.*, 2013; Klein *et al.*, 2014).

Climate literature refers to the period following adaptation failure (when the impacts and projected risks from climate change surpass limits to adaptation and existing systems fail) as the point at which unavoidable loss and damage occurs (IPCC, 2022a).[7] However, while the period after limits to adaptation are reached is considered a conceptually distinct phase requiring a separate set of policy responses, the implications of limits to adaptation being reached are only slowly being reflected in global climate policies and processes and have not yet been adequately incorporated into the social-protection discourse. This issue is explored further in section 3.

Limits to adaptation need to be understood in relation to multiple systems, given that individual actors, households and communities depend on a range of interconnected human and natural systems.

[7] Loss and damage may also occur where adaptation actions could have been taken but were not. This is known as "unavoided" loss and damage, as opposed to "unavoidable" loss and damage (Jensen and Jabczyńska, 2022). See below for further discussion in the context of "soft" and "hard" limits to adaptation.

Limits to adaptation need to be understood in relation to multiple systems, given that individual actors, households and communities depend on a range of interconnected human and natural systems simultaneously. Smallholders, for example, engage with small-scale agricultural systems, diversified rural livelihoods systems, large-scale agribusiness systems, infrastructure systems (e.g. irrigation, potable water and transportation), local and national social, political and commercial systems as well as ecosystems (see, for example, Kerr *et al*., 2022; Juhola *et al*., 2024). Climate-change impacts can disrupt the functioning of some or all of these individual systems, which may ultimately reach their limits and cease to function, affecting the viability of rural livelihoods in different ways. Hence, limits to adaptation may not only affect the specific agricultural systems that underpin smallholder livelihoods but also the overall social-ecological system within which those engaging in rural livelihoods operate (Bott, 2022).

Depending on the extent of systems breakdown, people either attempt to continue their previous lives but without the benefits that each individual system had previously provided (e.g. income, food, drinking water, safe living environment, social and political stability) or exit that particular system and engage in alternative social and economic practices to compensate (e.g. diversifying livelihoods, using tankered drinking water, using road instead of river transportation). As long as sufficient alternative options are available, affected populations may remain *in situ*, pursuing alternative livelihoods, even if these may be inferior to their previous livelihoods systems and may not provide the same standard of living. This is possible as long as the overall social-ecological system within which they live remains functional.

However, the system reaches a tipping point when a critical mass of the constituent human and ecological systems fail (see *Box 1* for an example of this). At this point, the limits to adaptation have been reached for the social-ecological system as a whole. In this situation, people must either leave the location or stay but suffer poor or intolerable conditions (without access to viable livelihoods, basic resources or services etc.) – a situation known as "involuntary immobility" (Gilmore *et al*., 2024; Letta, Montalbano and Paolantonio, 2024). Those most likely to remain *in situ* tend to be the poorest, most vulnerable and marginalized people, i.e. those without exit options, although for others the decision to stay may be shaped by factors such as place attachment, cultural ties or a desire to protect land and heritage (Benveniste, Oppenheimer and Fleurbaey, 2022; Bower and Weerasinghe, 2021; FAO and UNU-EHS, 2025; Farbotko and McMichael, 2019; Ncube and Murray, 2025).

In reality, individual and household strategies may differ, creating more of a continuum from immobility to forced or planned displacement, migration or relocation (FAO and UNU-EHS, 2025). However, for the sake of clarity in this paper, immobility and mobility are characterized as two distinct outcomes, with different policy implications (Zekarias and Zecharias, 2023).

Currently, few countries have comprehensive frameworks for anticipating and facilitating planned relocation and mobility in the context of climate change (Bower and Weerasinghe, 2021) or complementary social protection frameworks to support the process. More than 200 planned relocations associated with rapid- or slow-onset climate hazards have been documented in countries across multiple regions (ibid.) and the IPCC has recognized that "as climate risk intensifies, the need for planned relocations will increase" (IPCC, 2022a). Some have taken place within a comprehensive legislative framework, including that of the Government of Fiji, which prepared National Guidelines on Planned Relocation and passed acts of parliament to support their implementation. Others are based on explicit policies, including the Government of Vanuatu's National Policy on Climate Change and Disaster-Induced Displacement and the Pacific Access Category programme, which allows

residence in New Zealand for selected citizens from Fiji, Kiribati, Tonga and Tuvalu, at least partially in recognition of climate impacts (Chang and Collie, 2022).

However, even where legislated frameworks or explicit policies are in place, planned relocations often prioritize physical resettlement over the longer-term well-being of affected communities and overlook the need for culturally appropriate livelihood pathways, which are critical to the success and sustainability of relocation efforts (Piggott-McKellar *et al.*, 2020). This increases the risk of impoverishment, social fragmentation and long-term vulnerability among those who have been relocated (Bower *et al.*, 2023).

Much of the existing adaptation literature relating to agrifood systems and agricultural livelihoods focuses on technical limits within particular agricultural systems and overlooks the broader social-ecological context within which these systems are embedded (IPCC, 2022a; Schipper and Mukherji, 2024; Simpson *et al.*, 2023). This is problematic, as even where adaptation can enable specific agricultural systems to continue in the face of climate challenges, these adaptation interventions are unlikely to result in successful and sustained livelihoods outcomes if the broader social-ecological system is compromised by other human and/or ecological systems reaching their limits[8] as a result of climate or other external factors. For this reason, reaching climate-induced limits of ecological or human systems may limit the viability of a range of rural livelihoods, even if agricultural-sector adaptations are introduced and are initially successful. Conversely, even if specific agricultural systems reach their adaptation limits, alternative livelihoods options may still emerge if the broader social-ecological system is still able to adapt successfully, allowing former smallholders to diversify or transform their livelihoods.

Reaching climate-induced limits of ecological or human systems may limit the viability of a range of rural livelihoods.

[8] For example, through energy or transport infrastructure breakdown, lack of potable water and health challenges relating to extreme heat or changes in vector-borne disease.

The case study set out in *Box 1* illustrates how different human and ecological limits together shape the limits to social-ecological adaptation and influence the livelihood and mobility responses of those affected.

Box 1. ***Reaching adaptation limits in the Okavango Delta, Botswana***

In 2018/19 a severe drought resulted in the drying out of parts of the Okavango Delta in Botswana, the world's largest inland delta. As a result, villagers working in the Boro River "poling" station to provide canoe excursions for tourists lost their livelihoods.

Hundreds of polers and their families were helped to move to Daunara village, which still had water in the river. However, further drying of the delta, together with the impact of COVID-19, significantly reduced tourism and demand for canoe trips, generating increasing competition between the relocated population and the local polers, inflaming social tensions.

Boro villagers adopted other adaptive strategies besides relocating within the delta, including trapping wildlife, migrating to cities, abandoning farming, reducing the number of livestock, digging wells and boreholes and joining government-run social protection schemes such as Ipelegeng, a temporary employment programme. However, in many cases these strategies failed to provide sustainable livelihoods, leaving villagers dependent on non-governmental organizations for continued access to education and health facilities and without access to adequate safe drinking water.

The Government of Botswana's social protection programmes assist with seeds for farmers and provide compensation when wild animals harm livestock or property. However, they do not address the significant financial and technical barriers to ensuring access to water for consumption and agriculture, adequate measures to reduce conflict with wild animals, or the wider and systematic set of biophysical, economic and social limits to adaptation that climate change is causing. In the absence of efforts to address these constraints, economic, health and social systems are reaching their limits and the wider social-ecological system in which the Boro polers are embedded is reaching the limits to adaptation.

Source: Tshipa, S. 2025. Seven years of climate migration: A tale of the ghost villages of the Okavango Delta. In: *ALL ACT.* London. [Cited 3 September 2025]. https://tinyurl.com/4vxr3v39

Hard and soft limits

A distinction can be made between "hard" and "soft" limits to adaptation (IPCC, 2022b). Hard limits are those "imposed by the physical limitations of a species, ecosystem, location, or piece of infrastructure" (Addison *et al*., 2022) and represent "the point at which no action is possible to avoid intolerable risk." Hard limits are primarily the biophysical factors that inhibit the functioning of species, ecosystems or people (e.g. extreme heat, loss of land to sea-level rise, collapse of ecosystems). By contrast, soft limits are encountered when options to avoid intolerable risks through adaptive action are possible (e.g. adoption of technological solutions) but these options are not available to those affected due to a lack of finance, policy or power (Future Earth, The Earth League and WCRP, 2025; Lipper and Cavatassi, 2024). Such soft limits do not necessarily affect all members of a given society equally, as community members with greater agency and resources may be able to adopt effective adaptation responses while others may not (Addison *et al*., 2022; Lipper and Cavatassi, 2024; Simpson *et al*., 2023).

