

**DELIVERING
OUR
CLIMATE-
RESILIENT
FUTURE:
LESSONS
FROM A
GLOBAL
EVIDENCE
REVIEW**



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ACRONYMS

100RC	100 Resilient Cities
ARAF	Acumen Resilient Agricultural Fund
CAF	climate adaptation fund
CHAI II	Climate Change Adaptation and Information Communication Technology project (Uganda)
DCF	decentralised climate finance
FAO	Food and Agriculture Organization
FFF	Forest and Farm Facility
FMNR	farmer-managed natural regeneration
GCF	Green Climate Fund
GEF	Global Environment Facility
HSNP	Hunger Safety Net Programme (Kenya)
IDCOL	Infrastructure Development Company Limited
IFAD	International Fund for Agricultural Development
IFRC	International Federation of Red Cross and Red Crescent Societies
IIED	International Institute for Environment and Development
ILO	International Labour Office
INDC	intended nationally determined contributions
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
KAP	Kiribati Adaptation Program
KC-NCDDP	Kalahi-Cidss National Community-Driven Development Program (the Philippines)

KLIP	Kenya Livestock Insurance Programme
LDCs	Least Developed Countries
LDC REEEI	LDC Renewable Energy and Energy Efficiency Initiative for Sustainable Development
LIFE-AR	Least Developed Countries Initiative for Effective Adaptation and Resilience
LTS	long-term strategies
LUCCC	LDC University Consortium on Climate Capacity
MGNREGS	Mahatma Gandhi National Rural Employment Guarantee Scheme (India)
NAP	national adaptation plan
NDC	nationally determined contribution
NDF	Nordic Development Fund
NGO	non-governmental organisation
NUSAF III	Third Northern Uganda Social Action Fund
PSNP	Productive Safety Net Programme (Ethiopia)
SDGs	Sustainable Development Goals
SLMP	Sustainable Land Management Programme
UNCTAD	United Nations Conference on Trade and Development
UNECA	United Nations Department of Economic and Social Affairs
WHO	World Health Organization

EXECUTIVE SUMMARY

The Least Developed Countries (LDC) Ministerial Group and LDC Chair officially welcomed and launched the LDC Initiative for Effective Adaptation and Resilience (LIFE-AR) at COP24. The next stage has seen the development of the LDC Group vision, offer and ask. A deliberative process across LDCs and the technical inputs from a review of evidence of effective global adaptation and resilience initiatives guided the process. This process captured rich insights and experiences of LDC experts and resilience partners and helped to shape our 2050 Vision for delivering a climate-resilient future:

Our vision is for all LDCs to deliver climate-resilient development pathways by 2030 and net-zero emissions by 2050 to ensure our societies and ecosystems thrive.

This vision embodies the ambitious commitments that we LDCs are making together to ensure we leave no LDC behind. The climate emergency is calling for a historic shift in the way LDCs and the international community are responding to climate change. By working together better, we can align with and deliver the Sustainable Development Goals (SDGs), Paris Agreement, Aichi Biodiversity Targets and the Sendai Framework for Disaster Risk Reduction to implement real action on the ground at national and local levels and make climate resilience a reality. LIFE-AR charts out an effective, ambitious response to the climate challenge, with all countries and communities – from the least to the most vulnerable – working hand in hand for a climate-resilient future.

Purpose of the evidence review

This evidence review aims to deepen understanding of ‘what works’ in delivering long-term resilience, and to present a non-exhaustive base of potentially effective adaptation and resilience interventions that we might use to achieve our ambitions.

We reviewed interventions from across the world to identify positive deviance – where the evidence so far is pointing to positive outcomes in supporting effective adaptation and resilient development. This also supports cross-country learning and knowledge transfer. Whilst at this stage, for many of the initiatives, the review found

that it would be difficult to determine the impact of the interventions as many were in early stages or still in implementation, or due to impact data being unavailable. However, it was possible to identify those that look promising based upon an assessment of how they are being delivered and the extent to which they are already supporting communities.

Process

The review of evidence of effective global adaptation and resilience initiatives was guided by a deliberative process across LDCs. Under the direction, guidance and expertise of the LDC Ministerial Group, LDC Advisory Group, LDC Chair and LIFE-AR technical lead, we held six technical workshops with almost 200 experts across Anglophone and Francophone Africa and Asia Pacific over 2018–2019 and brought together more than 400 experts at COP24, CBA12 and the NAP expo to provide further evidence and guidance. A public call for evidence elicited over 100 submissions. The review team also conducted interviews with several hundred climate change experts and case study research with members of LUCCC, capturing rich insights and experiences of LDC experts and resilience partners to shape our 2050 Vision.

Scope

The 95 initiatives reviewed cover a wide geographical range from around the globe, with 43 from Africa, 30 from Asia, 9 from the Pacific, 3 from Latin America and 10 multi-regional or global initiatives. In total, 68 countries are represented in the sample of initiatives, with a balance of LDCs (29), upper and lower middle-income countries (39) and small island developing states (11).

The diversity of initiatives in the review provides opportunities for learning for all countries irrespective of size, landscape or hazard. The initiatives cover a wide range of landscapes and ecosystems, including agricultural and pastoral (37), coastal (19), urban (11), watershed (11), forest (8) and mountainous (4). They also span a wide range of environments that are vulnerable to different hazards, including drought (45), flooding and storm surges (49), cyclones and typhoons (31), extreme temperatures (20) and earthquakes (3).

Criteria

The review has focused on three priority areas. These were identified by the LDC Group through deliberative workshops as our priority areas for action in delivering a climate-resilient society:

- 1. Climate-resilient people** living in just, inclusive, happy and poverty-free societies
- 2. Climate-resilient economies** that are net-zero and prosperous, with vibrant and sustainable growth within ecological limits, and
- 3. Climate-resilient landscapes and ecosystems** that are sustainably managed, less vulnerable to climate shocks and stresses and use nature-based solutions.

At the outset of the LIFE-AR evidence review, the LDC Advisory Group also identified nine criteria — based on text from Article 7, paragraph 5 of the Paris Agreement — to guide the understanding of ‘what works’ in effectively supporting long-term adaptation and resilience:

Outcome-based criteria

- 1.** Targets the drivers of climate vulnerability
- 2.** Promotes far-sighted action for the long term
- 3.** Promotes far-reaching action at scale
- 4.** Promotes social justice with gender equality and social inclusion

Process-based criteria

- 5.** Integrates scientific and technical knowledge within local knowledge systems
- 6.** Supports vertical integration between layers, and horizontal integration between sectors
- 7.** Supports the coherent delivery of global commitments, including those in the SDGs, the Paris Agreement, the Sendai Framework for Disaster Risk Reduction and the Aichi Biodiversity Targets
- 8.** Uses participatory design and transparent processes
- 9.** Is domestically driven and owned, and strengthens national institutions.

Lessons from LIFE-AR

After analysing each of the selected initiatives individually, we grouped our findings from each initiative and analysed them across each of the nine criteria to generate cross-cutting lessons on delivering long-term effective adaptation.

Overarching lessons

Taking an integrated approach to reducing poverty and climate vulnerability

- Coherent efforts to promote both poverty reduction and resilience to climate change can address underlying drivers of vulnerability.
- Reducing climate sensitivity through social protection, and improving incomes and access to financial and basic services can deliver climate resilience.
- Reducing or minimising people’s exposure to climate hazards and shocks can help deliver climate resilience.

Delivering long-term and far-reaching outcomes

- Building resilience to climate change takes time.
- Delivering over longer timeframes helps build the support needed for political buy-in and national financing.
- Investing in climate-resilient infrastructure now can future-proof infrastructure, technology and services and reduce maladaptation.
- Developing long-term national plans to address climate change and integrating climate change into all other planning is necessary.
- Devolving adaptation governance, planning and financing to subnational levels develops climate resilience at local levels.
- Securing long-term finance helps build national capacity for climate resilience.

- Despite some advances in long-term financing, we need more long-term, predictable finance.
- Countries need to scale up efforts to reach more people, cover larger geographies and deliver change to governance systems, markets and landscape management.
- LDCs will also have to take whole-of-government and whole-of-society approaches, and with the consideration of long-term impacts, to address systematic drivers of vulnerability and exclusion.

Promoting gender equality and social inclusion

- Gender equality and economic inclusion is vital for reducing long-term vulnerability to climate change.
- Promoting gender equality and ensuring equal rights and opportunities for women and men to access economic resources and benefits, as well as promoting capacity building and appropriate gender-relevant technology, is essential to build resilience of both women and men.
- Better outcome-level data is critical to assess how effectively initiatives will improve livelihoods for the poorest, reduce gender inequality and promote social and economic inclusion.
- Investing in locally managed organisations and businesses and supporting local access to products and services that support the better management of climate risk is crucial in building climate-resilience at the local level.

Building on local knowledge and supporting the development of technical knowledge

- Significant investment is required to strengthen local knowledge on managing climate risks, including brokering links to new technical knowledge and skills.

- Harnessing local knowledge of managing climate hazards helps ensure climate risk management is locally relevant.
- Integrating technical and local knowledge into formal planning systems helps strengthen resilience planning.

Lessons for developing mechanisms for delivering climate-resilient people

Social protection

The review analysed 12 social protection initiatives to understand how LDCs can support people to become more resilient to climate change. Social protection is an important poverty reduction approach that has supported around 2.7 billion people in poor and middle-income countries. Social protection can take many forms, including conditional and unconditional cash transfers, social insurance, pensions, school feeding programmes, public works, employment guarantee schemes and fee waivers. They can have significant impacts on reducing poverty in terms of nutrition, income, assets and health. The review found the following key lessons:

- Social protection programmes can help reduce poverty and build absorptive resilience by reducing people's sensitivity to climate hazards.
- Integrating social protection initiatives into national government systems led by a strong national department or agency can deliver long-term and far-reaching resilience outcomes.
- Smaller initiatives are piloting innovative approaches, such as forecast-based financing, which countries could take to scale once they have demonstrated proof of concept.
- Climate-resilient social protection initiatives should establish clear funding procedures and targeting mechanisms to improve delivery and promote transparency.

Access to basic services (including secure housing, clean energy, clean drinking water, health and education, and transport networks)

The review analysed 22 initiatives that deliver essential services that underpin human wellbeing and sustainable development. These services are essential building blocks, and as the impacts of climate change increase in the coming decades, they will become even more important. For example, people living in insecure housing are more likely to be impacted by climate extremes and disasters such as tropical storms, flooding and earthquakes. The review found the following key lessons:

- Improved access to basic services can reduce people's sensitivity to climate impacts.
- Improving access to climate-resilient infrastructure can reduce exposure to climate change.
- Prioritising investment in durable, climate-resilient infrastructure and strengthening the planning and governance of basic service provision can deliver long-term resilience.

Lessons for developing mechanisms for delivering climate-resilient economies

Climate-resilient production systems

The review analysed 24 initiatives that aimed to build climate resilience in the agricultural sector, a critical sector for food security, economic development and prosperity in LDCs. The world's 2.5 billion small-scale farmers, herders, fishers and forest-dependent communities who derive their food and income from renewable natural resources are among the most vulnerable to climate shocks and natural hazards. Climate change is already affecting agriculture and food insecurity and there is a critical need to strengthen the resilience of small-scale agriculture. The review found the following key lessons:

- Introducing inputs, services, finance, technologies and climate information that help improve yields can reduce sensitivity to climate change.

- Using systematic approaches to integrate producers into climate-resilient agricultural value chains and markets can deliver far-reaching impacts.
- Climate-resilient agriculture initiatives can promote partnership with a diverse group of stakeholders and support the creation of participatory local organisations.
- Integrating climate-resilient agricultural practice into government plans and developing long-term systems to deliver climate information to producers can deliver long-term outcomes.

Promoting micro, small and medium enterprises in climate-resilient value chains

The review analysed 14 initiatives that develop and strengthen enterprises in climate-resilient value chains. LDCs can invest in strengthening market systems to support poor and marginalized groups to access the products and services they need to live with dignity, move out of poverty, develop secure livelihoods and improve their wellbeing. Supporting micro, small and medium enterprises is particularly important in this space. Employment in developing countries is characterized by high rates of informality and participation in these enterprises. Supporting the people who work in formal and informal enterprises across a range of value chains can help reduce poverty and promote climate resilience. The review found the following key lessons:

- Making value chains more climate resilient can deliver the SDGs and reduce poverty.
- Supporting enterprises to ensure their businesses are robust to future climate impacts can help people reduce sensitivity to a changing climate.
- Supporting climate-resilient value chains can help enterprises prepare for and address future climate impacts and open new long-term markets for climate-resilient products.
- Climate-resilient value chain initiatives create strong horizontal collaboration and partnerships with a diverse group of stakeholders.

Lessons for developing mechanisms for delivering climate-resilient landscapes and ecosystems

Landscape management

The review analysed 17 initiatives related to landscape management and ecosystem-based adaptation. Landscapes and ecosystems provide services that are critical to human life. Humans have significantly altered nature across most of the globe and the majority of ecosystems and biodiversity indicators are showing rapid decline. Integrated landscape management approaches that restore ecosystems, increase ecosystem services and reduce poverty within the context of population growth are required. Such approaches are large-scale, multi-stakeholder processes to sustainably manage ecosystems and support local economic development, livelihoods and wellbeing. They include watershed management, forest and landscape restoration, ecosystem approaches to fisheries and aquaculture, agroecology practices and incentives for ecosystem services. The review found the following key lessons:

- Landscape management approaches and ecosystem-based adaptation initiatives can help reduce both sensitivity and exposure to climate shocks.
- The benefits of landscape management are likely to be delivered over long timeframes.
- Landscape approaches work across different levels to deliver far-reaching impacts.
- There is a strong level of domestic ownership of landscape management and ecosystem-based adaptation approaches, since they work to strengthen natural resource governance at national and subnational levels.

- Landscape approaches that facilitate and integrate collaboration and clear, shared governance arrangements between local authorities at landscape level can support management of landscapes that span a number of jurisdictions and territories.

Lessons for developing mechanisms for strengthening an enabling environment for delivering climate resilience in LDCs

All initiatives we reviewed are making significant efforts to strengthen climate change planning, financing and the delivery of climate information. By strengthening the effective use of climate information and approaches to tackle deep uncertainty in planning and finance decisions, LDCs can create an enabling environment for building resilience to climate change. This can form a foundation to support nationally owned initiatives under LIFE-AR that deliver the Paris Agreement and the SDGs. The review found the following key lessons:

- Strengthening LDC institutions for climate change planning, financing and climate information services delivery is essential for delivering long-term resilience.
- Climate change planning and financing and climate information services need to be integrated into government systems from national to local levels.
- Working across sectors, government departments and jurisdictions is important for delivering climate resilience.

1. INTRODUCTION

The Least Developed Countries (LDC) Initiative for Effective Adaptation and Resilience (LIFE-AR) is an LDC-led, LDC-owned initiative to develop a long-term vision for delivering a climate-resilient future. LIFE-AR outlines the ambitious commitments that we LDCs are making together to ensure we leave no LDC behind.

The climate emergency calls for a historic shift in the way LDCs and the international community respond to climate change. By working together better, we can align with and deliver the Sustainable Development Goals (SDGs), Paris Agreement, Aichi Biodiversity Targets and the Sendai Framework for Disaster Risk Reduction, implementing real action on the ground at national and local levels, to make climate resilience a reality. LIFE-AR charts out an effective, ambitious response to the climate challenge, with all countries and communities — from the least to the most vulnerable — working hand in hand for a climate-resilient future.

The Intergovernmental Panel on Climate Change and Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services have both issued stark warnings: we are running out of time to avoid catastrophic runaway climate change and loss of nature.^{1,2} In the context of rapidly escalating climate risks, we face unique and unprecedented challenges as we work to end poverty and achieve sustainable development. A long-term focus on building resilience is the only way to deliver the SDGs while also averting and addressing large-scale loss and damage.

Business-as-usual approaches to addressing climate change are not working. Evidence shows that the adaptation financing gap in developing countries is still wide. Estimates suggest that LDCs will need US\$93.7 billion a year from 2020 to implement the nationally determined contributions (NDCs) alone.³ Only 18% of global climate finance reaches LDCs; and less than 10% of climate finance from dedicated climate funds gets to local level, where climate action is required.^{4,5} Only 7% of all climate finance comes from dedicated climate funds and is transparent enough for analysis. Greater transparency would allow us to track the effectiveness of all climate finance.⁶

Climate finance is clearly not getting to where it is most needed. Short-term, projectised, sectoral climate responses have limited impact. And with external actors leading and defining most initiatives, these are failing to build capacity and deliver sustainability at national and local levels. Some 87% of the Green Climate Fund's investments are through international development partners, with just five LDC institutions accredited.

Recognising the challenges posed by climate change — and the inadequate response to date — we LDCs are taking decisive action to step up our own climate efforts and ambition. LIFE-AR engages with and benefits all LDCs — from the first movers or 'front-runner' LDCs, to the regional clusters around these and the broader group. Our 2050 Vision will help strengthen our institutions, structures and systems to secure a climate-resilient future and graduation from LDC status. Despite being the most vulnerable to climate risks, we are taking the lead in developing a more effective, ambitious climate response.

We are joined in this initiative by our development partners, who share our ambitions and recognise that business-as-usual is no longer enough. Using LIFE-AR, we will drive forward our enhanced climate ambition and shift away from business as usual. We need to collectively step up and raise our ambition. We need to strengthen climate action and our approaches to it if we are to minimise widespread climate impacts, protect nature and eradicate poverty. Together we can bring about this historic shift by committing to this long-term collective response to the climate emergency with climate justice at its heart.

This document is divided into two parts. Part 1 summarises our vision and LIFE-AR and provides an overview of LDC status with regards to national adaptation and initiatives for mutual support to increase our climate resilience. Part 2 provides evidence, supporting material and background for our vision. It reports on the LIFE-AR evidence review and contains overarching lessons and case studies from lighthouse initiatives that should allow us to learn from each other.

PART 1. SETTING THE SCENE



2. LIFE-AR AND THE LDC 2050 VISION

Box 1. What is LIFE-AR?