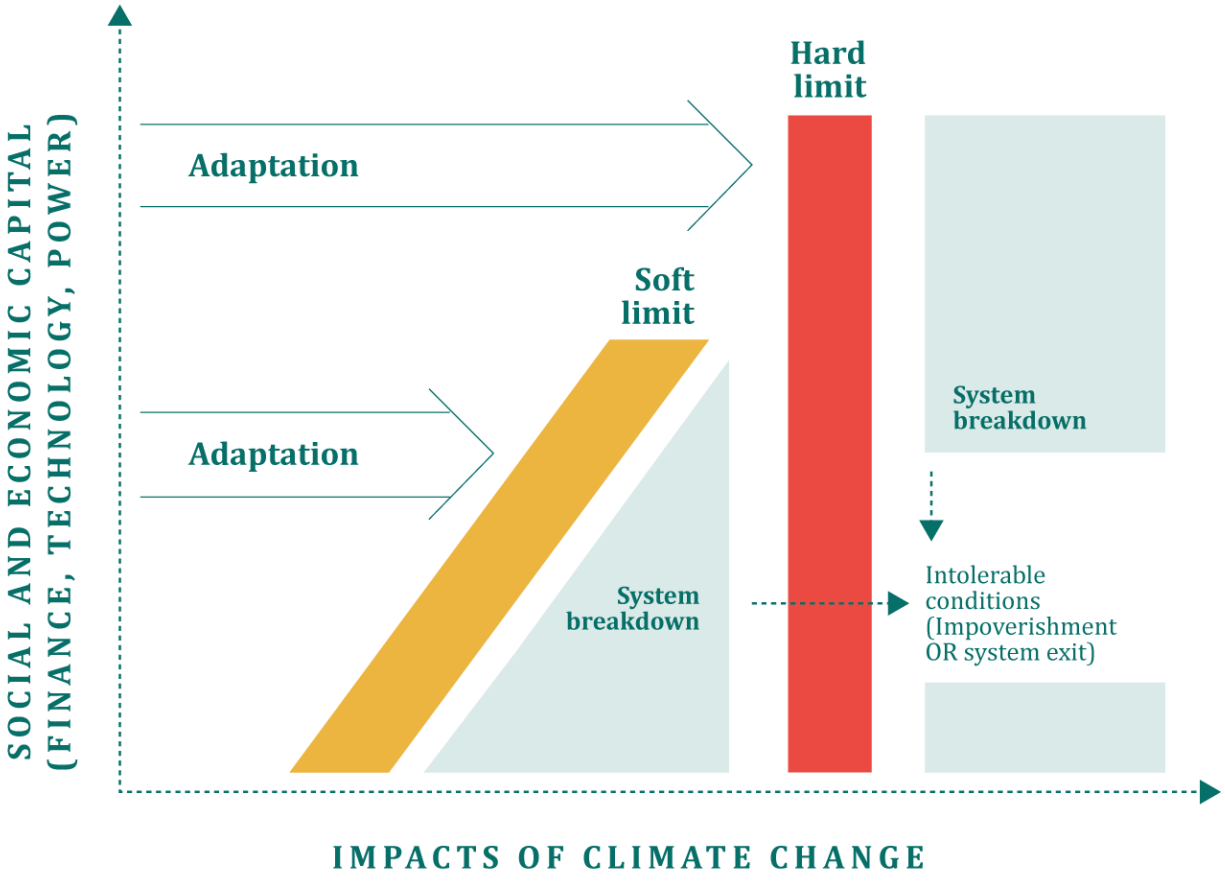
While hard biophysical limits represent an upper boundary in the limits to adaptation of agricultural livelihoods across different contexts and settings, other limits to adaptation are not fixed but are determined by "dynamic socioecological systems" (IPCC, 2022a). These include the magnitude of climate hazards (such as the amount of sea-level rise in low-lying coasts and islands), exposure and vulnerability to those hazards (in terms of the populations and assets in affected areas) and physical, infrastructural and social "tolerance thresholds", which may be highly context specific. "[T]he evolution of … socioeconomic systems over time, including their interaction with the changing physical climate" is thus a key determinant of the evolution of limits to adaptation (IPCC 2022a). This means that limits to socioeconomic adaptation are highly context specific and socially differentiated, being informed not only directly by climate impacts on agricultural systems but also by the broader social-ecological system within which they are located and by pre-existing social and economic conditions.

Both hard and soft limits can lead to system breakdown and intolerable conditions.

As Lipper and Cavatassi (2024) note, "many of the constraints to adaptation are the same as those that constrain processes of economic development and poverty reduction." These include lack of access to land and capital, low labour productivity, governance challenges and barriers arising from social and cultural forces. As such, soft limits may be overcome if relevant financial, governance, institutional, technological, social or policy-related constraints are addressed (FAO, 2023a). Whether limits are hard or soft – or continue to be limits at all – may also change over time as additional adaptation options become available (IPCC, 2022a).

Figure 1 shows how both hard and soft limits can lead to system breakdown and intolerable conditions. Soft limits vary between and within communities and socioeconomic groups, and even within and between individual rural households, due to the differing levels of vulnerabilities, resilience and adaptive capacity that are determined by socioeconomic, demographic, ethnic, geographic and other intersectional factors (Addison et al., 2022).

Figure 1. *The relationship between soft and hard limits to adaptation, intolerable risk and systems exit*



Source: Authors

In addition, the impacts of climate change are not discrete but rather are interdependent and compounding (World Bank, 2024); as well as affecting agricultural systems directly, in combination they generate additional and unanticipated limits to adaptation in relation to wider social-ecological systems. Impacts are non-linear and accelerating in unpredictable ways, driven by domino effects and tipping points, and are likely to result in profound disruption in social-ecological systems, including regime shifts (Stockholm Resilience Centre, n.d.). This introduces a significant degree of uncertainty in the likely temporal and spatial occurrence of both hard and soft limits to adaptation. Already, both direct and compounding impacts are occurring at a significantly faster rate than had been previously anticipated. As such, the focus on promoting adaptation in a single aspect of smallholder livelihoods (e.g. irrigation methods or diversification of crops) while failing to take account of broader challenges resulting from cascading impacts across sectors and social-ecological systems (including food systems breakdown, infrastructural disruption, excess heat etc.) may result in underestimating the risks of limits to adaptation in many contexts.

Finally, it is not only climate change that is generating limits to smallholder adaptation; policy interventions intended to promote climate-change mitigation and even adaptation can also exacerbate the vulnerability of some marginal groups in terms of limits to adaptation (Bayrak and Marafa, 2016; Eriksen et al., 2021). Agrifood systems are responsible for approximately one-third of current global greenhouse gas emissions and have the potential to provide 20–30 percent of the mitigation actions necessary for a 1.5 °C or 2 °C pathway (FAO, 2022; IPCC, 2022a), particularly through reducing deforestation and changing agricultural practices. As such, the sector is a key focus of mitigation efforts in nationally determined contributions (Crumpler et al., 2022). However, mitigation policies can themselves directly create adaptation limits for smallholders: some policies adversely affect access to the land and natural resources critical for livelihoods; others negatively impact incomes and food, fuel and transport prices, reducing the ability of smallholders to meet basic needs (Hasegawa et al., 2018).

Policy interventions intended to promote climate-change mitigation and even adaptation can also exacerbate the vulnerability of some marginal groups.

The interaction of non-climate policies, such as infrastructure investments and agricultural development initiatives, may also generate unanticipated negative outcomes for some segments of rural populations (Davies *et al.*, 2024; FAO, 2024; Fobosi and Malima, 2025; Li, 2007; Scott, 1998).

MALADAPTATION

Before addressing the issues of limits to climate adaptation and adaptation in global policies and how these connect with social protection, it is important to briefly address the concept of maladaptation.

Interventions are considered maladaptive if they result in "increased risk of adverse climate-related outcomes, including via increased vulnerability to climate change, diminished welfare, or increased greenhouse gas (GHG) emissions, now or in the future" (IPCC, 2022a). The report of Working Group II on Impacts, Adaptation and Vulnerability for the IPCC's Sixth Assessment Report noted an increase in responses to climate change that are maladaptive, particularly in relation to agriculture and human mobility.

Maladaptive approaches fall into three broad categories (Kerr, 2023):

- "fixes that fail", where short-sighted solutions fail to address the root causes of a problem and provide effective short-term fixes but create long-term negative side-effects;
- "band-aid solutions", where temporary short-term solutions are introduced rather than long-term adaptive actions; and
- "success to the successful", where some groups benefit from interventions at the expenses of other groups.

Maladaptive responses can thus take a range of different forms and can sometimes be identified only when the distribution of impacts is considered across time and space and across society. Interventions may be simultaneously

both adaptative and maladaptive, in that they may reduce vulnerabilities for some while creating new vulnerabilities for others, especially already marginalized groups (Antwi-Agyei *et al.,* 2018; Szaboova *et al.,* 2023). There can also be a tension between adaptation interventions and broader development and sustainability outcomes (Simpson *et al.,* 2023). An example of this would be promoting irrigation in rainfed croplands experiencing drought; this might boost crop production but at the cost of depleting freshwater stocks and damaging aquatic ecosystems (Simpson *et al.,* 2023). Short-term, iterative adaptation might also be maladaptive if considered over a longer timescale, with short-term incremental adaptation responses locking farmers into maladaptive pathways over the longer term (IPCC, 2022a).

Social protection can sometimes also contribute to maladaptation, albeit unintentionally.

Social protection can sometimes also contribute to maladaptation, albeit unintentionally. For example, social protection programmes could foster unsustainable adaptations by linking eligibility requirements to a fixed domicile; this would limit the potential for migration as an adaptation strategy and increase rather than reduce vulnerability by creating incentives to remain in agricultural livelihoods that are inherently unsustainable (Costella and McCord, 2023). Similarly, they may facilitate diversification into livelihoods that are themselves of diminishing viability in the face of climate change, such as shifting from crops to livestock.

Schipper and Mukherji (2024) found that the primary causes of maladaptation resulting from adaptation interventions were related to design and implementation challenges, often resulting from an exclusive focus on narrow, sector-specific technical issues rather than the broader development context and the social-ecological systems within which adaptation responses took place. Given the current focus on the use of social protection to promote agricultural adaptation as a response to climate change (Bhalla *et al*., 2024), this issue is of particular concern (Eriksen *et al*., 2021).

Simpson *et al.* (2023), in a review of literature on adaptation interventions across 39 countries, identified maladaptive outcomes in almost half the studies reviewed. They found that a significant proportion of these interventions provided benefits for some but had unanticipated negative impacts on other segments of society and that 11 percent of the interventions reduced the effectiveness of other adaptation responses.

Overall, the main concerns identified in the literature are that maladaptation can increase vulnerability of those implementing the action; shift vulnerability to other actors or sectors; result in outcomes that are inequitable; diminish welfare; and even increase emissions (Kerr, 2023).

The key insight in relation to soft and hard limits to adaptation specifically is that, rather than reducing risks and vulnerability, maladaptive interventions may end up transmitting and exacerbating vulnerabilities across time, space and society, ultimately undermining efforts to address the challenges of adaptation limits (Biella *et al*., 2024; Juhola *et al*., 2016, 2024; Kerr, 2023; Magnan *et al*., 2016).

The focus in much of the current programming and literature on the role of social protection in relation to smallholder adaptation is on promoting change in specific technical agricultural practices (Bhalla *et al*., 2024), in line with prevailing

approaches to smallholder adaptation outlined above (IPCC, 2022a). However, it is essential for the discourse on social protection adaptation to consider limits to adaptation within wider human and ecological systems and the power structures that shape the social-ecological context of smallholder livelihoods. This includes a recognition that adaptation interventions that work well for some groups may not be effective for others, with "successful" agriculture-focused adaptation approaches sometimes failing to reach vulnerable subgroups of smallholders or landless farmers due to the unequitable socioeconomic and geographic distribution of vulnerability. Further, addressing the adaptation limits of one segment of a community may, in some cases, exacerbate adaptation challenges for others (Szaboova 2023). However, before exploring key considerations for future social protection policy and programming in more detail, we first provide an overview of how these issues are currently reflected in existing global policy agendas.

It is essential to consider limits to adaptation within wider human and ecological systems and the power structures that shape the social-ecological context of smallholder livelihoods.

3. How are adaptation limits addressed in global policy agendas?

In this section we review the extent to which the implications of limits to adaptation are considered in the global policy agenda in general and the social protection discourse in particular.

GLOBAL CLIMATE DISCOURSE

Limits to adaptation have long been identified in the climate discourse and were documented in the Stern Review two decades ago (Stern, 2006). This argued that:

> *"There are clear limits to adaptation in natural ecosystems. Even small changes in climate may be disruptive for some ecosystems (e.g. coral reefs, mangrove swamps) and will be exacerbated by existing stresses, such as pollution. Beyond certain thresholds, natural systems may be unable to adapt at all, such as mountainous habitats where the species have nowhere to migrate. But even for human society, there are technical limits to the ability to adapt to abrupt and large-scale climate change, such as a rapid onset of monsoon failure in parts of South Asia. Sudden or severe impacts triggered by warming could test the adaptive limits of human systems. Very high temperatures alone could become lethal, while lack of water will undermine people's ability to survive in a particular area, such as regions that depend on glacier meltwater. Rising sea levels will severely challenge the survival of low-lying countries and regions such as the Maldives or the Pacific Islands, and could result in the abandonment of some highly populated coastal regions, including several European cities."*

The issue of hard limits was highlighted in the contribution of Working Group II on Impacts Adaptation and Vulnerability to the Sixth Assessment Report of the IPCC (AR6) in relation to both human and natural systems (IPCC, 2022a). The report acknowledged that "hard limits to adaptation have been reached in some ecosystems", including some warm-water coral reefs, coastal wetlands, rainforests and polar and mountain ecosystems. It also noted that "with increasing global warming, losses and damages will increase and additional human and natural systems will reach adaptation limits", with the geographical scope and severity of these impacts increasing if global warming level exceeds the 1.5 °C, 2 °C and 3 °C thresholds.

The inclusion of substantive analysis on limits to adaptation for the first time in AR6 reflects the increasing visibility of the concept, particularly in discussions within the climate and agriculture sectors, and its incorporation into integrated assessment modelling (Berkhout and Dow, 2023). It is also a response to the documentation of the lived experience in parts of the Global South that are already reaching limits to adaptation, including Pacific Island countries (Bryar and Westbury, 2023) and Bangladesh (Huq *et al.*, 2024). Drawing on these insights, efforts have been made to increase attention to the issue in the public climate discourse, for example by characterizing the challenge as the "myth of endless adaptation" and questioning prevalent assumptions that the ability to adapt is unlimited and that adaptation options will not at some point be exhausted (Future Earth, The Earth League and WCRP, 2022; Martin *et al.*, 2022).