LIFE-AR is an LDC-owned and driven initiative to develop a long-term vision for achieving a climate-resilient future by 2050. LIFE-AR will help drive forward climate action according to LDC needs and priorities, presenting a strong case for domestic, donor and private investment to deliver long-term, innovative action at scale. It aims to identify immediate priorities that will build national institutions, domestic systems and capabilities, defining national adaptation plans (NAPs), NDCs and wider efforts to build resilience and address poverty.

Through LIFE-AR, we LDCs have developed a long-term vision to support our members in driving forward our enhanced climate ambition and moving away from business-as-usual approaches.⁷ Our vision — **for all Least Developed Countries to deliver climate-resilient development pathways by 2030 and net-zero emissions by 2050** — commits us to ambitious, low-carbon, climate-resilient development and will ensure our societies and ecosystems thrive. To achieve our vision, we need to deepen our climate knowledge and access predictable, reliable finance (including from domestic, private and international sources). This will allow us to develop our technology and capabilities to support the emergence of:

- 1. Climate-resilient people** living in just, inclusive, happy and poverty-free societies
- 2. Climate-resilient economies** that are net-zero and prosperous, with vibrant and sustainable growth within ecological limits, and
- 3. Climate-resilient landscapes and ecosystems** that are sustainably managed, less vulnerable to climate shocks and stresses and that use nature-based solutions.

Our vision is guided by the principles of inclusion, participation, justice, equity and leaving no one behind, especially the most fragile LDCs and most vulnerable locations. We all aim to graduate from LDC status before 2050; some of us are on course to achieve this soon. But increasing climate risks present a critical threat to these aspirations and will significantly undermine our development efforts.

We will take a whole-of-society approach to secure a climate-resilient future and achieve our graduation goals. The LDCs of today are the G47 of tomorrow and we commit to continue working together as our members graduate, sharing our knowledge and capabilities to achieve our joint vision. We see our future in a resilient society that is happy, secure and self-reliant; where every person thrives despite climate change; where every person is empowered to participate in decision making; and where ecosystems flourish in a climate-conscious, vibrant green economy.

2.1 What sets our vision apart?

Our vision is defined, driven and led by us. It charts out our journey towards a climate-resilient future by 2050, in line with our own needs and priorities. On this journey, we do not merely ask for planning and coordination support. We do not seek single-project funding. Instead, we aim to build the institutional systems and capabilities we need for long-term transformative change. To achieve this, we need LDC-focused delivery mechanisms that are flexible and forward-looking; that respond to changing circumstances, needs and new knowledge as they arise; and that are transparent and open, with predictable budgets rather than funds for prescribed activities. We want these mechanisms to be vertically integrated with government systems while also enabling horizontal collaboration across different sectors. We are no longer simply chasing the money; we are following our mission. And this mission is to develop a legacy that ensures institutions have a proven track record, where there is subsidiarity of decisions on action and finance as we adapt to our new, climate-resilient development pathway.

We are in this together. From the beginning, LIFE-AR has worked to 'join the dots' with existing initiatives. We set up a network of LDC practitioners and partners — resilience and adaptation experts from LDC governments, civil society, academia and research institutions, international accredited entities, climate funds, the LDC Expert Group and the United Nations Framework Convention on Climate Change — to guide strategic linkages and learn from and build on existing practice. We also established LDC ministerial and advisory groups to guide the initiative's political and technical direction and ensure

a governance structure that continues to be LDC-led and driven.

2.2 Delivering our vision with LIFE-AR

Our vision will help us develop long-term climate strategies under Article 4, paragraph 19 of the Paris Agreement and articulate our ambitious leadership on climate action. It will help us better address the long-term impacts of a changing climate and further define and update the adaptation priorities of our NAPs and NDCs, in line with national development goals for climate resilience and poverty eradication. By complementing our existing adaptation planning processes in this way, it will help us develop cross-cutting, climate-resilient development strategies to 2050.

Our vision unites and draws on the knowledge, resources and work of three LDC initiatives: the LDC Renewable Energy and Energy Efficiency Initiative for Sustainable Development (LDC REEEI), the LDC Universities Consortium on Climate Change (LUCCC) and LIFE-AR (see Section 3). Following our vision will build synergies with these initiatives.

LIFE-AR seeks to redefine relationships between us, our donors and our wider development partners, so we can strengthen our own delivery systems. Under the

overarching guidance of the LDC Group Chair, LIFE-AR will engage with and benefit all LDCs, to ensure we achieve our vision and leave no country behind. Countries can join the initiative in cohorts over time on a voluntary basis, with learning shared through regional clusters and peer-to-peer support. LIFE-AR will support the first of these — the front-runner countries — in developing their own long-term strategies (LTS) informed by the 2050 Vision and building synergies with their NDC and NAP adaptation priorities (see Section 3). The front-runners will also be able to develop their own delivery mechanisms linked to the 2050 Vision. As well as being vertically integrated with government systems, these mechanisms will enable horizontal collaboration across different sectors, allowing us to implement our plans while also ensuring support reaches those who need it most at local level.

To deliver our vision, we are looking particularly to interventions that have the potential to deliver adaptation and resilience at scale. The need for large-scale adaptation is now urgent. We need to support whole societies to adapt and increase their resilience against climate vulnerabilities. Adaptation actions need to be taken by actors from across society at every level, many of which provide small-scale interventions. There therefore needs to be a large-scale shift towards making decisions across society that support adaptation and resilience building and aggregating these to scale.

3. OVERVIEW OF LDC ADAPTATION PLANNING AND INITIATIVES

3.1 Nationally determined contributions

NDCs are national climate plans that outline climate actions, policies and measures countries will take to implement and meet the long-term goals of the Paris Agreement. They can include information on mitigation, adaptation, financial support, technology transfer, capacity building and transparency. NDCs collectively represent the global effort to address climate change and deliver the Paris Agreement. Countries must review and resubmit their NDC every five years, encouraging them to ratchet up their ambition and commitment to addressing climate change.

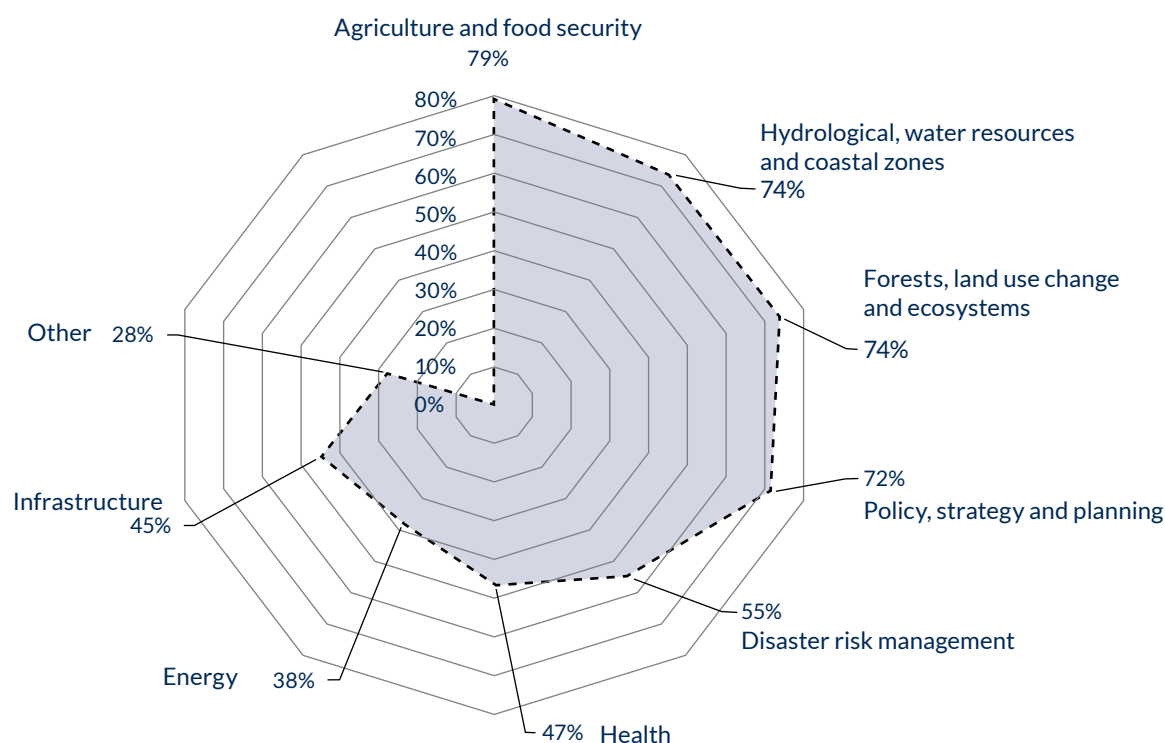
All 47 LDCs developed an intended (I)NDC to the Paris Agreement presenting their intended short- and medium-term climate actions. Forty-two converted these into NDCs by ratifying the Paris Agreement, with four of them updating their NDC at the same time.

As a group, we face a diverse range of climate hazards. According to the most recent NDCs (or INDCs for countries that do not have NDCs), the most common climate hazards across all 47 LDCs are floods, heavy precipitation events and changes in precipitation patterns (83%), followed by droughts (72%), extreme temperatures and altered temperature patterns (64%) and storms (36%).

The NDCs also indicate priority adaptation measures in specific sectors. The most prominent sector for action is agriculture and food security (79%), particularly building resilience in farming. Other priority sectors that emerge are natural resource management including hydrological, water resources and coastal zones and forests, land use change and ecosystems.

However, as a group, our NDCs do not take a sufficiently whole-of-society approach in addressing actions required across sectors and scales. Gaps include social protection, health, education and infrastructure. The NDC documents

Figure 1. Priority sectors identified in LDC NDCs



are also largely unclear about the scales of action — regional, national, subnational (provincial, municipal) and local (community, household, vulnerable group) — engaged under various adaptation measures.

Only 16 NDCs break down financing needs to sector or project level. Among these, the largest projects in need of funding are in agriculture, food security, water resource management and coastal zone protection.

Thirty-one NDCs indicated the estimated costs of implementing adaptation measures. This totalled US\$167 billion; but the actual figure will necessarily be much higher. As well as needing to estimate the costs for the remaining 16 countries, the estimates provided by the 31 countries do not always cover all the adaptation sectors and measures they outline in their NDCs. They also cover different timeframes. As we develop the coverage of our NDCs and refine the metrics for costing adaptation interventions, there will be greater convergence between adaptation and mitigation interventions. It is probable that as climate change impacts worsen — and loss and damage costs increase — the cost of implementing our NDCs will increase.⁸

3.2 Strengthening NDCs

The five-year NDC submission cycles allow us to strengthen our NDCs by:

- **Asking for greater resources to help build clearer national adaptation strategies** through processes such as developing NAPs and LTS and then revising our NDCs to reflect these updates. Creating a national adaptation plan and a long-term 2050 Vision will guide the five-year NDCs. LIFE-AR will also support this process by building the capabilities, structures and systems we need at both national and local levels for implementation and by helping us develop delivery mechanisms to ensure support and finance reach local level and the most vulnerable communities. This will help strengthen our ask from the international community.

- **Developing strategic and comprehensive delivery mechanisms** that define how we can take climate action through existing services and **investment mechanisms** to aggregate climate actions at scale to deliver our national adaptation strategies. This will also lead to clearer resource asks in our NDC documents. Presenting our specific financing, capacity and technology needs will help clarify where we need support, helping the international community better target their resources. We must also specify where we will meet costs domestically and where and how much international support we require.
- **Improving coverage of adaptation measures by bringing in sectors and subsectors that are currently missing**, such as social protection, health, education and infrastructure. This will help develop more robust and effective adaptation and resilience planning. Supporting multi-sectoral and multi-level climate responses through horizontal and vertical integration will also be vital to address the cross-cutting impacts of climate change. Taking a whole-of-government and whole-of-society approach will engage cross-coordination and incorporate all vulnerable sectors.

3.3 National adaptation plans

NAPs are documents in which parties to the United Nations Framework Convention on Climate Change identify medium- and long-term adaptation needs and develop implementation strategies and programmes to address those needs. The NAP formulation is a continuous, progressive and iterative process which aims to follow a country-driven, gender-sensitive, participatory and transparent approach. The NAP process has four elements — laying the groundwork and addressing gaps; preparation; implementation strategies; and reporting, monitoring and review — with several steps under each. The reporting, monitoring and review element is the iterative and 'living' element, as countries continually review and update their NAPs. The LDCs are working through the stages of these elements in producing their NAP documents. Four countries — Burkina Faso, Ethiopia, Sudan and Togo — have submitted their NAPs.

3.4 Long-term strategies

LDCs are beginning the process of developing LTS under the Paris Agreement's invitation for countries to communicate their long-term low greenhouse gas emissions development strategies by 2020. LTS outline the pathway that countries will take to achieve low-carbon climate-resilient development by 2050. They can include goals and plans for mitigation, adaptation, energy access, technology transfer, finance, capacity building and so on. LTS can help provide strategic and visionary direction to developing NDCs over time and can complement and help recalibrate short- and medium-term national development strategies and plans. We have begun to formulate our LTS in advance of the 2020 deadline. Over the coming years, the LDC Group will work with a small group of front-runner countries to translate and implement our vision to each national context and develop long-term strategies that connect to national development efforts, the NDC update process, the LDC REEEI and capacity building via LUCCC.

3.5 Other LDC initiatives

LIFE-AR draws on two other LDC initiatives —LDC REEEI and LUCCC — and informs our national LTS work, enabling us to learn from and support each other while building climate resilience.

LDC REEEI is an LDC-driven effort to accelerate harnessing LDCs' renewable energy potential and promote energy efficiency. Under the mandate of LDC ministers, LDC REEEI focuses on supporting LDCs to achieve our development aspirations by addressing three over-arching goals:

1. 100% access to enough affordable, modern and clean energy by all LDC citizens by 2030
2. 100% renewable energy systems in all LDCs by 2050 that cater to all citizen, social service and industry needs, and
3. 100% use of energy efficiency potentials along the value chain through full implementation of best practice measures and planning by 2040.

Work to deliver our 2050 Vision will draw on LDC REEEI to align all resilience-building efforts, charting a clearer, integrated pathway towards a climate-resilient future.

LUCCC is a South-South consortium initiated by ten LDC universities to enhance knowledge on climate change through climate capacity building, with a focus on adaptation measures such as education and research. LUCCC aims to network and develop the capacity of South-South universities to develop common research projects and implement teaching and training programmes on different aspects of climate change. This two-way collaborative capacity-building programme offers help to — and seeks support from — others to build capacity within LDCs. LUCCC universities have been a key part of the Phase 1 evidence generation under LIFE-AR, providing the research skills to analyse effective adaptation interventions. As LIFE-AR moves to connect further in-country, LUCCC will be part of our learning from country experience, deriving good practice for sharing across all LDCs and with others, such as small island developing states and the Africa Adaptation Initiative.

While not an LDC Group initiative, **LTS** can frame the political ambition of our work under LIFE-AR, LDC REEEI and LUCCC, supporting synergistic delivery, visible leadership globally and accountability domestically. Developing national long-term, low-carbon, climate-resilient development strategies, or strengthening existing ones where they are already in place, will support the LDC visioning process at national level and will capture plans for mitigation, adaptation and development. This will allow us to develop an integrated strategy that connects national development efforts in country and aligns the work of the LDC initiatives on adaptation, resilience and mitigation.

PART 2. PRIORITY AREAS FOR ACTION AND LESSONS FOR DELIVERING CLIMATE RESILIENCE



4. LIFE-AR EVIDENCE REVIEW

The LDC Ministerial Group and LDC Chair officially welcomed and launched LIFE-AR at COP24. The next stage was developing our group vision, offer and ask. This was guided and strengthened by the technical inputs from a review of evidence of effective global adaptation and resilience initiatives gathered through a deliberative process across LDCs. Under the direction, guidance and expertise of the LDC Ministerial Group, LDC Advisory Group, LDC Chair and LIFE-AR technical lead, we held six technical workshops with almost 200 experts across Anglophone and Francophone Africa and Asia Pacific over 2018–2019 and brought together more than 400 experts at COP24, CBA12 and the NAP expo to provide further evidence and guidance and to deliberate. A public call for evidence elicited over 100 submissions. The review team also conducted interviews with several hundred climate change experts and case study research with members of LUCCC, capturing rich insights and experience of LDC experts and resilience partners to shape our 2050 Vision. We present the key findings of this evidence review here in Part 2.

4.1 The purpose of the review

We conducted the review to learn more about how adaptation and resilience interventions are being implemented — and delivered — to provide a deeper understanding of ‘what works’ in delivering long-term resilience. The evidence base for adaptation and resilience initiatives is still nascent, making it difficult to understand the range and scope of interventions and the short- and long-term impacts they will have.

The purpose of the evidence review was to understand what interventions are being undertaken across the developing world and identify interventions that show positive deviance in terms of where the evidence so far is pointing to positive outcomes in supporting effective adaptation and resilient development. At the same time, we can provide examples and ideas of what is working from across LDCs, supporting cross-country learning and knowledge transfer. Although it is difficult to determine the impact of many of the interventions at this stage, we can identify those that look promising based on an assessment of how they are being delivered and the extent to which they are already supporting communities.

The focus of this evidence review is on presenting a non-exhaustive base of potentially effective adaptation and resilience interventions that we LDCs might use to achieve our ambitions. It aims to support the LDC Group in bridging the gap between setting out and delivering our vision in each country by stimulating ideas for innovation based on the evidence from interventions that are being implemented across sectors and societies.