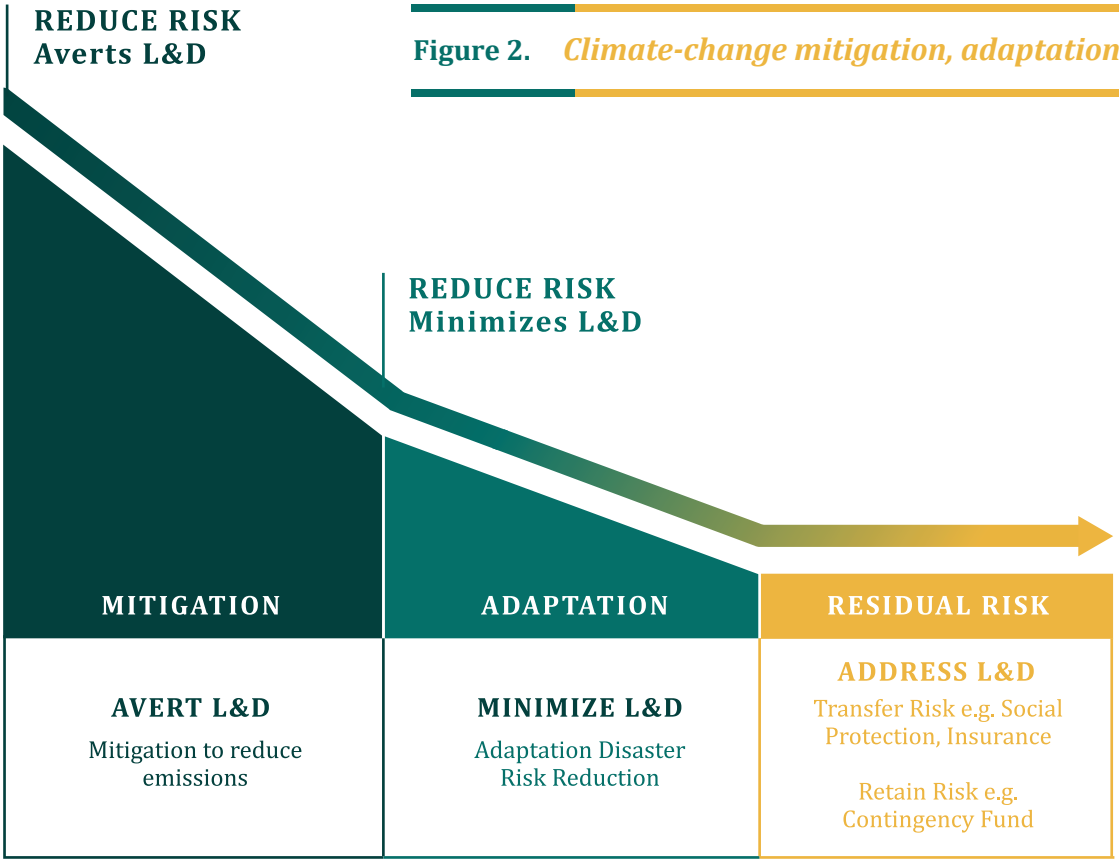
Another important development is the increased profile given to the issue of limits to adaptation in the negotiations around financing to address unavoidable, unavoided or residual loss and damage resulting from climate change. These negotiations have resulted in recent years in the establishment of the Fund for responding to Loss and Damage (FRLD) (FRLD, 2025) and the development of the Santiago Network (Santiago Network, n.d.), which is mandated to support the development and implementation of FRLD-supported interventions. The losses and damages under discussion are sometimes referred

to as "residual climate impacts" (see, for example, Mechler *et al.*, 2020) and can be understood as the "impacts of climate change that have not been, or cannot be, avoided through mitigation or adaptation efforts" (Jensen and Jabczyńska, 2022). While there is no official definition of loss and damage under the UNFCCC, it is generally agreed that the term includes the economic and non-economic impacts that occur despite, or in the absence of, mitigation and adaptation efforts (ibid.)[9].

While mitigation and adaptation actions may avert and minimize loss and damage, they do not entirely eliminate risk *(Figure 2)*. Loss and damage that occur are the residual impacts that have not been avoided through interventions or when the limits to adaptation are reached.

For smallholders, loss and damage occur once soft or hard limits to adaptation have been reached and take the form of impacts that have not – or cannot – be averted or minimized at this point directly and that negatively affect their livelihoods and well-being. However, defining precisely how these limits relate to the experience of loss and damage is a politically sensitive issue. Many high-income countries and some middle-income countries avoid recognizing hard limits to adaptation in human and broader social-ecological systems because to do so would mean accepting the full consequences and associated costs of climate change and raise challenging questions about responsibility for financing those costs. This is a highly contested issue and as a result has been largely avoided in climate negotiations to date (Berkhout and Dow, 2022; Stern, 2006).

Figure 2. ***Climate-change mitigation, adaptation and loss and damage***



Source: FAO. 2023. *Loss and damage in agrifood systems: Addressing gaps and challenges.* Rome. https://doi.org/10.4060/cc8810en adapted from Richards, J.-A. 2022. How does loss and damage intersect with climate change adaptation, DRR and humanitarian assistance? In: *The Loss & Damage Collaboration.* [Cited 4 September 2025]. https://tinyurl.com/5n6fyyat

Note: L&D – loss and damage.

[9] "Economic losses" refers to the loss of resources, goods and services commonly traded in markets such as agricultural products, infrastructure or property. Non-economic losses are losses that can affect individuals, society and/or the environment (e.g. loss of life or health, loss of territory, loss of cultural heritage, identity or indigenous knowledge, loss of biodiversity or loss of entire ecosystems) (Jensen and Jabczyńska, 2022).

Consideration of the potential role of social protection in meeting the basic needs of smallholders where limits to adaptation have been reached – and in supporting rehabilitation, reconstruction and possible relocation – also invokes this political sensitivity, as does the question of who holds liability in relation to impoverished or displaced smallholders. This may be one reason why the discussion of the potential role of social protection in responding to disruption caused by regime shifts after limits to adaptation are reached has not been more prominent in the loss-and-damage discourse to date.

These issues have significant climate justice implications. Calls for the establishment of the FRLD were rooted in claims related to climate justice and equity, given that those countries and individuals least responsible for climate change are disproportionately affected by its impacts. However, efforts to conceptualize the relationship between limits to adaptation and notions of justice are still quite limited (Düvel and García-Portela, 2024; Wallimann-Helmer and Kräuchi, 2025). The issue is yet to be fully integrated into the policy discourse around a just transition, which aims to ensure that the shift to more sustainable economies is not only environmentally responsible but also equitable and just for all (ILO, 2015; ILO and UNEPFI, 2023). A 2024 technical paper by the UNFCCC Secretariat on defining and understanding transformational adaptation in the context of hard and soft limits to adaptation (UNFCCC, 2024) recognized the importance of connecting transformational adaptation with efforts to support a just transition.

The discussion of limits to adaptation has not yet spread from the AR6 and associated technical processes into the social policy agenda relating to agrifood systems, rural development or social protection. Neither have developments such as the scientific modelling of hard limits to crop suitability or the boundaries of future habitation viability (Lenton *et al.*, 2023; Mombo *et al.*, 2025) or the use of geospatial mapping tools to assess climate implications on production[10] been systematically incorporated into mainstream approaches to inclusive climate adaptation or the climate and social protection discourse. As a result, the implications for agricultural livelihoods and the sustainability of broader social-ecological systems have not yet been widely explored (Juhola *et al.*, 2024). It is notable that the World Social Protection Report 2024–26 (ILO, 2024), which focuses on climate action and a just transition, contains no reference to the issue of limits to adaptation.[11] For the time being, the topic of limits to adaptation remains essentially a technical, expert issue that has not yet been mainstreamed into development planning, social protection or humanitarian discourses (Costella and McCord, 2023).

Until limits to adaptation are integrated into mainstream development policy, the development community will struggle to adequately engage with the topic. Without this shift, it will be difficult to design appropriate policies and interventions that match the scale of needs and respond to the associated regime shifts, economic disruptions, population mobility and impoverishment that are likely to result.

SOCIAL PROTECTION PROGRAMMING AND POLICY DISCOURSE

The topic of climate adaptation and social protection is well reflected in current literature (see, for example, Bhalla *et al.*, 2024; Costella and McCord, 2023; Kundo *et al.*, 2021; Tenzing, 2020) and in an increasing range of programmes (Costella *et al.*, 2024). It is also included in position papers of major bilateral and multilateral development partners (see, for example, Bowen *et al.*, 2020) and incorporated in the targets on poverty and livelihoods (9f) and food and agriculture (9b) in the consolidated list of indicator options of the Paris Agreement's Global Goal on Adaptation under the United Arab Emirates–Belém work programme on indicators (UNFCCC Authors, 2025).

However, the issue of limits to adaptation is less well accommodated. While there are brief references to

[10] See, for example, FAO's geospatial app, Adaptation, Biodiversity and Carbon Mapping Tool (ABC-Map) (FAO, n.d.), which has the capacity to provide information on the suitability of major crops in evolving climate scenarios to the end of the century.

[11] This in part reflects the consequences of early efforts to separate climate adaptation from mainstream development for funding purposes. That distinction created a conceptual gap between the two workstreams and resulted in a technocratic, top-down approach to adaptation, rather than a more integrated developmental approach.

limits to adaptation and the associated challenge of maladaptation in recent social protection literature, this issue has not yet been formally explored in terms of its implications for social protection in the academic literature or in position papers by major international development partners, either conceptually or through literature reviews.