4.2 Methodology and scope

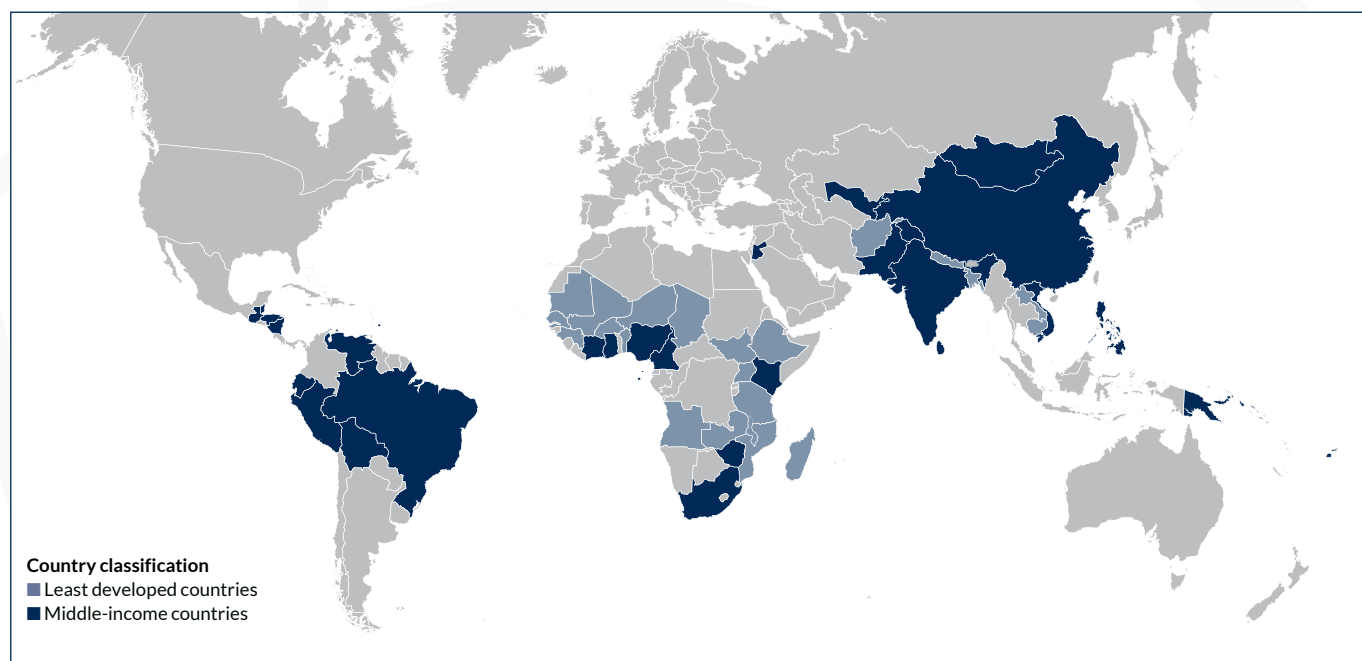
The LIFE-AR evidence review is truly global in its scope. The 95 initiatives cover a wide geographical area, with 43 from Africa, 30 from Asia, 9 from the Pacific, 3 from Latin America and 10 multi-regional or global initiatives. In total, 68 countries are represented: 39 upper- and lower-middle-income countries and 29 LDCs, including 11 small island developing states.

The diversity of initiatives reviewed gives all countries opportunities for learning, irrespective of size, landscape or hazard. The initiatives cover a wide range of landscapes and ecosystems, including agricultural and pastoral (37), coastal (19), urban (11), watershed (11), forest (8) and mountainous (4). They span a wide range of environments that are vulnerable to different hazards, including drought (45), flooding and storm surges (49), cyclones and typhoons (31), extreme temperatures (20) and earthquakes (3).

At the outset of the LIFE-AR evidence review, the LDC Advisory Group identified nine criteria — based on text from Article 7, paragraph 5 of the Paris Agreement — to guide the understanding of ‘what works’ in effectively supporting long-term adaptation and resilience. These fall into two groups, illustrated in Box 2.

Through deliberations, the review team selected the 95 initiatives for review based on the criteria in Box 2. The team analysed each of the initiatives individually and then grouped the findings from each initiative, analysing them across the nine criteria to generate cross-cutting lessons on delivering long-term effective adaptation.

Figure 2. Geographical spread of countries included in the review



Box 2. Nine criteria for long-term adaptation and resilience

Outcome-based criteria

1. Targets the drivers of climate vulnerability
2. Promotes far-sighted action for the long term
3. Promotes far-reaching action at scale
4. Promotes social justice with gender equality and social inclusion

Process-based criteria

5. Integrates scientific and technical knowledge within local knowledge systems
6. Supports vertical integration between layers and horizontal integration between sectors
7. Supports the coherent delivery of global commitments including those in SDGs, the Paris Agreement, the Sendai Framework for Disaster Risk Reduction and the Aichi Biodiversity Targets
8. Uses participatory design and transparent processes
9. Is domestically driven and owned, and strengthens national institutions

4.3 Structure of the review

Our vision prioritises actions to support climate-resilient people, economies and landscapes, so we grouped interventions in this way for the evidence review. We also noted that most interventions cut across two — if not all three — of these areas.

Section 5 discusses the overarching lessons coming out of the evidence review, with a focus on the outcome-based criteria. Review across the initiatives against all the criteria brought out some clear lessons for how these outcomes are being delivered for effective adaptation and resilience.

Sections 6 to 8 analyse the delivery mechanisms that the initiatives present for supporting climate-resilient people, economies and landscapes, discussing lessons for the process-based criteria in more depth. We supplement these lessons with brief examples that showcase practical approaches to achieving climate-resilient outcomes and conclude each section with a detailed case study that takes a deeper dive into a real-world example that can provide valuable lessons and inspire ambition in delivering our vision.

In Section 9, we explore cross-cutting issues and look at creating an enabling environment to support climate-resilient people, economies and landscapes through joined-up approaches to planning, finance and climate information, domestic ownership of initiatives and by mainstreaming climate change adaptation into government systems.

Finally, in Section 10 we draw our conclusions and explore next steps.

5. OVERARCHING LESSONS FROM THE EVIDENCE REVIEW

Table 1. Overarching lessons from the LIFE-AR review

Themes	Insights
Taking an integrated approach to reducing poverty and climate vulnerability	1. Coherent efforts to promote both poverty reduction and resilience to climate change can address underlying drivers of vulnerability 2. Reducing climate sensitivity through social protection and improving income and access to financial and basic services can deliver climate resilience 3. Reducing or minimising people's exposure to climate hazards and shocks can help deliver climate resilience
Delivering long-term and far-reaching outcomes	1. Building resilience to climate change takes time 2. Delivering over longer timeframes helps build the support needed for political buy-in and national financing 3. Investing in climate-resilient infrastructure now can future-proof infrastructure, technology and services and reduce maladaptation 4. Developing long-term national plans to address climate change and integrating climate change into all other planning is necessary 5. Devolving adaptation governance, planning and financing to subnational levels develops climate resilience at local levels 6. Securing long-term finance helps build national capacity for climate resilience 7. Despite some advances in long-term financing, we need more long-term, predictable finance 8. Countries need to scale up efforts to reach more people, cover larger geographies and deliver change to governance systems, markets and landscape management 9. LDCs will also have to take whole-of-government and whole-of-society approaches, and with the consideration of long-term impacts, to address systematic drivers of vulnerability and exclusion
Promoting gender equality and social inclusion	1. Gender equality and economic inclusion is vital for reducing long-term vulnerability to climate change 2. Promoting gender equality and ensuring equal rights and opportunities for women and men to access economic resources and benefits and promoting capacity building and appropriate gender-relevant technology are all essential to build the resilience of both women and men 3. Better outcome-level data is critical to assess how effectively initiatives will improve livelihoods for the poorest, reduce gender inequality and promote social and economic inclusion 4. Investing in locally managed organisations and businesses and supporting local access to products and services that support the better management of climate risk is crucial in building climate resilience at the local level
Building on local knowledge and supporting the development of technical knowledge	1. Significant investment is required to strengthen local knowledge on managing climate risks, including brokering links to new technical knowledge and skills 2. Harnessing local knowledge of managing climate hazards helps ensure climate risk management is locally relevant 3. Integrating technical and local knowledge into formal planning systems helps strengthen resilience planning

5.1 Lessons around taking an integrated approach to reducing poverty and climate vulnerability

1. Supporting long-term climate resilience can create ‘win-wins’ in delivering the Paris Agreement, SDGs, Sendai Framework on Disaster Risk Reduction and the Aichi biodiversity targets. All 95 initiatives submitted to the LIFE-AR evidence review work to reduce underlying vulnerability to climate hazards and align with at least one of the SDGs. Nearly two-thirds of the initiatives address both climate vulnerability and one of the Sendai Framework’s four priorities for action. This shows there is a strong relationship between efforts to promote poverty reduction and resilience to climate change. All nine of the initiatives that address the underlying causes of biodiversity loss — thus supporting delivery of the Aichi biodiversity targets — address climate vulnerability and align with at least one SDG. This also indicates a strong relationship between efforts to support ecosystems, reduce vulnerability and build resilience to climate change. These synergies illustrate the value of coherent responses, where a climate component adds an explicit focus on the climate impacts on wider objectives and helps institutions develop robust responses given the uncertainties of future climate. Although pro-poor development initiatives can address the underlying drivers of vulnerability, explicitly including climate in these supports coherent responses. Considering the uncertainties in potential climate futures in this way will help reduce maladaptation and ensure that progress in poverty reduction is not undermined by the evolving types, magnitude and timescale of climate hazards.

2. LDCs can improve the delivery of climate resilience by conducting climate change vulnerability assessments to understand the impacts of climate change on women and men, boys and girls, and by designing interventions that address their needs and build on their capabilities. The initiatives should be gender-responsive and holistic in coverage to reduce climate sensitivity in an inclusive manner. They can do this by: increasing household incomes and assets to better manage shocks through social protection transfers; improving access to financial services; improving crop yields with climate-resilient agricultural practices; increasing

participation in climate-resilient value chains; improving access to essential services such as water, energy and infrastructure; improving the availability of and access to critical ecosystem services; increasing access to climate information services; and improving climate and disaster risk management planning.

3. LDCs can deliver climate resilience by using contextual understanding of risk and vulnerability — in terms of geographical location, gender, age and income disparity — to help vulnerable communities and households reduce their exposure to climate-related hazards and disaster events. The initiatives we reviewed take different approaches to reducing climate exposure as a pathway to building resilience. Some focus on building infrastructure that can withstand the impact of climate hazards — for example, housing, roads and water stores that can withstand typhoons, hurricanes, floods, increased rainfall and extreme temperatures. Others aim to restore degraded ecosystems such as forests, mangroves and waterways to help minimise the impact of climate shocks or help communities or households voluntarily relocate to areas that are less exposed to severe climate shocks.

5.2 Lessons around delivering long-term and far-reaching outcomes

1. Building resilience to climate change requires long-term perspectives. Across the initiatives we reviewed, we found three main approaches to building long-term climate resilience: delivering activities over long timeframes, promoting long-term climate-resilient planning and accessing long-term finance for climate-resilient investments. Nearly half of the initiatives are implemented over long timeframes or deliver benefits that will be sustained over at least ten years. These include nationally owned, LDC-led initiatives that deliver climate resilience, donor-funded projects that are expanding beyond the traditional five-year project cycle and investments in long-term climate-resilient infrastructure.

2. LDCs are taking ownership of national resilience initiatives to deliver extended support to poor and climate-vulnerable people. Many of the initiatives that have been implemented over long timeframes are

nationally owned initiatives that began as smaller (often donor-funded) projects, and were rolled out nationally or institutionalised in governance systems through a strong leading government ministry or agency, thus achieving significant political buy-in and national financing. This suggests a link between long-term and patient donor financing, institutionalisation into national systems and the achievement of national scale. Examples of such initiatives include social protection systems such as the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) in India and the Hunger Safety Net Programme (HSNP) in Kenya and national planning approaches such as the Kalahi-Cidss National Community-Driven Development Program (KC-NCDDP) in the Philippines and the Kiribati Action Program (KAP) in Kiribati.

3. Integrating climate resilience into long-term planning processes can help deliver long-term resilience. Over half of the initiatives support such integration through developing national-level plans to address climate change; integrating climate change into sectoral policies (such as water, health or forestry); long-term landscape management plans (for example, for watersheds and rangelands), long-term investment models or business plans; and relocation or migration planning.

4. Investing in climate-resilient infrastructure in the next decade can deliver long-term resilience. There is an urgent need to invest in climate-resilient infrastructure now to avoid locking LDCs into infrastructure, technologies and services that are not fit for the future, and at the very worst could lead to maladaptation. An additional group of initiatives we reviewed deliver climate-resilient infrastructure with benefits that will accrue over long time horizons. These include initiatives that:

- Invest in natural systems so they can deliver long-term ecosystem services — for example, for smallholder agriculturalists in Niger, pastoralists in Ethiopia, urban residents in Fiji and watersheds in Mali and Uganda
- Invest in physical infrastructure such as housing for the urban poor in Vietnam, typhoon-resilient buildings in Madagascar, roads in Cambodia and coastal storm drainage infrastructure in Tanzania, and

- Provide infrastructure support for small-scale voluntary relocation for coastal communities to areas that will not be exposed to future climate hazards (Fiji, the Philippines and São Tomé e Príncipe).

5. Devolving adaptation governance, planning and financing to subnational levels enables people to manage current and future climate risks at local level.

As climate risks are highly context-specific and vary over small geographical areas, effective adaptation approaches take local specificities into account. Locally planned adaptation actions can better consider local specificities by drawing upon local, traditional and indigenous knowledge of climate risk to develop effective adaptation actions. Local people are also better placed to deliver more sustainable adaptation solutions by considering local complexities and resolving local tensions that might undermine the effectiveness of adaptation, and by strengthening the capabilities of local institutions and enabling them to deliver and learn from adaptation solutions. Locally planned, budgeted and implemented action also means that local community members have greater control over how finance is allocated and oversight into how it is spent, providing a means of accountability. Further, devolving adaptation in this way can unlock new resources by stimulating local investment in adaptation from local government, business and household budgets. A significant number of initiatives are developing long-term subnational climate resilience by supporting devolved governance, planning and financing of climate change adaptation. These include developing local climate change adaptation plans in Nepal and Mozambique, early warning systems in the Pacific and Vietnam, and urban climate planning in South Africa, the Philippines, Fiji and Tanzania.

6. Securing long-term finance helps build national capacity for climate resilience. Only half of the initiatives we reviewed had secured long-term finance. Most of these were donor-funded and had multiple five-year project phases that strengthened the capacity of national systems to slowly integrate them into their own planning and financing systems. Such initiatives have worked in countries such as Ethiopia, Kenya, Bangladesh, Uganda, Kiribati and Cambodia that have strong governance systems built around a national ministry or delivery

agency capable of long-term planning and financing. Most involved long-term partnerships between countries and specific donors, including the UK's Department for International Development, the World Bank and the Asian Development Bank. A smaller group of projects in middle-income developing countries — such as India's MGNREGS — were funded by domestic finance, usually where there is a strong level of existing government capacity. Finally, a group of private sector projects strengthened the development of climate-resilient value chains and micro, small and medium-sized enterprises mainly in the agricultural sector but also in energy and forestry. But rather than only providing direct finance over long periods, these value chain projects take a longer-term and self-sustaining approach by also investing in market systems development so market actors can provide the products and services poor people need to move out of poverty and climate vulnerability.

7. Although a new generation of internationally funded projects are financing climate resilience investments over long time frames, greater levels of long-term predictable finance are still needed. One of the recent changes in global climate resilience financing has been the Green Climate Fund (GCF) investing in longer-term initiatives that exceed traditional five-year project funding cycles. Our review captured several of these initiatives, including the 14-year Bhutan for Life forestry project and the 12-year Acumen Resilience Agriculture Fund in Ghana, Nigeria and Uganda. Most of these GCF projects are in the initial implementation phase, so it is too early to determine their impact on long-term resilience or the extent to which they are embedded in national government systems. But this group of projects is still relatively small and only the GCF, the World Bank's International Development Association and the Pilot Program for Climate Resilience have provided long-term funding in a single phase for more than five years. LDCs are still not receiving the long-term predictable finance we need to build climate resilience.

8. Building long-term climate resilience requires scaling up efforts to reach more people, cover larger geographies and deliver change to governance systems, markets and landscape management. There needs to be more investment in large-scale initiatives that improve resilience for large numbers of people. Only 40% of the

initiatives we reviewed were large-scale ones in terms of geographic reach and number of people benefitting. Most of these were institutional delivery mechanisms embedded in government planning. This suggests a new generation of projects is scaling up to support larger groups of people to become more climate resilient. A significant number of these large-scale initiatives aimed to deliver climate-resilient agriculture approaches and/or large-scale water management. Others focused on landscape management approaches at watershed, wetland and forest landscape levels.

9. Delivering long-term and far-reaching outcomes will also require reaching deeper to address systematic drivers of vulnerability and exclusion. Given the pervasive and far-reaching nature of climate hazards, engagement of all actors in society will be needed in delivering coherent and coordinated responses. Taking such responses will support:

- Incorporating different perspectives to tackle trade-offs justly and effectively. Including all local perspectives and groups in decision making will make funds and resources more likely to take more sustainable and fairer actions. Over three-quarters of the initiatives reviewed involved significant engagement of subnational actors.
- Providing clarity on rights. Securing tenure can support communities in making long-term investments and in prioritising returns for the future. Over half of the initiatives supported the strengthening of national and subnational governance systems; such strengthening is critical in supporting improved governance on such issues as land rights.
- Taking more sustainable resource management decisions. Ensuring inclusive governance of local resources leads to fairer and more just use of resources.⁹ Only around one-fifth of the initiatives incorporated inclusive governance through involvement of subnational actors and institutions and enabled the participation of poor and marginalised groups in decision making.

In engaging with and reaching the most vulnerable groups, we will therefore need to take a whole-of-government and

whole-of-society approach as much as possible —and a long-term perspective.

5.3 Lessons around gender equity and social inclusion

1. Reducing long-term vulnerability to climate change in the LDCs requires strong efforts to support the poorest and most marginalised groups in a way that promotes gender equity and social and economic justice. There needs to be an explicit focus on women, indigenous peoples, the elderly, disabled people and youth. The initiatives we reviewed have made strong efforts to reach the poorest, but few focus explicitly on gender justice and very few support other marginalised groups. Three-quarters of the initiatives target the poorest households, communities and regions, while slightly fewer than half target women and girls.