For example, a 2022 bibliometric review of social protection, disaster risk reduction and climate-change adaptation did not identify adaptation limits among the key themes or keywords addressed in the literature (Rana *et al.*, 2022). Limits to adaptation are also not discussed in any length in key literature on the role of social protection in climate adaptation and mitigation (see, for example, Agrawal *et al.*, 2020; Aleksandrova, 2019; Bhalla *et al.*, 2024; Costella *et al.*, 2023; Silchenko and Murray, 2023; Tenzing, 2020). A review of position papers on social protection and climate action by seven international organizations identified no references to limits to adaptation, except for a brief reflection in a single World Bank paper on the possible implications of the limits to adaptation on programme design (Costella *et al.*, 2024).

We find similar gaps in programming: a global mapping of climate-relevant social protection programmes (Costella *et al.*, 2024) identified 23 programmes in low-income countries that included adaptation components (defined as facilitating behavioural, ecological or infrastructure adaptation actions or measures) but none of the related programming documentation mentioned limits to adaptation. Interviews with the managers of selected flagship climate-relevant social protection programmes also confirmed that this issue is not yet identified as a priority concern.

One consequence of the absence of discussion about the limits to adaptation in the broader social protection discourse is that programming frequently retains a business-as-usual framing of agriculture, focused largely on technical sectoral responses that promote short-term iterative adaptation. This approach overlooks the broader and more profound impacts that climate change is engendering across a range of human, biophysical and social-ecological systems and the implications of limits to adaptation over medium-term timescales. This may at least in part reflect the fact that social protection interventions are rarely part of more-comprehensive integrated programmes that tackle these medium- to long-term challenges. As a result, debates on policy and programming within the sector do not yet explicitly address the profound and compounding implications of limits being reached across multiple nested and interrelated human and biophysical systems; the implications that follow from this in terms of fundamental constraints in the capacity of populations to support themselves in future through traditional, or even diversified, livelihoods; and the need to develop long-term, strategic responses that are commensurate with the scale and severity of this challenge.

The lack of discussion on limits to adaptation in social protection leads to programming frequently retaining a business-as-usual framing of agriculture.

[12] Key project documents included in the mapping for each adaptation programme were reviewed using the search terms "limit to adaptation", "limits to adaptation", "adaptation limit" and "hard limit".

4. What are the key considerations for social protection systems?

Overall, there has been limited conceptual or analytical crossover from the agriculture and climate sectors into the social policy sector on the emerging policy discourse around the limits to adaptation and the related issue of maladaptation. However, for countries already approaching hard biophysical limits, the implications for social protection are profound. This is well illustrated by the case study from Brazil set out in *Box 2.*

Box 2. ***Facing hard limits in the Bolsa Verde, Brazil***

The *Bolsa Verde* cash transfer programme in Brazil has been implemented since 2011 (with a suspension between 2018 and 2023) and provides households living in extreme poverty with cash transfers in return for conducting activities that conserve natural resources. It aims to promote the conservation of ecosystems (caring for the environment and sustainable use of resources), encourage the practice of citizenship, improve the living conditions of households in situations of extreme poverty, and promote the participation of recipients in environmental, social, educational, technical and professional actions. It is recognized globally as an innovative and successful programme that has had significant effects on poverty and inequality and on the conservation of natural resources, having provided cash transfers to over 100 000 households prior to its suspension and currently reaching 30 000 households.

However, hard biophysical limits are now undermining the positive impact of the *Bolsa Verde* in some areas. Continuing drought left water levels in many Amazon basin rivers at their lowest on record in late 2024, a situation exacerbated by the connection between deforestation in the rainforest and reductions in rainfall. As the rivers dried up, their ecosystems were critically damaged, removing a vital source of nutrition and livelihoods for many smallholders while also rendering many rivers unnavigable. This undermined their function as critical transport arteries, restricting access to basic resources, including fuel, food and water, and curtailing access to health and education facilities. As a result, the availability of key commodities was severely restricted, leading to increases in scarcity and rising prices for basic goods such as food and water. This reduced the effectiveness of the *Bolsa Verde* in terms of closing the poverty gap and promoting the uptake of basic services while also undermining the viability of its conservation function.

Biophysical limits thus compromised the ability of the *Bolsa Verde* to function as an effective tool to address poverty and improve natural resource management by undermining the broader social-ecological system on which it depends. As a result, the medium- to long-term viability of a previously successful social protection model is being brought into question, and alternative approaches to securing smallholder welfare and promoting sustainable adaptation in the Amazon basin now have to be considered.

Sources: Economic Commission for Latin America and the Caribbean. n.d. *Bolsa Verde* programme (2011-). In: *ECLAC Non-contributory Social Protection Programmes Database.* [Cited 4 September 2025]. **https://dds.cepal.org/bpsnc/programme?id=60**; and Gabriel de Mendonça Domingues, Coordenador-Geral de Gestão Socioambiental, personal communication, 2025.

The experience of the *Bolsa Verde* programme in Brazil demonstrates how hard biophysical limits can generate a cascade of compounding ecosystem and human-systems disruptions, exacerbating pre-existing developmental challenges and undermining the efficacy of existing social protection programmes. While the extreme drought experienced in 2024 was temporary, it raises the question of whether the rivers of the Amazon basin will remain viable sources of nutrition, livelihoods and transport in the medium to long term. As a result, there are likely to be significant smallholder populations who are no longer able to meet their basic needs through existing or diversified livelihoods in the coming decades. This exemplifies the nature of the challenge to social protection programming in contexts where no external adaptation options are available that can ensure the continuing viability of social-ecological systems or their ability to support tolerable levels of well-being for individuals, communities or societies in the future.

As previously noted, the role of social protection in supporting adaptation is already well developed and is a key part of the social protection and climate-change discourse. Depending on their depth, scope and speed, transformative adaptation interventions may even enable communities to challenge or overcome some of the soft limits to adaptation they face. However, the role of social protection in the post-limits scenario, in which intolerable conditions and loss and damage are core concerns, has not been similarly explored. Providing support after limits to adaptation have been reached is a critical area for future social protection policy and programming. It may also be considered a key additional social protection function in relation to climate change, alongside the already established functions of supporting resilience, shock response, adaptation, mitigation and enabling a just transition identified in the literature (Costella and McCord, 2023; Huber and Murray, 2024). This might be described as the post-limits, loss and damage or residual risk function of social protection.

CONCEPTUALIZING SOCIAL PROTECTION IN RELATION TO THE LIMITS TO ADAPTATION

The implication of the preceding discussion is that it is possible to identify two distinct scenarios for social protection policy and programming in relation to the limits to adaptation: the context prior to limits being reached, or the pre-limits scenario, and that after limits have been reached, or the post-limits scenario. These scenarios may not be fully discreet even within a specific population, given the existence of multiple interrelated systems whose limits may not be reached simultaneously and the unequal distribution of the capacity to overcome soft limits. As such, the point at which limits to adaptation are experienced is likely to differ across and within population groups, with much context-specific diversity in terms of both the nature of limits being reached and their impacts. However, given the exploratory nature of this paper and its intention to stimulate reflection on these issues, it is useful here to consider the broad conceptual implications of the pre- and post-limits scenarios for social protection as two discrete and generic phases as each generates a different set of challenges, questions and potential responses.

Key considerations for social protection in pre-limits scenarios

The main approaches to climate adaptation supported by social protection in rural contexts in the pre-limits scenario have been identified as the adoption of climate-adaptive agricultural practices; the diversification of livelihoods and income sources to reduce sensitivity to climate variability; and improved natural resource management and ecosystem restoration (Bhalla *et al.*, 2024). However, currently these approaches are generally not framed with reference to the limits to adaptation.

As a result, they continue to prioritize immediate technical agricultural constraints over responses that address long-term climate projections (Aleksandrova, 2019) and broader social-ecological systems, reflecting dominant paradigms in the agricultural sector (IPCC, 2022a). Some social protection interventions are therefore proving maladaptive, with compounding system dynamics eroding the effectiveness of previously successful responses (Aleksandrova, 2019). As with other policy areas, this short-term focus may also be reinforced by donor planning horizons and political cycles at national level, which often limit considerations of longer-term risks.

Pre-limits social protection programming needs to explicitly identify and incorporate approaching limits to adaptation if it is to ensure the sustainability of adaptation actions it supports. This should be based on the growing body of scientific evidence on this topic and the experience of countries already experiencing limits to adaptation. The key challenge, therefore, is to critically review the relevance and adequacy of the social protection's contribution to adaptation in the context of approaching limits to adaptation and to test the viability of the assumptions that are currently driving adaptation programming in the sector.