2. LDCs need more reliable outcome-level data to assess the extent to which initiatives could improve the livelihoods of the poorest, reduce gender inequality and promote social and economic justice for other marginalised groups. The initiatives lacked outcome-level data and a clear and developed theory of change to help assess progress against outcomes. This reflects a data gap in measuring the extent to which resilience interventions have improved development outcomes and an even bigger gap in measuring the extent to which development outcomes are sustained after a climate shock. Better long-term data systems and explicit theories of change would allow us to measure the outcomes of adaptation interventions both pre- and post-shock, and to understand the differentiated impacts of these interventions on women, men, youth, children, and poor and vulnerable groups. This would help provide more meaningful analysis on ‘what works’ to deliver resilience and ultimately strengthen the design and implementation of climate resilience initiatives.

3. LDCs can support climate resilience for the poorest and most vulnerable by investing in locally managed organisations and businesses and supporting vulnerable women and men to access products and services to better manage climate risk. The initiatives that best supported the poorest and most vulnerable — nearly a

third of those we reviewed — focus on helping grassroots organisations such as community organisations and women’s groups plan and build climate-resilient infrastructure and housing; supporting the development of local businesses and climate-resilient value chains in agricultural and forestry products; providing climate information services to households to help them boost their agricultural and livestock productivity; or supporting disaster risk management planning. They also include initiatives that improve energy access, which delivers a multitude of development and resilience co-benefits to socially excluded groups.

5.4 Lessons around building on local knowledge and integrating with technical knowledge

1. Supporting long-term climate resilience requires efforts to strengthen local knowledge on managing climate risks and to integrate with new technical knowledge and skills that can help address the challenges posed by climate change. Communities and indigenous peoples have longstanding relationships with their environment and have built up knowledge on and practices around how to manage the complex ecosystems they depend on. Technical know-how can be most effective when supplemented with traditional and local knowledge to support context-specific decisions in responding to the impacts of a changing climate. Developing interventions in this way can allow local people to adapt ‘expert’ solutions to local realities and give space for experimenting, learning and adjusting these to meet their own needs.

2. Evidence shows that there is a strong foundation of local knowledge on how to manage climate hazards. Over half the initiatives harness local knowledge on hazards and vulnerability to deliver locally relevant climate risk management approaches, such as:

- Strengthening traditional climate-resilient livelihoods and promoting the development of value chains and small businesses such as pastoralist livelihoods in the Horn of Africa and the Sahel, agricultural value chains in West Africa and South Asia and forestry value chains in central Africa

- Applying local knowledge and building practices in the design and construction of climate-resilient infrastructure in Madagascar, the Philippines, Vietnam and Zambia
- Promoting sustainable landscape management based on local knowledge to protect coasts in Fiji, manage glacial lake flooding in Pakistan, regenerate soil in Niger and Ethiopia and manage forests in Bhutan
- Promoting disaster risk reduction planning by developing early warning systems for tropical storms in the Pacific, integrating disaster risk management into local development plans in Western Nepal and developing urban heatwave protection systems and public awareness campaigns in Ahmedabad, India, and
- Using mobility or relocation as a climate risk management strategy in the Sahel and the Pacific.

3. Integrating technical and local knowledge systems into formal planning helps build resilience. Several initiatives are making significant efforts to integrate local knowledge on climate hazards into formal planning systems to manage climate risks — for example, in local adaptation planning in Nepal and South Africa, in landscape management approaches in Angola, Belize, Kenya, Mali and Vietnam and in water management planning in Bangladesh, Ethiopia,

the Maldives and Sri Lanka. In Kenya, Isiolo County's participatory digital mapping initiative uses satellite imagery and geographic information systems to bridge the knowledge and communication gap between pastoral communities and county government planners to support natural resource planning and management.

Other projects are helping subnational actors gain technical knowledge and skills to reduce their vulnerability to climate change, including:

- Accessing and using climate information services such as early warning systems in The Gambia and the Pacific, rainfall information for Ugandan and South Sudanese farmers and market and water access information for pastoralists in Ethiopia and the Sahel
- Financial services, including savings accounts and livestock insurance in Kenya
- New technologies such as multiple use water systems in Nepal, and
- Business and technology skills in developing climate-resilient enterprises, such as milk value chains using solar panels in Senegal and agricultural value chains in Tajikistan.

6. MECHANISMS FOR SUPPORTING CLIMATE-RESILIENT PEOPLE

Supporting climate-resilient people by creating just, inclusive, happy, poverty-free societies.

6.1 Social protection

Why focus on social protection?

- Social protection is an important poverty reduction approach that has significantly impacted on poverty reduction around the globe.
- If well designed, social protection is acknowledged for driving improvements in gender equality and women's and girls' empowerment, contributing to SDG 5 by reducing gender gaps in access to health, food and education, and enabling women and men to accumulate productive resources and assets for improved resilience to climate risks and shocks. Although it has helped reduce poverty among women, they still have less access to social protection than men.
- A growing evidence base shows that social protection programmes can promote resilience to climate change.
- Shock-responsive social protection can use existing social protection systems to reduce vulnerability to natural hazards and extreme events by acting as a safety net to help people continue to meet their basic needs.
- Adaptive social protection has the potential to deliver longer-term climate resilience by promoting sustainable livelihoods, although the evidence base still needs to be strengthened.

Social protection is an important poverty reduction approach. Globally, social protection programmes support around 2.7 billion people and invest nearly US\$500 billion in poor and middle-income countries. Social protection can take many forms, including conditional and unconditional cash transfers, social insurance, pensions, school feeding programmes, public works, employment guarantee schemes and fee waivers. A global meta-analysis of

conditional cash transfers programmes has shown that they have significant impacts on reducing poverty in terms of nutrition, income, assets and health.¹⁰

Social protection initiatives provide vital support to reduce poverty for women. Programmes can support women by improving nutrition, infant and maternal health and education — the basic determinants of wellbeing. They can also support women's labour market participation, give them access to financial services and improve both their asset accumulation and intra-household resource allocation, all of which improve women's economic wellbeing and capacity to manage risk.¹¹ But reproductive roles, social norms and a lack of market inclusion mean that social protection is often less available to women than it is to men.¹²

Social protection programmes can help promote climate change resilience at times of increasing climate hazards. There is growing recognition that social protection interventions can support vulnerable people to reduce poverty and strengthen climate resilience. A global review of 63 social protection initiatives found that social protection primarily helps build absorptive resilience and can sometimes build adaptive resilience. Absorptive resilience (and, to a lesser extent, adaptive resilience) are primarily achieved through cash transfers and income from wages in guaranteed employment, coupled with infrastructure enhancement.¹³

Shock-responsive social protection initiatives use social protection systems and tools to address vulnerability to natural hazards and extreme events, establishing early warning, finance, planning and targeting systems to deliver resources (often cash transfers) to specific groups of people when a shock occurs. They have been used to respond to climate-related shocks — for example, delivering cash transfers in the aftermath of Cyclone Haiyan in the Philippines and Fiji's Cyclone Winston, using HSNP to respond to droughts and *El Niño* floods in Kenya and using MGNREGS to respond to drought events in India. Such initiatives support the delivery of the Sendai Framework on Disaster Risk Reduction.

Adaptive social protection initiatives build on shock-responsive social protection by including a longer-term

focus on ensuring social protection builds adaptive and transformative resilience through promoting sustainable livelihoods. These approaches are still being developed and adjusted to explore how they can build longer-term adaptive and transformative changes.

Lessons from the LIFE-AR evidence review

Lessons on social protection

- Social protection programmes can help reduce poverty and build absorptive resilience by reducing people's sensitivity to climate hazards.
- Integrating social protection initiatives into national government systems led by a strong national department or agency can deliver long-term and far-reaching resilience outcomes.
- Smaller initiatives are piloting innovative approaches, such as forecast-based financing, which countries could take to scale once they have demonstrated proof of concept.
- Climate-resilient social protection initiatives should establish clear funding procedures and targeting mechanisms to improve delivery and promote transparency.

The LIFE-AR evidence review analysed 12 social protection initiatives to understand how LDCs can support people to become more resilient to climate change (see Table 2). This section summarises the overall lessons we drew from these initiatives and looks in detail at lessons from a disaster risk financing initiative in Uganda. Table 3 highlights the learning from several initiatives included in our analysis.

All 12 social protection initiatives support social inclusion by targeting the poorest people and regions, thereby promoting poverty reduction and helping to deliver the SDGs. We reviewed a variety of social protection programmes that used different types of instrument, from labour guarantee schemes like India's

MGNREGS to shock-responsive programmes that deliver cash transfers to victims of natural disasters such as the Philippines' KC-NCDDP and social insurance mechanisms like Ethiopia's R4 Rural Resilience Initiative. Half of these explicitly promoted gender inclusion by targeting activities or benefits to women and girls — for example, including women in labour guarantee schemes or promoting women's saving groups in social insurance initiatives.

Social protection programmes can build absorptive resilience by reducing people's sensitivity to climate hazards. The initiatives we reviewed under LIFE-AR helped people cope with drought, cyclones, typhoons, flooding and extreme temperatures. They used different instruments, including cash transfers, which provide people with the disposable income they need to manage climate risk pre- and post-shock; building public and private assets, which improved the productivity of livelihoods and gave people higher incomes to manage climate risks; and providing specific services — such as supporting pre-shock evacuation — which helped reduced exposure to hazards.

Integrating social protection initiatives into national government systems led by a strong national department or agency can deliver long-term and far-reaching resilience outcomes. Half of the initiatives we reviewed were large, long-term, far-reaching programmes integrated into national planning systems, such as MGNREGS in India. Most of these were domestically owned poverty reduction programmes implemented by national governments, vertically integrated into planning and financing processes to target vulnerable people with conditional cash transfers, employment guarantees and infrastructure investment instruments. Some — including MGNREGS — were launched by national governments as platforms to reduce poverty. Others began as donor-funded poverty reduction initiatives that were launched in parallel with government, implemented through a lead national ministry or agency and delivered through subnational ministry or agency departments and field officers. These have gradually scaled up over time with increasing levels of co-funding from national governments, as in the case of Kenya's HSNP.

Table 2. Social protection initiatives examined in the LIFE-AR evidence review

Type of initiative	Examples
Social protection	Productive Safety Net Programme (PSNP) (Ethiopia) MGNREGS (India) HSNP (Kenya) Kenya Livestock Insurance Programme (KLIP) PRIORIZE (Mozambique) Third Northern Uganda Social Action Fund (NUSAF III)*
Shock-responsive	Bono AAA and Bono de Alimentación Rural (Ecuador) Poverty Benefit Scheme (Fiji) KC-NCDDP (the Philippines)
Pilot initiatives trialling innovative social protection and climate resilience approaches	Forecast-based financing initiatives (Bangladesh and Mongolia) R4 Rural Resilience Initiative (Ethiopia, Kenya, Malawi, Senegal and Zambia)

* See Box 3 for detailed case study and lessons for LDCs

Several shorter-term, smaller initiatives are experimenting with new mechanisms to deliver climate-resilient social protection systems. Some – such as the shock-responsive social protection responses to Typhoon Winston in Fiji – were new experiments with scaling up social protection benefits to an existing target population to address a specific climate or non-climate disaster. Others were experiments with new climate resilience mechanisms to improve the ability of social protection systems to support climate risk management. Relatively small in geographic scope, these initiatives, which included forecast-based financing in Bangladesh and Mongolia and insurance coverage under R4 in Senegal, Ethiopia, Malawi, Kenya and Zambia, were mostly pilot NGO projects testing approaches that could be scaled up in future. Among other things, scaling up would require deeper engagement with broader stakeholders such as national and local governments to provide an integrated and long-term approach.

To promote transparency in addressing climate change, climate-resilient social protection initiatives should establish clear and transparent funding procedures and targeting mechanisms for delivering cash transfers to vulnerable people on the frontline of climate change and clear rules and procedures for scaling up cash transfers before or after a climate-related shock. Many of the nationally owned social protection systems we reviewed also rely on external support and technical knowledge to make their operations more climate responsive. This was particularly so for shock-responsive initiatives that work with external actors such as the World Bank or humanitarian agencies to develop systems and processes to scale up cash transfers when disasters occur. In recent years, governments, donors and humanitarian agencies have been experimenting with how to improve targeting mechanisms, parametric indices to monitor climate shocks like drought, and clear rules, thresholds and operating procedures for scaling up and out to more beneficiaries. The case study from Uganda (Box 3) provides a good example of how to deliver this in practice.

Table 3. Issues to consider for social protection initiatives

Issue	Example	
Promoting poverty reduction and building absorptive resilience	Shock-responsive social protection Ecuador, the Philippines¹⁴	Shock-responsive social protection occurs when governments use national social protection programmes and administrative capacity to assist populations affected by a crisis. There is a rich evidence base on how existing social protection systems can be used to help vulnerable people cope with a shock. In April 2016, a magnitude 7.8 earthquake hit Ecuador, affecting more than one million people, damaging critical infrastructure and displacing 10,000 people. After creating a database of affected households, the national government used the delivery channels of existing social protection systems – the Bono AAA and Bono de Alimentación Rural – to deliver cash transfers to the bank accounts of affected people. Similarly, in the aftermath of Typhoon Haiyan in 2013, the government of the Philippines used the country's flagship conditional cash transfer programme Pantawid Pamilyang Pilipino, which supports 4.4 million households, to scale up the value of cash transfers to existing beneficiaries. Both these examples used cash transfers to help households meet their immediate needs in the aftermath of disasters.
Integrating into national systems through strong national agency	Hunger Safety Net Programme (HSNP) Kenya¹⁵	The HSNP is an unconditional cash transfer programme that focuses on households living in extreme poverty in four arid counties of northern Kenya. County governments register all households in their jurisdictions with Equity Bank accounts. The HSNP provides regular bi-monthly cash transfers to 100,000 households – around 25% of households in the region. The programme sits under the Ministry of Devolution and Planning and is managed by the National Drought Monitoring Agency, which also monitors drought conditions by satellite. If these reach severe levels in any given month, an additional 25% of households in the drought-affected area (so 50% of all households) receive a one-off 'emergency' payment. If conditions worsen to extreme levels, coverage increases to 75% of all households. The channel created by registering all households with bank accounts on the system makes it easy for the county government to scale up the initiative horizontally when needed. HSNP, funded by the governments of Kenya with support from Australia's Department for Foreign Affairs and Trade in Pilot phase I and the UK's Department for International Development through Pilot Phase I to the current Phase III, is a part of Kenya's overarching National Safety Net Programme.

Issue	Example	
Testing new innovation	Forecast-based financing Mongolia ¹⁶	In Mongolia, the International Federation of Red Cross and Red Crescent Societies has been testing forecast-based financing, an innovative approach to provide social protection payments to vulnerable households in advance of climate-related shocks. Mongolia is vulnerable to <i>dzud</i> (severe drought followed by an extreme winter), which affects pastoralist communities and their livestock. The Mongolian Red Cross Society, supported by the British Red Cross, partnered with national agencies including the National Agency for Meteorology and Environmental Monitoring to develop a <i>dzud</i> risk map that uses 14 indicators including rainfall deviation, temperature and drought risk to identify the regions that are most vulnerable to <i>dzud</i>. In 2017, they trialled forecast-based financing in the 40 most at-risk <i>soums</i> (local administrative districts). The Mongolian Red Cross worked with local government to identify the most at-risk beneficiaries and provided pre-emptive support for 2,000 herder households in the form of cash transfers and animal care kits to prevent them from losing their livestock and livelihoods due to <i>dzud</i>. Many countries are trialling forecast-based financing to build on and develop national systems and procedures for larger-scale early action social protection that can help prevent humanitarian crises before they occur.
Promoting transparency by developing clear targeting mechanisms	MGNREGS India ¹⁷ Third Northern Uganda Social Action Fund (NUSAF III) Uganda ¹⁸	Different social protection systems take different approaches to targeting beneficiaries and ensuring transparent delivery of social protection benefits. India's MGNREGS is a universal programme enacted by parliament which gives every person in rural India the right to access social protection assistance. People choose to participate based on their own needs. Beneficiaries register individually, receiving a job card linked to their bank account so that cash transfers are delivered directly. In Uganda, the NUSAF III programme has taken a different approach to integrating climate risk financing into the public works scheme. The World Bank has supported the government to develop a drought monitoring system in the Karamoja region using satellite technology that monitors drought conditions. This system includes clear rules and procedures to establish that a drought has occurred and scale up cash transfers to help people cope with it (see Box 3).

Box 3. Disaster risk financing: lessons from Uganda¹⁹

NUSAF III, a labour-intensive public works scheme in northern Uganda, gives social protection assistance to 100,000 households in 55 districts. It provides employment for poor and vulnerable households — at least 40% women — to help smooth consumption, improve food security, build public assets and strengthen resilience to shocks. Participants are paid to build community assets such as rural access roads, tree nurseries, afforestation projects, soil and water conservation assets, flood control structures, rainwater harvesting infrastructure, market shelters, rural health facilities and schools.

NUSAF III is piloting a US\$12 million disaster risk finance component to help communities in Karamoja District manage climate shocks. Social protection systems can integrate disaster risk financing to scale up and scale out benefits to communities when a crisis occurs. The World Bank has helped Ugandan policymakers develop several systems and procedures to integrate disaster risk finance into NUSAF III and roll out disaster risk financing in the district. These include improving data collection systems to monitor drought conditions, establishing transparent index-based parameters to establish that a drought has occurred using remote sensing technology to evaluate vegetation cover in drought-hit areas of Karamoja, developing transparent rules for disbursing funds after the drought threshold has been passed and setting aside US\$10 million as a contingency fund for increased payouts when a drought occurs.

In 2016, El Niño caused a widespread drought, triggering a rapid scale-up of NUSAF III to an additional 125,000 people and testing the disaster risk financing mechanism. Karamoja quickly drew US\$4 million from the US\$10 million reserve fund to give disaster assistance to 30,000 extra households (150,000 people) on top of the 5,000 households (25,000 people) already receiving assistance. Over 20% of the population of Karamoja were covered by the 2016 scale-up. The programme is expected to scale up assistance to 84,000 additional households (400,000 people) over its lifespan.