Pre-limits social protection programming needs to explicitly identify and incorporate approaching limits to adaptation if it is to ensure the sustainability of adaptation actions it supports.

Enhancing the contribution of social protection to supporting smallholder populations in a pre-limits context will thus require:

- systematic engagement of climate scientists and experts on agrifood systems in designing social protection programmes to avoid an exclusive focus on short-term biophysical challenges within agricultural systems;
- consideration of how social protection can support smallholder strategies that address the context-specific and compounding effects of climate impacts across the range of biophysical and human systems that affect livelihoods;
- anticipation of reaching soft and hard limits to adaptation and the occurrence of regime shifts;
- increased attention to the social, temporal and geographical distribution of programme impacts in order to avoid potentially maladaptive outcomes, including the redistribution of negative impacts as limits are reached; and
- increased analysis of the cost and effectiveness of programming interventions over medium-term timescales so as to promote the efficient use of scarce resources.

Overall, this implies a more strategic and accountable approach to adaptation through social protection that is informed by climate analysis and integrated with climate policies. A central challenge in this regard is policy integration and coherence. This requires cross-sectoral coordination and climate-informed policy development to enhance sustainability, minimize trade-offs, avoid maladaptation and achieve

common objectives. Within this framework, social protection must be embedded in broader strategic planning processes on climate across different governance levels (Howarth *et al*., 2024), including alignment with national climate strategies such as nationally determined contributions and National Adaptation Plans and related rural development and agricultural strategies. Equally, climate impacts and the challenges of limits to adaptation must be fully reflected in social protection policies and strategies.

It also implies the need for a shift towards large-scale, long-term interventions informed by medium-term climate projections to address limits to adaptation and avoid unsustainable outcomes. This agenda is already technically feasible. However, it will require a substantial deepening of the cooperation between social protection, climate and agricultural experts given the currently limited use of climate information in the design of social protection programmes (Aleksandrova, 2019).[13] These efforts can also draw on the conceptual and analytical frameworks developed in relation to maladaptation and the limits to adaptation in the climate and agricultural sectors; the critical analysis of existing adaptation programming across these sectors; and the detailed climate impact modelling and analysis available within agencies such as FAO,[14] the European Commission and the World Bank[15] (see, for example, Berrang-Ford *et al*., 2021; Bhalla *et al*., 2024; Juhola *et al*., 2024; Kerr, 2023; Simpson *et al*., 2023). Finally, implementation must prioritize the development of scalable, interoperable systems – such as identification mechanisms and universal registries – capable of supporting rapid scale-up, efficient and effective large-scale provision and cross-sectoral coordination, including, where appropriate, cross-border interoperability between states to anticipate future needs (e.g. by building on agreements of the type between Pacific Island states and New Zealand discussed above). As many lower-middle-income countries currently lack the institutional capacity for such systems, significant investment in operational infrastructure and support through global and regional mechanisms and partnerships will be needed to develop these capacities and this infrastructure.

Key considerations for social protection in post-limits scenarios

The main routes through which social protection influences adaptation in rural contexts include climate-adaptive agricultural practices, diversification of livelihoods and improved natural resource management and ecosystem restoration. However, these are either inadequate or irrelevant in post-limits scenarios. In these scenarios, the functionality of existing social-ecological systems has collapsed, with the result that "risks become intolerable, leading to substantial and irreversible loss and damage, and radical changes in behaviour (such as land abandonment or human migration)" (O'Neill *et al*., 2022).

This scenario represents a major challenge for social protection, one that the sector has yet to acknowledge or engage with. Where there are no viable options for either sustainable agriculture or diversification into non-agricultural livelihoods *in situ* for all or even some smallholders,[16] this challenge has two main dimensions. The first is to support basic needs and income security for those in the "intolerable" zone, who are facing highly challenging biophysical conditions such as extreme heat and water scarcity and wider social-ecological challenges, including economic and

[13] Notable exceptions to this include the PROEZA (Pobreza, Reforestación, Energía y Cambio Climático) programme in Paraguay and the LINK (Building climate resilience by linking climate adaptation and social protection through decentralized planning in Mozambique) programme in Mozambique (FAO and GCF, 2025).

[14] For more information on climate impact modelling in agriculture, see FAO (2025).

[15] See, for example, the European Commission's INFORM Country Climate Risk (European Commission. n.d.) and World Bank Country Climate and Development Reports (World Bank Group, 2025).

[16] It is important to note that the simplifying and somewhat monolithic characterization of entire areas and populations as being at risk (reaching the limits to adaptation), which is prevalent in the literature, fails to recognize the socially and economically differentiated impacts that are likely in many instances (see Barrett, Steinbach and Addison, 2021).

market disruption. The second is to support populations in moving and resettling either internally (see IASC, 2010) or across borders. These can be characterized as "help to stay", "help to move" and "help on the move". However, in the case of social protection in the post-limits scenario these are also likely to include "help to resettle" and "keep helping", where continued income or other forms of support are required after resettlement or displacement.

Evidence suggests that even when large-scale outmigration happens, some will choose to remain and others will even attempt to return (Benveniste, Oppenheimer and Fleurbaey, 2022; Ncube and Murray, 2025; Thomas *et al*., 2025; Upadhyay, Vinke and Weisz, 2024) despite their awareness of the irreversible breakdown of ecological systems. This raises questions regarding what may be considered appropriate in terms of support for continued habitation in agroecological zones that are no longer viable for agriculture or other livelihoods, and how social protection can be mobilized to support both mobile and immobile populations in contexts of social-ecological and economic breakdown and regime shifts. Such decisions may be informed by experiences during previous episodes of significant and multi-country socioeconomic and labour-market dislocation. For example, between the First and Second World Wars there was significant innovation in social policy programme design to address the challenge of mass unemployment and ensure that basic needs were met (Gentilini, 2024; McCord *et al*., 2021). Strategies were developed that involved a combination of provision of cash, in-kind transfers and subsidies to support basic needs, together with state-sponsored employment through public works. These approaches remain relevant in the post-limits scenario, although their effectiveness may be compromised by biophysical constraints, health challenges and the scarcity of financial resources available, not least in the countries hit hardest by climate change. The development of an appropriate and affordable policy and programming portfolio to respond to these issues at scale therefore remains an outstanding challenge.

In addition to the provision of income support for those remaining *in situ*, the other major role for social protection in a post-limit scenario is likely to be supporting the process of internal or cross-border migration and relocation. Whereas in the pre-limits scenario migration is used in an attempt to adapt to increasingly challenging circumstances, once limits are reached migration becomes a strategy for exiting a failed social-ecological system and entering a new one. Once again, this will occur at different times for different people, with different groups of migrants having different needs and suffering different impacts depending on a variety of contextual factors. One example of relocation support of this kind is the Government of Fiji Climate Relocation of Communities (CROC) programme *(Box 3).*

Box 3. ***Government of Fiji Climate Relocation of Communities***

The Government of Fiji is providing climate resettlement grants as part of a government-legislated, community-driven process for the planned relocation of communities, settlements and groups. This process is a proactive retreat from the impacts of climate change when *in situ* adaptation efforts fail.

Eligibility for support to relocate is not contingent on the experience of a particular instance or type of event or impact. Relocation may be required due to vulnerability to both slow-onset events (sea-level rise, prolonged drought etc.) and sudden-onset events (severe flooding, exposure to cyclones, landslides etc.) or a combination of both.

Grants for domestic resettlement are administered under the Government of Fiji's Planned Relocation Guidelines, developed in 2018 and financed through the Climate Relocation of Communities (CROC) trust. The CROC and the resettlement programmes are supported by the 2019 Trust Fund Act and 2021 Climate Change Act, which together created a legal framework for relocation interventions. The fund was designed to support vulnerable communities, settlements and groups adversely affected by climate change that are seeking assistance from the government to relocate when limits to adaptation are reached. The fund is financed through a contribution from the Government of Fiji of 3 percent of the revenue raised through value-added tax on prescribed services, a plastic levy, a superyacht levy and income tax, along with contributions from international and bilateral funders.