Lessons for LDCs

International actors can help build LDCs' technical skills in shock-responsive social protection at national level to develop robust systems that can respond to climate shocks.

Although many LDCs already have a strong foundation of technical knowledge and expertise on using social protection to reduce poverty, we need to build our technical knowledge of shock-responsive social protection systems, mechanisms and processes. The World Bank team spent significant time and resources working with the Ugandan government to develop the NUSAF III disaster risk finance component, drawing on regional experience from Ethiopia's PSNP and Kenya's HSNP. The World Bank team embedded staff within the government to build capacity and develop shock-responsive social protection systems and procedures. Ugandans see the NUSAF III disaster risk finance mechanism in Karamoja as a domestically owned government response.

Shock-responsive social protection systems can address the twin challenges of climate vulnerability and poverty if they develop transparent systems and processes that scale up in times of crisis. Mechanisms for triggering a response and channelling payouts to climate-vulnerable households should outline how they will target women, given the disproportionate impact that climate extremes have on women's wellbeing. NUSAF III's transparent rules and procedures clarify when to declare a crisis, how many additional households the programme will support and for how long. A transparent, rules-based approach avoids politicising a response, which can lead to costly delays.

Integrating disaster risk financing into social protection systems can build the long-term institutional capacity needed for future climate responses. Through NUSAF III, the government has developed vertically integrated mechanisms and processes to channel global climate finance to the local level. By integrating disaster risk finance mechanisms into the scheme, the government strengthened its long-term institutional capacity to respond to climate change. The relief that social protection transfers provide to vulnerable communities may only help households smooth consumption gaps in the short term, but long-term investment in developing systems means that the government will be prepared to address future climate shocks as they become more frequent and severe in the decades ahead.

6.2 Access to basic services

Why focus on basic services?

- Access to basic services is vital to achieving the SDGs.
- More than 2 billion people lack access to safe water.
- More than 1.2 billion people in urban areas lack access to affordable and secure housing.
- Nearly 1 billion people have no access to clean energy and 3 billion lack clean cooking facilities.
- Between 2030 and 2050, climate change will cause an additional 250,000 deaths a year from malnutrition, malaria, diarrhoea and heat stress.
- Given the deficit, there is an opportunity for LDCs to leapfrog in investing in climate-resilient infrastructure that improves basic services, reduces poverty and lays the foundation for more resilient societies in the future.
- LDCs can direct such investments to developing low-carbon basic service systems, particularly in areas such as public energy, water and transport.

Access to safe and secure housing, clean energy, clean drinking water, health and education, transport networks and other basic services that underpin human wellbeing and sustainable development is central to achieving the SDGs. As the impacts of climate change increase in the coming decades, this will become even more important.

More than 2 billion people have no access to safe water at home:¹⁹ in 2015, 29% of the global population lacked safely managed drinking water supplies, and 61% lacked safely managed sanitation services.²⁰ People living in insecure housing are more likely to be impacted by climate extremes and disasters such as tropical storms, flooding and earthquakes, but more than 1.2 billion people in urban areas lack access to affordable and secure housing.²¹ Nearly 1 billion still live without access to clean energy and 3 billion lack clean cooking facilities.²⁰ And women in low-income countries often lack access to critical services such as safe and secure housing, drinking water and energy.^{22,23}

Climate change threatens the underlying determinants of health — air quality, safe drinking water, food, nutrition and secure housing. Between 2030 and 2050, climate change will cause an additional 250,000 deaths per year from malnutrition, malaria, diarrhoea and heat stress.²⁴ Investing in access to safe and secure drinking water is vital to ensuring poverty reduction and delivering the SDGs, while ensuring safe and secure housing in LDCs will reduce climate exposure and enable people to move out of poverty. Access to safe, clean, affordable renewable energy is also fundamental to both economic and human development and will lead to more resilient households and communities. The multiple co-benefits of accessing these services — water, housing, energy, education, health, income generation and increased gender equality — all reduce poverty and underpin resilience to shocks.

Over the next 15 years, developing countries will account for two-thirds of global infrastructure investment. With the right investment, we can leapfrog the technologies of the past to develop infrastructure that improves basic services to meet the needs of the 21st century and reduce poverty.²⁵

Lessons from the LIFE-AR evidence review

Lessons on access to basic services

- Improved access to basic services can reduce people's sensitivity to climate impacts.
- Improving access to climate-resilient infrastructure can reduce exposure to climate change.
- Prioritising investment in durable, climate-resilient infrastructure and strengthening the planning and governance of basic service provision can deliver long-term resilience.

The LIFE-AR evidence review analysed 22 initiatives that deliver essential services that increase people's resilience to climate change (see Table 4). This section summarises the overall lessons we drew from these initiatives and looks in detail at lessons from a voluntary village relocation on Fiji (Box 4). Table 5 highlights the learning from several initiatives included in the analysis.

Table 4. Initiatives to improve climate resilience through basic services examined in the LIFE-AR evidence review

Type of initiative	Examples
Climate-resilient housing	Cyclone-proof buildings (Madagascar) Relocation of coastal communities (Fiji*, the Philippines, São Tomé e Príncipe) Typhoon-proof houses (Vietnam)
Climate-proofing core infrastructure	Mainstreaming adaptation into rural road building to avoid flooding (Cambodia) Urban coastal infrastructure to avoid flooding (Tanzania)
Improved access to safe, clean water	Green Climate Fund projects to manage climate-induced water shortages (Ethiopia, Maldives and Tanzania).
Expanding energy access to off-grid communities	Solar home system programme (Bangladesh) Micro-hydro electrification (Pakistan) CLIMADAPT (Tajikistan)
Mainstreaming climate adaptation into national health planning systems	Developing a health national adaptation plan (Tanzania) Health planning supported by the World Health Organization (Barbados, Bhutan, Cambodia, China, Fiji, Kenya, Jordan, Laos, Uzbekistan and Vietnam)

* See Box 4 for detailed case study and lessons for LDCs

The review found a mix of small-scale initiatives that had achieved deep impact by improving access to basic services and large-scale initiatives that had far-reaching coverage at national level, such as Bangladesh's solar home system programme and the Maldives GCF project. We received no submissions for health or education initiatives looking at the design or location of schools, clinics or other core infrastructure to improve the climate resilience of primary service delivery. This omission probably reflects the relatively early stage of adaptation planning in these sectors.

Improving access to basic services can also help reduce people's sensitivity to climate impacts, which helps deliver the Paris Agreement and Sendai Framework as well as the SDGs. All the basic services initiatives we analysed help reduce poverty and deliver the SDGs. This is unsurprising, as access to clean drinking water, clean energy, health services and secure housing are enshrined within the SDGs. But we also found that these improved development outcomes support climate resilience by giving people the wellbeing, income and resources that

they need to better manage risks. For example, energy access provided by the Infrastructure Development Company Limited's (IDCOL) solar home programme in Bangladesh or Pakistan's micro hydro-electrification programme can boost education, health and incomes, which have vital co-benefits for building resilience. Likewise, improved access to clean drinking water can improve human health and help people cope in times of drought.

Improving access to climate-resilient infrastructure can help deliver the Paris Agreement and Sendai Framework by reducing exposure to climate change. Building climate-resilient housing, roads, storm drains and schools is highly correlated with reducing people's exposure to climate hazards. The case studies we analysed took two approaches to delivering climate resilient infrastructure.

Several initiated planning processes to map out the vulnerabilities of infrastructure to climate change and develop plans to reduce the exposure of critical infrastructure. For example, detailed mapping with

tourist operators, government and communities in Belize led to plans to reduce the exposure of critical economic infrastructure to climate change. In the Philippines and Vietnam, community groups have undertaken more localised vulnerability mapping in poor urban settlements to identify infrastructure that was vulnerable to flooding and invest community resources in drainage channels and improved housing.

Others built climate-resilient buildings and infrastructure. In Vietnam, for example, the city of Da Nang launched a public architecture competition to design low-income housing for households that were vulnerable to typhoons and the subsequent flooding. The winning design created simple structures that met local households' social, economic and spiritual needs while using materials and a design that could help them withstand the effects of climate change.

Settlement relocation is an important emerging option in reducing exposure to climate change. A small number of projects supported communities to voluntarily relocate away from coastal areas to locations that are not exposed to coastal inundation or typhoons. In Fiji and the Philippines, this was a voluntary process initiated by households and communities; in São Tomé e Príncipe, the World Bank led the mapping exercise and consultation process that facilitated the relocations.

Prioritising investment in durable, climate-resilient infrastructure can deliver long-term resilience. Houses, schools, clinics, roads and transport networks typically have a long lifecycle and create path dependency by encouraging a range of further decisions as a result of their existence. As such, their design can have long-term impacts for resilience and in terms of the carbon footprint and path dependency of the system. Directing investments to new infrastructure that can withstand the impact of typhoons, flooding, sea level rise, drought and other future climate impacts can help deliver resilience over long time horizons. We reviewed several (mostly small-scale) initiatives that were helping to develop climate-resilient infrastructure. Some had upgraded existing infrastructure with new climate-resilient designs. For example, in Madagascar, the government and regulatory agencies developed new building codes to make infrastructure resilient to typhoons. Others had designed

and built new infrastructure. In Fiji, they built new houses away from coastal areas vulnerable to flooding (see Box 4); in Vietnam, they used a public architecture competition to commission new typhoon- and flood-resilient building designs and then built them with the help of women's savings groups. As well as bringing in local knowledge, these examples also illustrated the importance of developing robustly designed infrastructure, of using approaches that support not only locally designed and led processes but also effective devolved decision-making structures. Much infrastructure is built at the local scale, which does not have the same resources and oversight as the national government in their planning of infrastructure, therefore requiring effective devolved structures for delivering with coherence and ensuring the design and placement are robust to the range of future climates. Delivering long-term investments in climate-resilient infrastructure at scale also requires long-term finance, and only five of the infrastructure initiatives we analysed were able to secure this. These were mostly energy sector initiatives with long-term financing from international donors or national NGOs.

Strengthening the planning and governance of basic service provision can also deliver long-term resilience. Over half the basic services initiatives we analysed were integrated into long-term planning. These included government-led initiatives such as Tanzania's plans to create new infrastructure under the Mzimba River project that will help protect Dar es Salaam from coastal flooding and donor-supported initiatives to strengthen national planning for basic services, such as the World Health Organization's support for mainstreaming climate change into national health plans. We found a strong degree of domestic ownership in the basic services initiatives, which reflects the importance of these sectors in national poverty reduction strategies. Two-thirds of the initiatives either align with national plans and policies or strengthen the domestic governance of climate change responses — for example, making health systems more prepared for long-term climate impacts, delivering water management infrastructure and systems or establishing guidelines for transparent and voluntary relocation of communities that are vulnerable to climate impacts (see Table 5 and Box 4 for more information on how initiatives have strengthened national governance).

Table 5. Issues to consider for improving climate resilience through basic services

Issue	Example
Improving access to basic services to reduce sensitivity to climate impacts	Managing climate change-induced water shortages Maldives²⁶ The outer islands of the Maldives experience drinking water shortages during the dry season. These shortages have had significant adverse human, environmental and social impacts on the outer island communities, where 27% of population lives under the poverty line of US\$2 per day. The problems around freshwater security relate to the increasingly variable rainfall patterns induced by climate change and sea-level rise induced by groundwater salinity. A dispersed and small population over 193 islands prevents economy of scale; a one-size-fits-all water production and supply solution cannot be applied here. Differences in geography (land availability), hydro-climatic characteristics (rainfall and distribution patterns) and socioeconomic conditions (population size, density, growing trends and type of customer base) suggested the need for decentralised and fully customised approaches to water production and distribution to achieve self-sufficiency at island and atoll (group of islands) level. The initiative aims to deliver year-round safe and secure water to the Maldives' 105,000 island residents through a 35-year design period to 2050. This long time horizon allows the government to integrate a broader and more complete view of water supplies into the planning process. The government plan to secure water supplies through several key actions: • Scaling up an integrated water supply system (rainwater, groundwater and desalinated water) to provide safe water to vulnerable households • Introducing decentralised and cost-effective dry season water supply systems, and • Improving groundwater quality to secure freshwater reserves for long-term resilience. The benefits of working to secure freshwater in this way include: • Promoting empowerment and self-organisation at island level so the integrated system reflects local priorities and enables local solutions for self-sufficiency • Maximising diversity in the water budget at island level • Increasing the use of meteorological forecast information to promote flexible and adaptable management of integrated water resource management strategies, and • Upgrading institutional skills and knowledge and promoting performance-based management for improved learning about what works to enable replication to other islands.

Issue	Example	
Improving access to climate-resilient infrastructure to reduce exposure to climate impacts	Typhoon-resilient buildings in Da Nang Vietnam ²⁷	In Da Nang, the <i>Climate and Development Knowledge Network</i> -funded Sheltering from a Gathering Storm project launched a resilient housing design competition for low-income households that could withstand the impacts of increasingly strong and frequent typhoons. The winning design addressed all the critical elements of disaster-resilient housing — site planning, building design and construction technology — at an affordable rate. With support from donors, the Da Nang Women's Union established a revolving loan facility to disburse loans for building new houses based on the winning design or typhoon-proofing existing houses through repairs and upgrades. When Typhoon Nari hit Da Nang in 2013, it caused millions of dollars in damage, but all 245 houses that had been built under the project were undamaged — a 100% success rate in reducing exposure to typhoons.
Investing in durable climate-resilient infrastructure to deliver long-term resilience	Climate-resilient rural roads Cambodia ²⁸	Cambodia has received investment support from the Asian Development Bank for 15 years to improve rural transportation networks through the Rural Roads Improvement project. The Nordic Development Fund has supported efforts to mainstream adaptation into rural transport planning and construction — including vulnerability mapping, review of road design, building climate-resilient roads, investing in tree planting and increasing vegetation to minimise road erosion and flooding, and rehabilitating damaged infrastructure. Funded over long time horizons, these activities will deliver long-term resilience benefits, improving rural households' connectivity to markets and employment centres and climate proofing infrastructure to prevent damage from future monsoon flooding or cyclones.
Strengthening the planning and governance of basic services provision to deliver long-term resilient.	Ahmedabad Heat Action Plan India ²⁹	The city of Ahmedabad in the state of Gujarat, India, has developed a Heat Action Plan to prepare its constituency against dangerous heat waves. Piloted by the Ahmedabad Municipal Corporation (AMC), it aims to provide a comprehensive early warning system and preparedness plan for extreme heat events, describing agency and community actions to increase preparedness, information-sharing, and response coordination to protect vulnerable populations from extreme heat. The Plan, enacted during heat seasons since 2013, has been effective in increasing awareness of the health dangers of heat waves amongst both the general population, and also amongst government, health and emergency response professionals through trainings and capacity building. A 2018 study found that an estimated 2,380 deaths were avoided through the Heat Action Plan.³⁰ As well as immediate and short-term response measures, the Plan also looks to longer term measures, such as the Ahmedabad Cool Roofs Program.

Box 4. Voluntary village relocation: lessons from Fiji³¹

In 2014, Fiji's coastal village of Vunidogoloa voluntarily relocated to higher ground two kilometres inland. A small island in the Pacific, Fiji is highly exposed to tropical cyclones, sea-level rise, flooding and coastal erosion. Before deciding to relocate, Vunidogoloa had begun to feel the negative impacts of climate change, with flooding and other extreme events damaging houses, cutting off access to transportation networks and destroying subsistence crops critical to food security.

Voluntary relocation was a participatory initiative, funded and implemented by the national government and community members. In 2006, the community approached the government with a request to support their relocation as a result of increasing risks associated with climate change. They used a participatory decision-making process to achieve consensus on the need to relocate from all 150 inhabitants, which was followed by a consultation and sensitisation process with government and community members. The government formally announced its support for the project in 2012, committing to cover two-thirds of the relocation costs — for building materials, construction, labour and income-generating activity support. Villagers contributed one-third of the cost in materials and labour.

Relocation involved building a new village with secure basic infrastructure that is not exposed to climate hazards. Under the terms of the relocation, each household received one of 30 identical houses equipped with running water, drainage, indoor toilets and showers and energy supply from solar panels. They also got new income-generating support to offset losses from coastal livelihoods.

Developed from a bottom-up community request for support rather than as a result of government adaptation policy, Vunidogoloa is a unique example of an initiative that has led to permanent national policies and guidelines. Following the successful relocation, the government developed the Planned Relocation Guidelines with a wide group of stakeholders to guide future voluntary relocations as a last resort option for climate change adaptation.

Lessons for LDCs

Providing long-term infrastructure with access to basic services can reduce exposure and sensitivity to climate shocks. Relocating Vunidogoloa from a low-lying coastal

area prone to flooding, coastal erosion and cyclones to a new site away from the sea and on higher ground has addressed underlying drivers of vulnerability by reducing people's exposure to climate change. The relocation has ensured a long-term solution to climate vulnerability and poverty reduction by building infrastructure that will last over long time horizons in a location away from the climate hazards that made the old village site highly vulnerable.

When limits of adaptation are clear, the decision to relocate must be undertaken in a participatory and transparent process that is based on principles of gender equality, social inclusion and human rights. The Vunidogoloa relocation was a participatory and transparent process guided by consensus-based decision making. Given the small size of the village, all its members participated in the decision to move, which was based on the principles of gender equality and social inclusion, with all members receiving the same benefits. The government has enshrined these principles in its new Planned Relocation Guidelines, which will inform all future relocations.

Nationally led climate responses with horizontal collaboration across government can deliver lasting impacts for vulnerable communities. This was a domestic initiative led by the community and the national government. It took a whole-of-government approach, ensuring horizontal collaboration across government departments by involving the Ministries of Economy, Provincial Development and Labour as well as the National Disaster Management Office and National Employment Centre. This integrated approach enabled the government to support the community with new long-term infrastructure and livelihood opportunities.