Sources: Government of Fiji. 2023a. ***Fiji's Climate Relocation of Communities Trust Fund. Information Brief 1: An introduction to the Climate Relocation of Communities Trust Fund for communities and the public.*** **Suva.** https://tinyurl.com/2wr66j39
Government of Fiji. 2023b. ***Case study: The development of Fiji's national planned relocation arrangements and associated financing mechanism.*** **Government of Fiji, Submission to the Transitional Committee, April 25, 2023. Bonn, Germany, United Nations Framework Convention on Climate Change.** https://tinyurl.com/4hvhnkke

Migration may occur in a planned way, as in the case of CROC, or it may be forced by events. This will depend on both the pace of change and on the broader policy and geopolitical context, including whether operational systems, legislative agreements and protocols are in place to facilitate social protection provision for internally displaced people or international migrants. In this context, initiatives to protect people at risk of displacement or already displaced by disasters and rapid-onset climate shocks may need to extend their mandates to include those affected when limits to adaptation are reached.

Depending on the socioeconomic context into which these migrants are moving or resettling, there may be a requirement for some combination of economic inclusion interventions to increase income through self-employment, active labour-market policies to enhance employability and/or ongoing transfers to ensure basic income security. The exact nature of appropriate social protection responses during and after exit will be determined by factors such as the scale of relocation; whether migrants move internally or internationally; the social and economic conditions in the receiving context; the range of risks the migrants face; the transferability of the skills of the migrants;[17] domestic and international financial resources available to finance provision; and a range of issues relating to registration, citizenship, rights and access to – and availability of – public services.

Building on the existing literature on the nexus of social protection, climate and migration (Bharadwaj *et al.*, 2021b; Johnson and Krishnamurthy, 2010; Ncube *et al.*, 2024), the main social protection options for consideration in the context of internal and cross-border migration in a post-limits scenario are likely to focus around:

- the provision of funds or services to enable migration by those otherwise unable to finance movement;
- financial or in-kind support in the form of cash and commodity transfers during the process of relocation and resettlement;
- active labour-market policies to support migrant employment and successful livelihoods in receiving locations, potentially including public-works employment, training, job information and job subsidies;
- the provision of ongoing transfers or in-kind support to ensure basic needs and other lifecycle needs are met post resettlement; and
- consideration of equitable provision of social protection to support receiving communities as well as incoming populations.

When borders have been crossed, the existence of regional or bilateral arrangements between countries that enable the coordination of social protection provision for migrants will determine the extent to which displaced populations have access to support, including consideration of benefit portability and the access of migrants to national systems. The existence of nationally interoperable systems, including those for universal identification, will also be a key factor in enhancing the potential for effective provision of social protection in a post-limits context.

Preparing strategically for a post-limits scenario requires an appropriate policy and legislative framework that recognizes the realities that this scenario will engender. This will require social protection actors to work in collaboration with climate analysts and experts from other key sectors (e.g. agriculture, labour, migration, disaster risk reduction) on the identification of likely geographical and sectoral areas of stress. They will then need to develop both domestic and regional policies, protocols and programming, along with associated financing mechanisms to accommodate mass provision *in situ* and support for migration and resettlement, or both. This is a

[17] For example, on the links between climate change and modern slavery see Bharadwaj et al. (2021a, 2025), Jackson et al. (2024) and Wang and Lotfi (2024).

substantial challenge given that work to date on cross-border portability of social protection and the accommodation of international migrants has been largely limited to the extension of multi- and bilateral social security agreements governing formal employment (see, for example, Holzmann, 2018) or temporary humanitarian flows (see, for example, Cantor, 2018) rather than resolving judicial issues about the viability or desirability of creating a separate legal category for climate-related migrants (Apap and Harju, 2021; Ionesco, 2019) or more pragmatic discussions on how to identify and meet their basic needs. Similarly, neither the role of social protection nor the practical policy and programming implications of accommodating post-limits challenges are well developed in current climate justice scenarios or in the loss-and-damage agenda, including the "residual risk" management objectives of the Fund for responding to Loss and Damage (FRLD).

In the development of both conceptual and policy frameworks, as well as practical options for the provision of social protection in post-limits scenarios, insights can be drawn from the climate mobility management discourse (see Huang, 2023) and efforts to explore the specific implications for rural and agrifood-system-dependent populations migrating in the context of climate change (FAO, 2017, 2023b; FAO and UNU-EHS, 2025). These options should also take into account broader global frameworks and principles, including the IASC Framework on Durable Solutions for Internally Displaced Persons (IASC, 2010), the Global Compact for Safe, Orderly and Regular Migration (UN, 2019)[18] and the United Nations Secretary-General's Action Agenda on Internal Displacement (UN, 2022). However, while there is now a substantial policy agenda on how best to address climate-related migration, neither the mainstream migration discourse nor the underlying rights-based frameworks currently accommodate the significant role that social protection may have to play in the design of effective responses to climate-induced displacement once limits to adaptation are being reached (Aleksandrova and Costella, 2021).

An additional challenge in developing policy responses to the implications of limits to adaptation being reached is that the scale of need and disruption that this is likely to engender makes it highly sensitive in the international discourse. Questions regarding the responsibility for both climate change and financing and delivery of responses remain heavily contested – and in some instances even deliberately unasked. Of particular concern are the cost implications of responding to "residual risk" at scale.[19] This includes the large-scale provision of social protection that would be required to ensure basic needs are met in post-limits scenarios, given the limited prospect of lower-middle-income country governments having fiscal capacity to finance this themselves. The costs of protecting basic needs when significant social-ecological systems breakdown occurs are high, as are the human costs of failing to respond, and this is driving the reluctance among richer nations to explore and acknowledge the realities of limits to adaptation.

This is fundamentally an issue of climate justice, given that the impacts of climate change fall disproportionately on countries and population groups least responsible for its causes. Notwithstanding the contested international debate around loss and damage and the non-trivial issue of attribution, there is an urgent need to advance the relevant legislative, policy and financial frameworks

[18] The Global Compact is an intergovernmentally negotiated agreement, aligned with Sustainable Development Goal target 10.7 to "facilitate orderly, safe, regular and responsible migration and mobility of people, including through the implementation of planned and well-managed migration policies" (UN, 2015). It already includes an explicit objective on social protection (albeit limited to establishing mechanisms for the portability of social security entitlements and earned benefits for migrant workers, rather than the needs of those driven across borders by climate-related factors).

[19] Conservative estimates put the annual cost of loss and damage at USD 150 to USD 300 billion by 2030 in terms of immediate impacts and reconstruction costs alone (Songwe, Stern and Bhattacharya, 2022).

nationally, regionally and internationally to support future provision of social protection at scale, including the formal inclusion of social protection as a sector eligible for FRLD financing (McCord and Ridout, 2025).

In terms of design of social protection programmes, the key considerati on in a post-limits scenario is to develop interventions that can be implemented at relatively low cost and at scale in a changing geopolitical and economic context. Diminishing international flows of official development assistance and projections of significant climate-induced reductions in growth in gross domestic product in the coming decades will further constrain domestic and international financing for the sector (Swithern *et al*., 2025). Anticipating likely future needs and revising current social protection programming accordingly will be critical and will require close collaboration with both climate sector analysts and local communities, and with the other sectors mandated to respond to these challenges (labour, agriculture, industry, water etc.). The financing challenge remains immense; current financing for social protection is insufficient to cover the cost of basic provision even before limits to adaptation are reached (Cattaneo *et al*., 2024) and current climate-related financing instruments have little capacity to support the scale of provision of social protection that may be required when the limits to adaptation are reached.

Post-limits scenarios require interventions that can be implemented at low-cost and at scale in a changing geopolitical and economic context.

Even with adequate financing, policy development and programme design, extended provision to meet the needs implied by limits to adaptation is likely to be constrained by the limited capacity of the operational systems underlying the provision of social protection currently in many low-income countries and some middle-income countries (Costella and McCord, 2023). Addressing this would require the establishment of systems for universal identification and registration, as well as delivery. These would have to be interoperable across sectors and borders and able to accommodate changing future programming demands. Currently, such systems are underdeveloped in many lower-middle-income countries and often fragmented between projects, ministries and different development actors, with the result that they are not able to support large-scale coordinated provision even under current climate and economic circumstances. In the absence of significant strategic investment, existing systems are likely to be severely

compromised and hamper the effective use of social protection to meet basic needs once limits to adaptation are reached. Recognizing this challenge and extending strategic climate investment into strengthening such systems is a prerequisite for effective future programming responses.