Voluntary relocation is an emerging basic service as climate impacts increase in severity. It is an important option for communities in the face of changing climate impact. Governments can integrate lessons from pilot initiatives like this one into national plans to deliver far-reaching impacts. In 2018, Fiji's government launched its Planned Relocation Guidelines to guide future voluntary community relocations. It has conducted climate change impact assessments across the country and identified 800 communities that have been negatively impacted by climate change. In 2017, Fiji's attorney general announced that it had identified 43 villages for relocation in the next five to ten years, which will deliver more far-reaching reductions to climate exposure.

7. MECHANISMS FOR DELIVERING CLIMATE-RESILIENT ECONOMIES

Supporting climate-resilient economies that are net-zero and prosperous, with vibrant and sustainable growth within ecological limits.

7.1 Climate-resilient production systems

Why focus on climate-resilient agriculture?

- The agriculture sector is vital for prosperity and food security in LDCs, providing employment for 60% of the labour force and accounting for 20–50% of output.
- Women play an important role in agriculture in LDCs but face structural inequalities that limit their productive capacity and pathways out of poverty.
- Small-scale farmers, herders, fishers and forest-dependent communities are highly vulnerable to climate change.
- Climate change is already affecting agriculture and driving food insecurity in LDCs. Global poverty cannot be eradicated without strengthening the resilience of small-scale producers.
- Agricultural approaches that are climate-informed can support food security and help people in LDCs adapt to climate change.

The agriculture sector is vital for prosperity and food security in our countries. Despite a downward trend in the sector as a percentage of GDP over the last 20 years, it will continue to be critical in supporting the livelihoods of millions of poor people in LDCs until 2050.³² Two-thirds of our people live in rural areas and 60% of the labour force works in agriculture. The sector also accounts for 20–50% of all output.

Women play a vital role in global agriculture production and it is the primary livelihood source for 79% of economically active women in LDCs. Yet women face structural inequalities that reinforce poverty and limit both their productive capacity and their ability to build climate resilience. As climate change impacts on agriculture become increasingly severe, these gender-based constraints will limit women's ability to make the decisions and investments in agriculture that they need to build climate resilience.^{22,33}

The world's 2.5 billion small-scale farmers, herders, fishers and forest-dependent communities who derive their food and income from renewable natural resources are among the most vulnerable to climate shocks and natural hazards. But climate change is already affecting agriculture and driving food insecurity. The number of undernourished people in the world reached an estimated 821 million in 2017, with women more likely to be affected by food insecurity than men. Global poverty cannot be eradicated without strengthening the resilience of small-scale agricultural producers.³⁴

Climate-resilient agricultural practices can support food security and help people adapt to climate change in the LDCs. Taking an integrated approach helps reorient and transform crop, livestock, forestry and fishery systems to ensure food security in a changing climate. It aims to achieve three main outcomes — increasing productivity and incomes, adapting to climate change, and reducing emissions — known as the 'triple win'. Climate resilience can be built into agricultural practices through using a diverse set of context-specific approaches, technologies and policies to help people and agricultural systems become more resilient. There is no 'one-size-fits-all' approach to delivering interventions.

Lessons from the LIFE-AR evidence review

Lessons on climate-resilient production systems

- Introducing inputs, services, finance, technologies and climate information that help improve yields can reduce sensitivity to climate change.
- Using systematic approaches to integrate producers into climate-resilient agricultural value chains and markets can deliver far-reaching impacts.
- Climate-resilient agriculture initiatives can promote partnership with a diverse group of stakeholders and support the creation of organised producer groups.
- Integrating climate-resilient agricultural practice into government plans and developing long-term systems to deliver climate information to producers can deliver long-term outcomes.

The LIFE-AR evidence review analysed 24 initiatives to draw lessons on how LDCs can build climate resilience in the agriculture sector, which is critical to economic development and prosperity in LDCs (see Table 6). This section summarises the overall lessons we drew from these initiatives and looks in detail at lessons from Ethiopia's Sustainable Land Management Programme (SLMP) (Box 5). Table 7 highlights the learning from several initiatives included in the analysis.

Several of the initiatives included here are also in Section 7.2 on promoting micro, small and medium-sized enterprises in climate-resilient value chains. In that section, we focus on support to businesses and the value chains that they participate in; here we look at agricultural practices, technologies and services that improve the resilience of agricultural production. However, there is no clear distinction between the two, as agricultural production underpins many of the enterprises and value chains we discuss below.

Table 6. Initiatives to build climate resilience in the agriculture sector examined in the LIFE-AR evidence review

Type of initiative	Examples
Strengthening climate-resilient agriculture practices	Supporting farmers with the inputs, services, technologies and farming practices that they need to build resilience (Ethiopia, The Gambia, Nepal, Madagascar, Mozambique, South Sudan, Tanzania) Improving soil fertility and agricultural productivity (Ethiopia, Niger) Drip irrigation and multiple-use water systems (Nepal) Anukulan: climate-smart technologies – BRACED (Nepal) Support for pastoralist livelihoods and value chains (Ethiopia, Sahel)
Integrating climate-resilient agriculture practices into government planning	National adaptation planning and mainstreaming (China, Nepal, Uganda Zambia)
Innovative financing mechanisms to help farmers adapt to climate change	Acumen Fund's private sector approach to service aggregation, digital platforms and finance (Ghana, Nigeria, Uganda) CLIMADAPT private sector investment initiative (Tajikistan) Insurance services for pastoralists (Kenya) Insurance services for farmers (India)
Access to climate information to maximise yields and better cope with climate variability and shocks	Technology for climate-resilient agriculture (Uganda) Improved meteorological services (Mozambique) Weather phone apps to guide planting and harvesting decisions (various countries)

Introducing climate-informed inputs, services, finance, technologies and climate information can help farmers reduce their sensitivity to climate change. Most of the initiatives we reviewed were in poor regions of countries that are prone to rainfall variability, drought and extreme temperatures. They worked to improve agricultural practices to boost output and increase incomes despite current and future climate impacts. Investing in more climate-resilient farming practices means that farmers' yields are not affected by short- and longer-term weather, which boosts household nutrition and improves household income. People who are healthier and wealthier are better able to manage the future risks associated with climate change. Investments in agricultural technology included introducing fertilisers, drought-tolerant seeds, agricultural extension services and climate information services – for example, Uganda's award-winning Climate Change Adaptation and Information Communication Technology (CHAI II) project introduced drip irrigation to boost yields in increasingly dry conditions (see Table 7).

Initiatives can deliver far-reaching impacts by integrating farmers into climate-resilient agricultural value chains. As well as giving farmers inputs, extension services, technology and climate information to help make their agricultural practices more resilient, climate-smart agricultural initiatives can support wider impacts by integrating producers into value chains through aggregation platforms and services that boost market access. Evidence from the Anukulan project in Nepal and the CLIMADAPT project in Tajikistan (see Table 7) show that these can lead to fundamental improvements in the lives of individual producers and effect changes in the wider market. The importance of supporting interventions to link producers with better services and markets along climate-resilient agriculture value chains, as well as agriculture production in the field, highlights the interconnectedness of delivering the LDC vision in practice.

Climate-informed agriculture initiatives can promote partnership with a diverse set of actors and support the creation of organised producer groups. More than half the initiatives established or supported local participatory

organisations, including cooperatives, savings groups, natural resource management groups and businesses, to improve farmers' access to credit, financial services and the inputs they need to grow their businesses. They created partnerships with multiple actors to increase production and improve resilience. Such partnerships increase social capital, facilitate knowledge sharing and collaborative working and improve access to social safety net mechanisms. By creating these organised groups, they operate as aggregators, reducing transaction costs for investors and buyers. Like the value chain initiatives, climate-informed agriculture initiatives took different approaches to creating these linkages, including:

- Partnerships with technology providers and meteorological agencies to provide locally appropriate weather information through mobile phone apps or to improve access to irrigation infrastructure and renewable energy
- Working with researchers to develop drought-tolerant crop varieties
- Supporting farmers to access extension services through formal governmental channels or direct NGOs and private sector support to increase production, and
- Creating aggregation platforms to link producers with better services and markets along agricultural value chains.

Integrating climate-informed agricultural practice into government plans and developing long-term systems to deliver climate information can support long-term resilience in the agricultural sector. Given the significant role that agriculture plays in low- and middle-income countries, it is not surprising that more than half of the initiatives aligned with existing government plans or integrated climate-resilient agricultural approaches into existing plans. Several countries – including Uganda and Nepal – are in the process of integrating climate-resilient agricultural approaches into their national adaptation plans. More than a quarter have developed long-term systems to provide climate information to farmers to help them make better decisions.

Table 7. Issues to consider for building climate resilience in the agricultural sector

Issue	Example	
Introducing inputs, services and technology to boost production and reduce sensitivity to climate change	CHAI II Uganda ³⁵	Canada's International Development Research Centre has supported a partnership between government, universities, meteorological services and an international consultancy to develop a climate information system to help vulnerable people in Uganda's cattle corridor cope with droughts and safeguard their livelihoods. The CHAI II project provided climate information to 250,000 farmers in three districts via radio broadcasts, text messages and emails. This information included seasonal weather forecasts, decentralised agricultural advisory information, livestock and agriculture market information, rainwater harvesting techniques, drought and flood coping mechanisms and pest control methods. Households in targeted districts were 50% more likely to have access to climate information than those in non-targeted districts, which helped reduce crop loss by 6–37% and made those households less sensitive to the impacts of drought.
Providing services and platforms to integrate farmers into agricultural value chains Supporting participatory local organisations	Anukulan project Nepal ³⁶	A consortium of NGOs, research institutions and technology providers is working with poor households in western Nepal to significantly improve farming livelihoods despite the impacts of climate change. Part of the UK-funded Building Resilience and Adaptation for Climate Extremes and Disasters (BRACED) programme, the Anukulan project uses a 'commercial pocket approach' that aggregates farmers to increase their access to services, information, technology and markets. This innovative approach organises farmers into small producer groups of 15–25 households. Each group elects a representative to join a marketing and planning committee that represents 15–50 producer groups in a commercial pocket. Having aggregated into a large group with enough production volume, the committee can facilitate access to pricing, inputs such as seeds and fertilisers, technology such as drip irrigation, integrated pest management, government advisory services and financial services. It also develops and manages a collection centre to process and store produce at sufficiently large volumes that it attracts buyers. Over time, many of these commercial pockets become agricultural cooperatives.

Issue	Example	
Integrating climate-smart agricultural practice into existing projects and government plans	Mainstreaming climate change adaptation in irrigated agriculture China ³⁷	The Irrigated Agriculture Intensification Project III is a government-led initiative in the Huang-Huai-Hai Basin that aimed to increase agricultural productivity and improve water efficiency through modernisation and innovation in the agricultural sector. Implementation was already underway when the project team became aware that the basin was highly vulnerable to the projected adverse impacts of climate change. In response, the government of China and the World Bank, the project funder, secured additional Global Environment Facility (GEF) funding support to analyse the risks and accordingly modify and adjust project activities. The project team integrated adaptation into ongoing project activities by undertaking climate change modelling research and consulting climate change impact assessments, identifying appropriate adaptation measures and demonstrating adaptation measures (climate-resilient crop varieties, practices and technologies) for uptake by farmer groups in sites selected through consultation with farmers and country experts. Over 250 demonstration activities resulted in farmers adopting a range of adaptive practices, including water-saving irrigation, drainage, rainfall collection and storage initiatives. They also adopted agricultural practices such as adjusting their sowing times, staggering sowing to allow crops to mature at different intervals, using alternative, drought-resistant crop varieties and developing facilities for specialised climate-controlled agriculture, such as greenhouses. The initiative also helped establish 494 new water user associations (in addition to the existing 182) and 166 new farmers' associations, providing education and training support to members. Establishing these organisations also enabled peer-to-peer knowledge sharing and increased dissemination of information on adaptive technologies. The project resulted in a US\$326 increase in average annual per capita farmer income and a rise in high-value crop production from 3.2 million to 4.2 million tonnes per year. At the same time, it has improved awareness and practices in agriculture and water management to significantly strengthen climate adaptation and resilience.

Box 5. Sustainable Land Management Programme: lessons from Ethiopia³⁸

The SLMP was initiated in 2008 to address two of Ethiopia's most significant developmental and environmental problems — agricultural productivity and land degradation — both of which are exacerbated by climate change. To mitigate ongoing erosion and soil nutrient loss in the country's productive agricultural highlands, the programme promoted and scaled up the application of successful sustainable land management technologies and approaches in six regions, targeting more than 70% of the total population. From January 2009 to July 2017, the programme brought 575,781 hectares of land under sustainable landscape management or climate-smart agricultural practices in 135 watersheds. The 10-year project (2008–2018) had two phases: Phase 1 (2008–2013), funded by US\$9 million from the GEF and US\$20 million from the World Bank International Development Association; and Phase 2 (2013–2018), funded by the national government (US\$2 million), the World Bank International Development Association (US\$50 million) and the Norwegian Ministry of Foreign Affairs (US\$42.65 million). Key development partners who have provided technical assistance and further financial support include the governments of Norway, Germany and Canada, the European Union and the International Fund for Agricultural Development (IFAD). The SLMP was followed by the US\$129 million Resilient Landscapes and Livelihoods Project (2018–2024), which aims to continue with and build on the SLMP's work.

SLMP is a comprehensive approach to sustainable land resources and integrated watershed management. It deals with the interlinked problems of poverty, vulnerability and land degradation at rural community level by overcoming key barriers around knowledge and technology, policy, legal issues and institutional, economic and financial matters. Elements of the approach include building watershed and land management structures to stabilise soils; improving water retention and supporting efficient tillage practices; building the capacity of service providers and rural households in sustainable land management implementation; and enhancing rural land certification.

Implementation is based on a multi-level cooperative partnership of stakeholders at federal, regional, district (*woreda*) and community (*kebele*) levels. The Ministry of Agriculture is the lead coordinating institution, chairing a steering committee that includes representation from the Ministry of Finance and Economic Development, the Ministry of Water and Energy, the Environmental Protection Agency, the Ethiopian Institute of Agricultural Research, regional administrations and development partner representatives. The steering committee ensures harmonisation, coordination and alignment of sustainable land management activities across the country and provides strategic direction and guidance. A high-level technical committee provides technical and managerial support to the steering committee. The regional Bureau of Agriculture and Woreda Office of Agriculture implements activities at regional and *woreda* levels. They have drawn up over 670 management plans for water catchment areas with communities. Over 500 local smallholder groups and watershed user associations jointly manage the land, implementing sustainable land use methods for individual and commercial purposes, sharing knowledge, skill development and local ownership.

Lessons for LDCs

Decentralising agencies at regional, zonal, district and community levels helps support a transparent and participatory process for natural resource management. Participatory forest management sites managed in partnership with local communities helped integrate local and technical knowledge and led to the widespread adoption of sustainable land management practices. The project used many traditional land management measures that have been practiced throughout the country for more than 400 years, maintaining local systems and ownership. These include *konso* hillside terracing, crop rotation, long-fallow and tree-crop-mix farming systems.

Promoting community empowerment is instrumental in supporting the scale of change in practices and knowledge sharing. Being participatory in the planning, design and implementation phases, the programme set up forums to give women and young people a greater voice in decision making, promoting social and gender inclusiveness with the objective to achieve inclusive green growth.

International actors provided legal and other advice and training to help partners deliver and communicate sustainable land management methods more effectively and promote their wider use by farmers. Development partners provided advice on improving the legal sustainable land management framework and technical support for Ethiopia's agricultural extension

service and the decentralised agricultural bureaux. This enabled strengthened implementation.

Harnessing existing social systems is an effective natural resource management method. SLMP supported community-level participation and mobilisation based on existing local systems for land management practices in agricultural, pasture and degraded lands. The programme's support for school, health centre and road building served as an incentive for community participation in forest development and natural resource conservation and management. SLMP integrates into broader aspects of life by considering the needs of the local communities more widely. As a result, it has led to greater local empowerment and had far-reaching impacts.

7.2 Promoting micro, small and medium enterprises in climate-resilient value chains

Why focus on enterprises and value chains?

- Micro, small and medium enterprises support the livelihoods of hundreds of millions of people across the developing world.
- Formal and informal enterprises across a range of value chains provide products and services that support poverty reduction and promote climate resilience.
- They often lack the knowledge and technical skills to respond to the increasing risk climate change poses to their businesses.
- Integrating climate risk management into decisions along a range of value chains is critical to economic development.
- Women need targeted support to participate in climate-resilient value chains and to overcome structural barriers to participation in markets.

LDCs can invest in strengthening the market systems that provide poor and marginalised groups with the products and services they need to live with dignity, move out of poverty, develop secure livelihoods and improve their wellbeing.

There are 365–445 million micro, small and medium enterprises in developing countries, including 25–30 million formal small and medium enterprises, 55–70 million formal micro enterprises and 285–345 million informal enterprises.³⁹ Employment in developing countries is characterised by high rates of informality and participation in these enterprises. Two billion people, or 61% of the global workforce, work in the informal economy and 93% of the world's informal employment is concentrated in developing countries. In most low-income countries, women are more exposed to informal employment and are more often found in the most vulnerable situations.⁴⁰

Supporting the people who work in formal and informal enterprises across a range of value chains can help reduce poverty and promote climate resilience.⁴¹ Strengthening value chains in the agriculture sector is particularly important for supporting LDC livelihoods, since it accounts for 60% of the labour force, 90% of which is employed informally.^{32,40} Other critical products and services for reducing poverty include renewable energy, information communication technology, health, education and water.