In summary, when considering the needs of both those who remain *in situ* and those who move, enhancing the contribution of social protection to support smallholder populations in a post-limits context will require:

- programme design innovations to support the transition process for affected populations once limits are reached, underpinned by adequate and equitable resourcing, including for associated losses and damages;
- development of an ethical framework to govern decision-making on support for populations remaining in intolerable contexts without the ability to meet basic needs and to underpin the design of appropriate programming responses;
- development of social protection instruments that can accommodate and even promote mobility, including both planned migration and relocation, while addressing the causes and consequences of involuntary or forced displacement; and
- a wider policy reform agenda associated with climate displacement and migration, including accommodating changes in beneficiary domicile and, for international migrants, agreements for cross-border provision of social protection governing the portability of transfers and inclusion of migrants in national systems.

Finally, it is critical to remember that, while broad climate-related trends can be clearly identified (see, for example, IPCC, 2022a), there remains a high degree of uncertainty around exactly how and when climate change will affect smallholder livelihoods and the ecosystems and human systems on which they depend and hence the specificities of the limits to adaptation challenges that smallholders are likely to face. The concern raised by Stern (2006) 20 years ago still holds true today:

> *"An inherent difficulty for long-term adaptation decisions is uncertainty, due to limitations in our scientific knowledge of a highly complex climate system and the likely impacts of perturbing it. […] Effective adaptation will involve decisions that are robust to a range of plausible climate futures and are flexible so they can be modified relatively easily. But there will always be a cost to hedging bets in this way, compared to the expert 'optimal' adaptation strategy that is revealed only with the benefit of hindsight."*

Policy and programming choices, and the design of operational systems to implement them – including social protection systems – need to recognize and explicitly accommodate this uncertainty, building in the ability to flex as needs shift and change.

5. Conclusions and recommendations

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This framing paper has highlighted the need to accommodate the concept of limits to adaptation in the social protection discourse and to explore ways that social protection can be used to respond to the challenges that reaching these limits will present to smallholder communities. It has highlighted several key findings:

- The question of limits to adaptation is not yet reflected in the current social protection policy discourse.
- Social protection responses need to go beyond addressing specific agricultural adaptation challenges and recognize limits to adaptation in relation to broader social-ecological systems.
- Failure to address limits to adaptation in programme design risks the implementation of interventions that may ultimately be maladaptive.
- Post-limits needs have not yet been adequately accommodated in the social protection policy discourse.
- In order to better address smallholder needs in the future there is a need to think across both pre- and post-limits scenarios, each of which has different implications for the social protection sector.

Analysis of the climate and agricultural development literature has shown how soft and hard limits to adaptation are already being reached or exceeded in a growing number of social-ecological systems, with severe impacts on smallholder livelihoods. A dialogue between countries, multilateral partners and other key stakeholders on the role of social protection in the context of the limits to adaptation is now urgently needed, together with increased research and investment to allow effective responses to these impacts to be developed.

Some initial recommendations on priority areas for advancing policy and programming in relation to this agenda are set out in *Tables 3 and 4,* including considerations at national, regional and international levels. They are intended to help initiate and inform policy dialogue between national and international actors working on these issues and all those with an interest in effective and equitable responses to the challenge of limits to adaptation for smallholder and other vulnerable populations over the short, medium and long term.

A dialogue between countries, multilateral partners and other key stakeholders on the role of social protection in the context of the limits to adaptation is urgently needed.

Table 3 Policy recommendations

Integrate data on **adaptation limits** in national **social protection planning processes** and embed these insights and approaches in **climate** and related **sectoral policies and strategies**	Promote collaboration with climate modellers and agricultural specialists to support systematic integration of climate-change projections and data on limits to adaptation into social protection policy.
	Integrate social protection in National Adaptation Plans, nationally determined contributions and other climate strategies as a key mechanism for inclusive climate action, including in relation to pre- and post-limits scenarios.
	Embed these insights and approaches in wider intersectoral policy planning processes – including for agriculture, migration and employment – and strengthen institutional coordination between ministries of social development, agriculture, planning, labour and environment.
Promote the inclusion of the social protection sector in the ongoing dialogue around the **limits to adaptation, residual risk and loss and damage**	Enhance understanding among key actors of the role of social protection as limits to adaptation are reached. This includes national governments, multilateral agencies, donors and all those engaged in key climate policy processes.
	Develop an ethical framework to govern decision-making on support for populations remaining in intolerable contexts who do not have the ability to meet their basic needs.
	Explore domestic and international financing options to address these needs, including external financial and technical assistance through the Fund for responding to Loss and Damage and other multi- and bilateral sources of climate finance.
	Promote dialogue between social protection and humanitarian sectors on policy and coordination in response to limits to adaptation.
Support a wider policy reform agenda associated with **climate displacement and migration,** both internally and internationally	Promote national, bilateral, regional and global dialogue on provision of social protection that accommodates changes in beneficiary domicile, both internally and across borders.
	Develop policies allocating roles and responsibilities for cross-border provision of social protection and strengthen regional collaboration on social protection around post-limits scenarios.
	Explore options for extending the mandate of institutions currently addressing the needs of those at risk or displaced by disasters to accommodate those facing limits to adaptation.

Table 4 Programming recommendations for pre- and post-limits scenarios

Pre-limits	Include analysis on limits to adaptation for smallholder populations in design of social protection programmes to inform context-appropriate programmes that explicitly identify and respond to approaching limits to adaptation.
	Ensure adaptation programming integrates analysis of the wider intersecting biophysical and human systems that contribute to smallholder livelihoods rather than focusing solely on short-term biophysical challenges within agricultural systems.
	Review the adequacy of existing adaptation interventions delivered through social protection to reduce the risks of maladaptation, avoid the redistribution of adverse impacts and ensure cost-effective use of resources over medium-term timescales.
	Assess current and projected internal and cross-border migration patterns and the status and adequacy of portability and provision of benefits for migrants.
	Invest in core operational systems for effective and scalable social protection systems, including universal registries/IDs, enhanced delivery mechanisms and cross-sectoral and cross-border interoperability.
Post-limits	Collaborate with humanitarian and climate actors on understanding the implications of limits to adaptation for the basic needs of both mobile and immobile populations, clarifying programmatic options, roles and responsibilities in different scenarios
	Review existing social protection policies and programmes to identify necessary design modifications and ensure that they do not constrain options for affected populations, e.g. by limiting mobility.
	Initiate dialogue to develop national and regional plans to support employment and livelihoods transitions for those exiting smallholder agriculture, including defining social protection components of the planned response.
	Enhance dialogue between social protection and displacement actors to identify roles for social protection in supporting internal migration and resettlement, with equitable provision for both receiving communities and incoming populations.
	Strengthen engagement between social protection and migration actors on the cross-border implications of limits to adaptation and the scope for harmonized or integrated bilateral or regional social protection policy responses.

There is a need for social protection policy and programming to account for the limits to climate adaptation for smallholder and vulnerable rural populations.

Overall, this framing paper argues that there is a need for social protection policy and programming to account for the limits to climate adaptation for smallholder and vulnerable rural populations. In doing so, responses should be rooted in scientific evidence, scenario modelling and attention to the fundamental and systemic interlinkages between agricultural livelihoods and wider social-ecological systems. Such an approach will necessarily involve interdisciplinary partnerships between social protection, climate and agricultural experts, stakeholders and actors from related sectors including employment and migration.

Many of the recommendations outlined in *Tables 3 and 4* are relevant even in contexts where limits are not likely to be reached imminently, where greater integration of climate projections and data – along with a wider focus on social-ecological systems rather than short-term biophysical challenges – would strengthen existing approaches to climate adaptation for smallholders. As the report makes clear, in a growing range of contexts – especially in the most vulnerable countries and communities – business-as-usual approaches are not a viable option for protecting agricultural livelihoods in coming years. The sooner that preparations for addressing limits to adaptation are begun, the better placed countries, regions and the global community will be to deal with these in an effective and equitable manner.

Social protection will have a key role to play in this context and beginning to advance some of the policy and programmatic recommendations outlined in *Tables 3 and 4* would be a major step forward. However, since this report is an initial contribution intended to stimulate dialogue and discussion, these recommendations are necessarily preliminary in nature, and there is a need for key actors across the social protection, climate, agriculture, employment and migration sectors to work together collectively to further define and advance this agenda. Hopefully, this paper will help to stimulate and foster this engagement so that all those with an interest in addressing the challenges that limits to adaptation present for vulnerable rural communities can begin collaborating on the development of appropriate, effective and equitable policy and programming responses in this critical area.

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