LDCs can develop climate-smart value chains by helping enterprises integrate climate risk considerations into business decisions along the value chain. Many LDCs are still highly dependent on natural resource-based market systems and enterprises, and these value chains are already having to cope with the impacts of climate change. But these market systems and enterprises often lack the knowledge and capacity to integrate the climate risk management into their operations that would enable them to develop proactive, preventive or preparatory measures to reduce the impacts of climate change and to move towards developing long-term climate-resilient businesses models and markets.⁴²

Women need targeted support to participate in climate-resilient value chains. They face deep structural inequalities in their ability to participate in markets and realise their full economic potential. These include limited access to productive land, inputs, extension services, financial services, information, technology, education and markets, a greater overall workload, more insecure work conditions, significantly higher instances of unpaid work, caregiving responsibilities, lower wages and lower levels of decision making within households compared with men.^{22,43}

Lessons from the LIFE-AR evidence review

Lessons on promoting micro, small and medium enterprises

- Making value chains more climate resilient can deliver the SDGs and reduce poverty.
- Supporting enterprises to ensure their businesses are robust to future climates and develop resilient value chains can help people reduce sensitivity to climate change impacts.
- Supporting climate-resilient value chains can help enterprises prepare for and address future climate impacts and open new long-term markets for climate-resilient products.
- Climate-smart value chain initiatives create strong horizontal collaboration and partnerships with a diverse group of stakeholders.

The LIFE-AR evidence review analysed 14 initiatives that develop and strengthen enterprises in climate-resilient value chains. These initiatives related particularly to natural resource value chains, owing to lack of submissions around non-natural resource-based value chains in sectors such as manufacturing, technology and finance — possibly reflecting less activity around building climate-resilience practices or the network of LDC experts engaged in this review being less connected to knowledge networks that share good practice in these chains.

The 14 initiatives reviewed cover a range of natural resource-related activities, including agriculture extension services, irrigation, climate-resilient seeds and other inputs, climate information services, financial services, technology, organisational development, marketing and distribution (see Table 8). This section summarises the overall lessons we drew from these initiatives and looks in detail at lessons from a global Forest and Farm Facility (FFF) project developing democratic and locally controlled forestry value chains (Box 6). Table 9 highlights the learning from several initiatives included in the analysis.

Making value chains more climate resilient can deliver the SDGs and reduce poverty. The initiatives in this category all help achieve the SDGs by increasing household income and food availability, improving household nutrition and strengthening rural institutions. Nearly all the initiatives help poor households and women improve their participation in markets and develop small businesses, boosting production with new drought-tolerant seed varieties or facilitating the uptake of new technologies that boost production and improve storage capacity, which helps increase incomes — for example, in Senegal's Project Lait.

Through aggregation, enterprises are better able to access resources and to negotiate better prices with services and markets. One-third of the initiatives supported the development of participatory organisations — such as farmers' cooperatives — to help small producers aggregate to a size where they can access inputs, extension services, climate and market information, technology, storage facilities, buyers and distribution capacity. The Anukulan project in Nepal is a good example of a national NGO helping farmers link with private sector technology providers and aggregate as local producer

Table 8. Initiatives to develop and strengthen enterprises in climate-resilient value chains examined in the LIFE-AR evidence review

Type of initiative	Examples
Agricultural value chains	Promoting aquaculture for female rice farmers threatened by the increasing salinity of the water supply (Bangladesh) Promoting resilience with cooperatives (Tanzania) Climate-smart agriculture (Nepal) Acumen Agriculture Resilience Fund (Ghana, Nigeria, Uganda) CLIMADAPT private sector investment initiative (Tajikistan) IFAD adaptation for smallholder agriculture programme (global) Helvetas support for climate-smart value chains (global)
Livestock value chains	Developing milk value chains — Project Lait (Senegal) Pastoralist Areas Resilience Improvement and Market Expansion (PRIME) project (Ethiopia) Livestock mobility (Sahel)
Forestry	Supporting businesses for sustainable forestry products (FFF) (Global)* Developing a climate-resilient natural resource-based economy through agroforestry value chains (The Gambia)
Renewable energy	Solar Home Systems initiative by IDCOL (Bangladesh)

* See Box 6 for detailed case study and lessons for LDCs

groups to attract new services, products and buyers for their farm businesses (see Table 7).

Supporting enterprises to make their production, processing and marketing more resilient and to develop resilient value chains can help reduce sensitivity to climate change impacts. Value chains for agricultural products — whether from farming, forests or fisheries — all rely on natural systems that are vulnerable to climate change. Helping enterprises introduce climate-resilient technologies, inputs, financial services and climate information can help make agricultural livelihoods less sensitive to drought or rainfall variability. In the initiatives we analysed, this support came from a number of sources, including NGOs such as Helvetas International supporting producers in agricultural value chains in Nepal, Madagascar, India, Pakistan, Ethiopia, Peru and Bolivia; United Nations agencies and multilateral climate finance institutions such as the Food and Agriculture Organization (FAO), IFAD and USAID; and the Climate Investment Funds as part of their bilateral development financing or specific climate finance investment projects. Helping

people invest in their businesses with an understanding of current and future climate risks can help boost household income, increase wellbeing and provide additional resources that they can draw on in time of crisis. It can also improve knowledge and skills, enabling people to better manage the future risks and shocks associated with climate change.

Working with enterprises to develop climate-resilient value chains can create long-term results by establishing businesses that are prepared to address future climate impacts. To deliver far-reaching, system-level change to markets, we should build on local knowledge and help people increase their technical knowledge of inputs, markets, business planning, financial services and climate information. Nearly all of the 14 initiatives were helping enterprises gain new technical knowledge to develop more climate-resilient businesses; many were supported by internationally funded donors such as IFAD, USAID and the European Commission. Tajikistan, for example, used international support through the Climate Investment Fund to establish a new credit system within banks to help

businesses purchase climate-friendly technologies such as gravity irrigation systems, more efficient greenhouse facilities and biomass digesters. In Zanzibar, business training through local financing institutions helped producers and businesses develop climate-resilient business plans in agriculture sectors that are increasingly impacted by climate change.

Climate-resilient value chain initiatives create strong horizontal collaboration and vertical integration with a diverse group of actors and achieve high levels of local participation. All the initiatives promoted partnerships with a diverse group of actors, including technology providers, businesses, financial institutions, government extension services, NGOs and researchers. But there is no one-size-fits-all approach to supporting the integration of people who are vulnerable to climate change into value chains. The initiatives we reviewed took several different approaches:

- Supporting farmers and pastoralists with climate information services provided by government extension workers and meteorological agencies
- Creating linkages between producers and financial service providers to increase access to credit and banking services so that people could invest in their businesses, and
- Supporting small businesses with technologies and inputs to grow and thrive.

These partnerships and platforms are central in bringing together stakeholders to share information, knowledge and resources. Creating a national platform can support policymaking and ensure that financing is fit for purpose. Many of the climate-informed value chain initiatives align with national agricultural policies. These national platforms are central to providing effective support to enterprises and need to continue to be strengthened across all types of enterprise.

Table 9. Issues to consider for developing and strengthening enterprises in climate-resilient value chains

Issue	Example	
Promoting poverty reduction and delivering the SDGs	Infrastructure Development Company Limited Bangladesh ⁴⁴	Bangladesh's Solar Home Systems programme is the world's largest off-grid programme of its kind. The government channels donor funding provided to IDCOL, which has developed an innovative financing model for low- and middle-income households to purchase solar home systems. The model uses a mixture of loan and grant financing through a partnership between IDCOL, microfinance institutions and technology providers to support the delivery, installation and maintenance of the solar home systems on affordable terms. The mechanism enables poor households to access the systems without having to pay either upfront costs or ongoing operating and maintenance costs on their own. Since 2003, the project has received nearly US\$700 million and supported the installation of over 4 million home systems, giving energy to 18 million people, or 12% of the population. The IDCOL programme has been a ground-breaking initiative, providing rural people with access to electricity for the first time, unlocking sustainable development benefits and transforming the country's energy system.⁴⁵ It demonstrates the potential of aggregation as it has delivered at significant scale, as well as illustrating the vital importance of continuing to evolve approaches with changing markets.

Issue	Example
Supporting enterprises to reduce their sensitivity to climate change	Acumen Resilient Agricultural Fund (ARAF) Uganda, Ghana, Nigeria⁴⁶ Investments in climate-resilient value chains is still relatively new, but the aim is for long-term financing and business models that are climate resilient. ARAF aims to address long-term climate hazards by investing in early-stage agribusinesses that work closely with smallholder farmers as customers or suppliers. It seeks to impact 10 million lives over 12 years by supporting approximately 18 to 20 companies that align with participating countries' climate adaptation objectives and their smallholder farmers. ARAF addresses underlying vulnerability by providing financial investment and technical assistance (to facilitate climate adaptation and general business development services) to enterprises that would not be able to find other sources of funding. These early-stage businesses need patient, long-term capital investment to finance growth until they achieve positive cash flow and can attract commercial capital. ARAF is targeting three main categories of business: aggregator platforms, digital platforms and innovative financial services. ARAF's long lifespan (12 years, including two one-year extensions) is designed to give innovative, early-stage companies time to develop, iterate, refine and build financially viable business models that provide social impact at scale.
Supporting enterprises to reduce their sensitivity to climate change (cont.)	Zanzibar resilience value chains for cooperatives Tanzania⁴⁷ The Zanzibar Climate Change Alliance (ZACCA) and the IIED supported the development of climate-resilient business plans for seaweed, lime and honey enterprises. The initiative strengthened long-term business models by incorporating resilience to respond to climate impacts, thereby reducing sensitivity to climate change. There were three types of intervention: • Climate-resilient production through short-term investments in assets and long-term investments in institutional systems, such as research and development and governance systems • Climate-resilient processing through investment in assets – such as modern processing equipment, climate-resilient storage facilities, improved packaging and labelling – and institutional systems to develop skills and encourage a shift away from business-as-usual practices, and • Climate-resilient marketing – regulatory, financing and partnership-based interventions – that strengthen cooperatives' capacities to engage in bulk purchasing and sales, increase the share of household revenue from the enterprise and allow local and national enterprises to compete effectively in a global market.

Issue	Example	
Supporting climate-resilient value chains to prepare for long-term changes and open new long-term markets	Climate-induced salinity Bangladesh ⁴⁸	An initiative by the government of Bangladesh (through the Ministry of Women and Children Affairs, Department of Women Affairs, Department of Public Health Engineering and local government Institutions) is working to support local communities prepare for long-term change by strengthening the climate-resilience of local industries (including through diversification from current industries) to the impacts of saltwater intrusion into freshwater resources. Induced by sea level rise, storm surge and cyclones, saltwater intrusion is already disrupting agricultural productivity and drinking water security in coastal communities, threatening lives and livelihoods. The initiative aims to help small-scale farmers, fishers and agro-labourers diversify from non-adaptive, freshwater-reliant livelihoods towards climate-resilient agricultural livelihoods. As well as using participatory mapping activities to build a portfolio of climate-resilient livelihood options, the project will help set up women's livelihood groups and offer awareness, technical and financial support through skills development, training and asset investments to help phase in resilient livelihoods. The government is also supporting these value chains and market development activities by undertaking investments that will leverage economies of scale through building the bargaining power of collective negotiations, promoting linkages from production through market access and enhancing private sector engagement through public-private platforms to connect different actors and broaden market access. These linkages support knowledge sharing to improve technologies, practices and management for resilient production and support the scaling up of the initiatives.
Creating strong partnerships with a diverse group of stakeholders to develop climate-smart value chains	CLIMADAPT Tajikistan ⁴⁹	Tajikistan has developed an innovative finance facility that brings together a diverse group of actors to support climate resilience in the country's highly vulnerable agriculture sector. Agriculture in Tajikistan employs two-thirds of the workforce and accounts for a 25% of GDP, but it is highly vulnerable to rising temperatures, rainfall variability and water scarcity caused by retreating glaciers. The European Bank for Reconstruction and Development has partnered with the Climate Investment Funds' Pilot Programme for Climate Resilience to launch an innovative financing facility that provides capital to partner banks and financial institutions (Bank Eshkhat, Humo MFI, IMON International, Arvand and First Microfinance Bank) in Tajikistan to fund loans for farmers to invest in assets such as greenhouses and drip irrigation and renewable energy technologies to improve water and energy use and promote sustainable land management. The programme creates linkages between farmers, technology providers, banks, businesses and construction firms to develop innovative solutions through improving access to financing and supporting knowledge sharing and technical capacity building, in order to address climate-exacerbated challenges faced by agricultural businesses in Tajikistan.

Box 6. Democratic and locally controlled forestry value chains: (global) lessons from the Forest and Farm Facility (FFF)⁵⁰

Forest resources are vital on multiple levels. On a local level, they can provide an income, food, clean water, wood energy, construction materials, fertile soils, medicinal and cosmetic products and recreation services. On a global level, they offer climate change mitigation, biodiversity conservation and play a key role in regulating water and mineral cycles.

There are around 1.5 billion forest and farm producers in developing countries, managing 500 million family farms and approximately 30% of forest lands in the global South. These family farmers, indigenous peoples, communities, small-scale producers and processors make up 90% of the world's farmers and supply around 80% of food supplies in Asia and sub-Saharan Africa. They constitute a large proportion of the rural poor and most are highly dependent on adjacent forests or grow trees and related products on their farms.

The FFF funds partnership agreements and small grants and provides technical assistance — such as advocacy support, information sharing, training in market analyses and development, incubating and supporting business, financial access and social programmes, learning and exchange visits and building linkages to regional and international federations — to facilitate the organisation of forest and farm producers into collectives and producer organisations so they can engage with governments at local, national, regional and international levels. This aggregation and organisation at scale has helped strengthen local voices and power, allowed members to share knowledge and experience, supported greater engagement in policy advocacy, secured tenure and access rights to forest, land and other natural resources, improved forest and farm management, and expanded the market and built enterprises.

These collective producer organisations have been able to participate more effectively in multi-stakeholder policy platforms to engage with governments on local forest farm resource rights, market access and technical

support. This has helped to link local voices and learning to national and global discourses on development goals, finance, and trade through communication, meaningful participatory processes and information sharing.

Organising as collectives has also improved the wellbeing of forest and farm producers and supported delivery of the SDGs and the Paris Agreement. A key outcome of the process has been the improved delivery of landscape-scale mitigation, adaptation and resilience for climate change through improved technical knowledge, direct engagement of producer organisations and integration with inclusive livelihood approaches.

Lessons for LDCs

Democratic and locally controlled forest and farm enterprises can sustainably provide local and global goods while safeguarding the livelihoods of local communities. This approach supports the development of an enabling policy environment that helps local people secure commercial forest tenure. The approach also supports the scaling up of more sustainable business models, where producers can prioritise wellbeing over commercial interests and knowledge sharing and technical knowledge transfer provide better landscape management, leading to climate benefits through improved farming techniques with lower emissions and increasing resilience.

Democratising forest business encourages transparency and locally accountable actions. Investing in rights, market access, technical and management capacity and social organisation will help make locally controlled forestry a success. Although it may not produce a tangible financial return, it will create the necessary conditions to encourage investment in improved forest management, processing facilities and marketing capacity — all of which should produce financial returns. Creating producer groups and cooperatives encourages producers to take ownership of and build value chains.

Box 6 cont.

Developing forest and farm producer organisation value chains creates strong horizontal collaboration that supports other groups and actors in the local economy and long-term climate-resilient landscapes.

Facilitating knowledge sharing and technical and financial support for producers by aggregation into producer collectives has supported local adaptation

to and mitigation of climate change, as well as helping protect biodiversity and maintain long-term soil fertility without costly and potentially resource-degrading chemical inputs. It has also helped support conserve water tables through regulation and avoiding over-depleting farming methods.

8. MECHANISMS FOR DELIVERING CLIMATE-RESILIENT LANDSCAPES AND ECOSYSTEMS

Creating climate-resilient landscapes and ecosystems that are sustainably managed, less vulnerable to climate shocks and stresses, and use nature-based solutions.

8.1 Landscape management

Why focus on ecosystems and landscape management?

- Natural systems provide ecosystem services that are critical to human development.
- Ecosystem function and ecosystem services are deteriorating worldwide as a result of human actions.
- Integrated landscape management approaches that restore ecosystems and increase ecosystem services can reduce poverty, build resilience to disasters and climate change and support the goals of the Paris Agreement, Aichi Biodiversity Targets, Sendai Framework and SDGs.

Natural systems provide ecosystem services that are critical to human development. Ecosystem services are the benefits people obtain from ecosystems and include:

- Provisioning services such as food, water, timber and fibres
- Regulating services that affect climate, floods, disease, waste and water quality
- Cultural services that provide recreational, aesthetic and spiritual benefits, and
- Supporting services such as soil formation, photosynthesis and nutrient cycling.⁵¹

Humans have significantly altered nature across most of the globe and the majority of ecosystems and biodiversity indicators are showing rapid decline.² To meet the SDGs, we must implement integrated landscape management approaches that restore ecosystems, increase ecosystem services and reduce poverty within the context of population growth that will reach 10 billion people by 2050. Integrated landscape management approaches are large-scale, multi-stakeholder processes to sustainably manage ecosystems and support local economic development, livelihoods and wellbeing. They include watershed management, forest and landscape restoration, ecosystem approaches to fisheries and aquaculture, agroecology practices and incentives for ecosystem services. They are multi-sector and multi-scale in nature, integrating knowledge from across sectors and building coalitions across different groups of actors.⁵²

The shift to more sustainable agriculture and stronger forest protection will increase prosperity, improve natural capital and support adaptation to climate change. A shift to sustainable agriculture and forest protection could generate over five million jobs and over US\$2 trillion a year – with the majority of benefits accruing in developing countries – while also restoring natural capital in agricultural land, forests and coastal zones to help people and ecosystems adapt to future climate extremes.²⁰

Women in LDCs often rely on natural systems for their livelihoods and wellbeing but their lack of access to land and tenure rights means they are also more likely than men to rely on common pool resources. Given the importance of natural systems for their livelihoods, it is vital that women are included in landscape management, so they can make decisions in the face of threats to their wellbeing from an increasingly changing climate.

Lessons from the LIFE-AR evidence review

Lessons on landscape management

- Landscape management approaches and ecosystem-based adaptation initiatives can help reduce both sensitivity and exposure to climate shocks.
- The benefits of landscape management are likely to be delivered over long timeframes.
- Landscape approaches work across different levels to deliver far-reaching impacts.
- There is a strong level of domestic ownership of landscape management and ecosystem-based adaptation approaches, since they work to strengthen natural resource governance at national and subnational levels.
- Landscape approaches that facilitate and integrate collaboration and clear, shared governance arrangements between local authorities at landscape level can support management of landscapes that span over a number of jurisdictions and territories.

The LIFE-AR evidence review analysed 17 landscape management and ecosystem-based adaptation initiatives to understand how we can increase people's resilience to climate change (see Table 10). This section summarises the overall lessons we drew from these initiatives and looks in detail at lessons from an integrated catchment-based water resource management project in Uganda (Box 7). Table 11 highlights the learning from several initiatives included in the analysis.

Landscape management and ecosystem-based adaptation approaches can help reduce both sensitivity and exposure to climate shocks. Three-quarters of the initiatives in this category helped people reduce their sensitivity to climate shocks. Most improved people's access to critical ecosystem services that support their livelihoods, such as water for irrigation, rangeland for pastoralists to feed their livestock and forest resources for people working in forestry value chains and to improve soil composition in marginal agricultural landscapes. In some cases, these resources may become increasingly scarce under future climate scenarios — for example, water in drought-prone areas. In others, access to these resources may help people better manage future climate shocks — for example, increased income from forest value chains.

Table 10. Initiatives to deliver climate-resilient landscapes and ecosystems examined in the LIFE-AR evidence review

Type of initiative	Examples
Integrated landscape management approaches to manage water resources	Integrated catchment-based water resource management (Uganda)* Transboundary management (Niger River Basin) River basin management (Angola, Mali, Sri Lanka) Freshwater management (Maldives)
Forest management / improving agricultural productivity through large-scale forest management or greening	Coastal afforestation (Bangladesh) Mangrove restoration (Fiji) Nationwide forestry management (Bhutan) Sustainable Land Management Programme (Ethiopia) Farmer management natural regeneration (Niger) Ecosystem-based adaptation in The Gambian River Basin (The Gambia)
Other landscape management approaches	Devolved climate finance (Kenya, Mali, Senegal, Tanzania) Rangeland management (South Africa, Ethiopia) Coastal zone management to secure water access (Maldives) Wetlands management (Uganda) Urban ecosystem-based adaptation (South Africa)

* See Box 7 for detailed case study and lessons for LDCs

Both scenarios highlight the need for long-term ecosystem and landscape management approaches to support long-term resilience. More than half the initiatives helped people reduce their exposure to climate shocks, with many working to restore degraded ecosystems so they can absorb the impacts of climate shocks and limit people's exposure. As well as supporting the Paris Agreement's resilience goals, using ecosystem-based adaptation to reduce people's exposure to climate shocks can also help countries support the delivery of the Aichi Biodiversity Targets and achieve the goals of the Sendai Framework on Disaster Risk Reduction.

Ecosystems take many years to regenerate and deliver ecosystem services that underpin resilience. So, **the benefits of landscape management and ecosystem-based adaptation initiatives are likely to be delivered over long timeframes.** There are strong signs from the LIFE-AR review that policymakers are working to deliver long-term resilience, with many initiatives integrating landscape management approaches into long-term planning processes. In Bhutan, for example, a GCF project is working over 14 years to improve the management of and resourcing to protected areas. Likewise in the Maldives, a 5-year project is delivering a 35-year design to secure water resources to 2050. At city level, Durban is working with multiple stakeholders to identify key actions to build long-term resilience into city planning.

Landscape approaches and ecosystem-based adaptation initiatives work across different governance levels to holistically support the management of landscapes and ecosystems that span over a number of jurisdictions or territories to deliver far-reaching impacts. Their integrated natural resource management approach across entire ecosystems ensures that the benefits of ecosystem services cover large spatial areas and numbers of people. To deliver far-reaching impacts, most landscape management approaches are vertically integrated into the planning process at both national and subnational levels. Landscape approaches must also integrate horizontally at subnational levels, crossing administrative boundaries, involving partnerships with different

sectoral ministries and departments and promoting collaboration with different groups of actors including government, communities, civil society, the private sector and researchers. Using a specific landscape or resource as the central point for resilient planning enabled the initiatives we reviewed to cross jurisdictions and manage resources at scale. Uganda's catchment-based integrated water resource management initiative (Box 7) and Bhutan's GCF national forestry management programme (Table 11) show how countries have managed this complex collaboration across political and administrative jurisdictions in practice.

There is a strong level of domestic ownership of landscape management and ecosystem-based adaptation approaches, since they work to strengthen natural resource governance at national and subnational levels. Strong engagement of stakeholders in governance at different levels supported institutionalised vertical integration and horizontal collaboration. Nearly all the initiatives in this category were designed and/or implemented by subnational actors. Many countries have developed national-level policy frameworks or strategies to improve the management of a particular resource — for example, forest management in Bhutan, drinking water in the Maldives, water irrigation in Sri Lanka or wetlands in Uganda. These programmes have often been co-financed and supported by international donors such as the GCF or bilateral donors, and implemented by national and subnational governments working across administrative and sectoral boundaries to improve long-term natural resource management. More than half also supported local governments to manage and regulate the use of natural resources, building on local knowledge and practices to ensure local participation in natural resource governance. This has taken different shapes in different places. In South Africa, the city of Durban is bringing together multiple stakeholders to integrate resilience into city planning. In Fiji, the town council conducted a cost-benefit analysis exercise that consulted with a wide range of stakeholders to support make long-term town planning decisions.

Table 11. Issues to consider for delivering climate-resilient landscapes and ecosystems

Issue	Example	
Devolving climate finance to support local level delivery over landscapes	Devolved climate finance (DCF) Kenya, Mali, Senegal, Tanzania ⁵³	The DCF approach, as described in detail in Box 8, establishes nationally owned mechanisms to channel climate finance to local governments. The approach facilitates place-based investments, supporting landscape and local ecosystem management by bridging the gap between informal or customary planning systems in place at the landscape-scale, and formal planning systems driven by multiple other priorities. Piloted in Kenya, Mali, Senegal and Tanzania, DCF uses participatory resilience planning tools that enable local communities to articulate priorities and select adaptation investments, thinking holistically about ecosystem management as part of the existing devolved government planning process. For example, in Tanzania, this approach has been led by the President's Office for Regional Administration and Local Government (PO-RALG), with the support of the UK's Department for International Development, and works through a consortium of government and non-government institutions. Between 2016 and 2018, PO-RALG established climate adaptation funds in the districts of Monduli, Longido and Ngorongoro, through which 35 resilience-building investments are now functioning. These projects are context specific, focusing on priorities defined by communities, investing in the enabling environments for resilient livelihoods through for example, improving livestock health and water access, and create meaningful community ownership, efficiency and the transparency of landscape-level climate responses.
Using landscape management and ecosystem-based adaptation approaches to reduce sensitivity to climate shocks	Climate-resilient value chains The Gambia ⁵⁴	Climate change is exacerbating the effects of poverty in The Gambia, where large-scale ecosystem adaptation is becoming necessary to build the climate resilience of rural communities whose livelihoods are threatened by the impacts of climate change. In response to this threat, The Gambia is transitioning towards a sustainable natural resource-based economy using rigorous, evidence-based natural resource management. It is doing this by implementing large-scale ecosystem-based adaptation within and adjacent to agricultural areas, community-managed forest reserves and wildlife conservation areas. This includes restoring degraded forests and agricultural landscapes with climate-resilient plant species that provide goods for consumption or sale and establishing community-run, commercially viable natural resource-based businesses. Using ecosystem-based adaptation approaches will help protect the environment and facilitate the development of a sustainable, natural resource-based economy that builds the climate resilience of local communities by bolstering supplies of resources and strengthening local economies. This reduces local communities' sensitivity to future climate shocks. The Gambia is integrating ecosystem-based adaptation into planning at national, district and village levels.

Issue	Example
Using landscape management and ecosystem-based adaptation approaches to reduce exposure to climate shocks	Mangrove restoration in Lami Town Fiji⁵⁵ Lami Town, on Fiji's Viti Levu island, undertook a cost-benefit analysis to identify climate change adaptation options to respond to the threats of higher frequency and intensity storms. The cost-benefit team — made up of staff from the Secretariat of the Pacific Regional Environment Programme, Conservation International and UN-Habitat in close consultation with Lami Town Council — identified several options, including a range of engineering and ecosystem-based adaptation solutions. Using flood damage information from nearby Ba and Nadi and information about Lami, they calculated the cost of inaction to set a baseline. They included losses to households and businesses and the cost of government repairs, flood relief supplies, healthcare and education in their estimated value of damages. After discussing a larger list of adaptation options with Lami Town Council, the team identified a smaller set of adaptation options and developed four scenarios with defined actions. From these scenarios, the council chose to implement the two 'no regrets' actions — 'mangrove foreshore forests' and 'avoided clearing of vegetation in high erosion areas' — which enabled them to reduce their exposure to the impacts of floods.
Using traditional knowledge and working to long timeframes	Farmer-managed natural regeneration Niger⁵⁶ Farmer-managed natural regeneration is a method of restoring degraded environments to health and productivity, implemented over long time periods. It is a climate-compatible development practice that evolved from a partnership between grassroots stakeholders (farmers), external experts and supporters. The practice adapts centuries-old methods of managing tree species that re-sprout rapidly to produce continuous harvests of trees for fuel, building materials, food and fodder — without the need for frequent, costly replanting. In this way, traditional knowledge and practices have supported the regeneration and use of the forest resources in a sustainable way, avoiding intensive practices and over-use. Honouring local wisdom is key to success, as farmers play a central role in experimenting, innovating, communicating potential benefits and advocating behaviour change. The approach is principally community-driven. Farmers are the primary stakeholders involved in implementing the practice and farmer groups and village associations play an important role in knowledge transfer and other enabling factors to help adoption amongst farmers. Government policy and supporting public investment have also been important in facilitating the widespread adoption of farmer-managed natural regeneration. Since 1983, the practice has spread across five million hectares, or 50% of the country's farmlands, representing Africa's largest positive environmental transformation in the last 100 years. The practice has produced dramatic results in Niger in terms of increasing crop harvests. In some communities, it has significantly reduced the annual hungry period — when food supplies are exhausted — from six or more months to two to three months and even zero in some locations.

Issue	Example
Building national and local financing and management capacity into project design	Bhutan for Life Bhutan⁵⁷ Bhutan is managing 51% of its territory under its protected area network. A 14-year project is designed as a financing bridge that will support the country to step up their management of protected areas. The government is gradually increasing its own financing and management to become fully self-sufficient by the end of the project period. In the short term, the project enables Bhutan to immediately begin upgrading natural resource management in half of its territory, explicitly accounting for the impacts of climate change through ecosystem-based adaptation to support sustainable livelihoods and enhance resilience for communities and ecosystems, while also maintaining carbon sinks and sequestration. In the long term, the project aims to develop Bhutan's human and budgetary resources so it can sustainably manage its protected areas system unaided, meeting greenhouse gas mitigation goals and building climate resilience to benefit people and nature. The project's financial modality is based on business models used to organise and finance large, complex projects designed to provide assurances to both investors and recipients. It is an innovative financial model built around a sinking fund to support improved management of the country's protected areas while giving the government time and resources to identify and secure the long-term revenues it needs to maintain these management improvements.
Working across different levels to deliver far-reaching impacts	Transnational management of water access in the Niger Basin Benin, Burkina Faso, Cameroon, Chad, Cote d'Ivoire, Guinea, Mali, Niger, Nigeria⁵⁸ High population growth rates, land degradation and use pressures, changes in rainfall patterns, greater frequency and intensity of droughts and conflicts over natural resources have undermined the resilience of Niger Basin communities, disrupting livelihoods and leading to famine and high mortality. To promote climate-resilient growth in the basin, the African Development Bank, European Union, GEF, GCF and affected country governments have allocated financing for the Programme for Integrated Development and Adaptation to Climate Change in the Niger Basin. This programme improves the resilience of populations and ecosystems in the basin through sustainable natural resource management by reducing silting in the Niger River, enhancing people's adaptability to climate change, improving natural resource management and integrated ecosystem management, protecting biodiversity and restoring soil fertility. It also set up a payment mechanism for environment services and an adaptation fund. The programme improves the management and restoration of natural habitats and protects them from climate variability and change; generates and uses climate information in decision making; increases adaptive capacity and reduces exposure to climate risks; raises awareness of climate threats and risk reduction processes; and improves the management of land and forest areas that contribute to emissions reductions.

Issue	Example	
Strong levels of domestic ownership to strengthen natural resource governance at national and subnational levels	Resilience planning at city level in Durban South Africa⁵⁹	The 100 Resilient Cities (100RC) initiative focuses on supporting cities to become more resilient to the physical, social and economic challenges facing urban communities. In 2013, Durban was among the first 33 cities under the initiative. 100RC helps cities adopt and incorporate resilience to shocks (earthquakes, fires, floods and so on) and cyclical stresses, such as pressure on services. During the scoping phase in 2014, a participatory exercise identified 18 key resilience issues faced by Durban, which were all taken forward into the next phase of strategy development. They were grouped into six focus areas: bold and participatory governance, knowledge-centred city, innovative place-making, sustainable and ecological city, catalytic and transformative economy, and equitable and inclusive society. While developing the city's 100RC programme, the Durban team has continued to engage a broad range of local stakeholders, including a cross-sectoral municipal technical team, city and political leadership, a group of critical thinkers from within and outside the municipality and a range of stakeholders such as tertiary institutions, NGOs, businesses and members of the public to ensure that the resilience strategy development process represented the challenges facing Durban.

Box 7. Catchment-based integrated water resource management: lessons from Uganda⁶⁰

Uganda decentralised its water resource management to maximise economic and social benefits from water-related resources and development, shifting various coordination and implementation mechanisms from national to regional, catchment, district and community levels. It established four water management zones, based on the country's natural catchment basins — Victoria, Albert, Kyoga and Upper Nile — with catchment management organisations sitting underneath. These have various governance structures, including stakeholder forums, catchment management committees and a secretariat. Activities include undertaking stakeholder and water resource situation analyses and preparing catchment management plans. All activities are stakeholder-driven, with the relevant stakeholders implementing the catchment management plans.

This restructure followed the recommendations of a water resource management reform study, which found water resource planning and management was most effective when conducted at the lowest appropriate level and based on hydrological catchments rather than administrative boundaries.

This approach is key to building the climate resilience of Uganda's water resources. The catchment management plans — prepared at catchment level following a 2010 framework — contain priority investment and management measures for protecting and restoring catchments while improving people's livelihoods. The management zones divide their activities into three broad thematic areas: zone-level operational water resources monitoring and information management, licensing and regulation; integrated catchment-based water resource planning; and implementing catchment-based water resource management plans.

Lessons for LDCs

Government funding supports a long-term, country-driven process. Since the inception and operationalisation of the water management zones, the government has allocated funds for catchment-

based integrated water resource management under the Ministry of Water and Environment's financial year budgeting. This has allowed the decentralised regional, catchment, district and community-level structures to implement activities while ensuring the mechanisms are integrated into domestic structures, keeping the process country-driven and long-term. Additional funding has come from NGOs, the private sector, area-specific funds and development partners, including the FAO, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), International Union for Conservation of Nature (IUCN), PRONTOS, World Wide Fund for Nature (WWF), Rain International, International Institution of Rural Reconstruction (IIRR), Makerere University, National Forest Authority and Wetlands Management Department.

A decentralised catchment-based integrated water resource management system gives the authorities a more robust overview of water resources. By basing the water governance system on the country's natural catchment basins, the vertically integrated authorities can take a holistic view of water resources and have sight of how different activities are impacting overall resources. Combined with the multi-level governance structure, it allows authorities to coordinate actions through a logical system.

The catchment-based integrated approach emphasises multi-stakeholder participatory forums, community involvement and partnerships involving all relevant stakeholders in water management. Implementing catchment-based water resource management is based on a partnership approach where the Ministry of Water and Environment's Directorate of Water Resources Management engages with other relevant organisations, development partners and NGOs who support and facilitate the implementation of activities in the different water management zones. The catchment management organisations prepare the catchment management plans, which are implemented by all relevant stakeholders.

9. MECHANISMS TO SUPPORT CROSS-CUTTING ISSUES IN DELIVERING CLIMATE RESILIENCE IN LDCs

Creating an enabling environment that supports climate-resilient people, economies, landscapes and ecosystems by taking a joined-up approach to planning, finance and climate information, domestic ownership of initiatives and mainstreaming climate change adaptation into government systems.

Why focus on building an enabling environment?

- A more joined-up approach to climate planning, finance and climate information services will create a supportive enabling environment for building resilience.
- LDCs are global leaders in integrating climate change into national policies and plans and can use this as a strong foundation for implementing their vision.
- LDCs need greater levels of climate finance to invest in their institutions and systems for delivering resilience and poverty reduction, particularly at the local level.
- Strengthening the availability and use of climate information services is critical to improve decision making at every level so development choices are robust to the range of future climates.

By strengthening the effective use of climate information and approaches to tackle deep uncertainty in planning and finance decisions, LDCs can create an enabling environment for building resilience to climate change.⁶¹ This can form a foundation to support nationally owned initiatives under LIFE-AR that deliver the Paris Agreement and the SDGs.

LDCs are global leaders in developing policies and plans to adapt to climate change. Over the last 20 years, we have taken a lead in developing national responses to adapt to climate change. Many of us have developed national-level climate plans and integrated climate change into our national development planning processes. As outlined in Section 3, all 47 LDCs have national adaptation programmes of action; 42 have developed NDCs; and

several are in the process of developing NAPs. This vast experience and technical capacity to plan for climate change provides the perfect foundation for implementing our vision.

But we need greater levels of climate finance to invest in adaptation and resilience. By 2030, the cost of adaptation could reach as much as US\$300 billion per year; by 2050, it could rise to US\$500 billion.⁶² Current levels of adaptation finance fall vastly short of these needs: in 2016, just US\$22 billion was invested globally in climate change adaptation.⁶³ Finance also needs to reach the local level so vulnerable people can invest in climate change resilience initiatives that meet their own needs. There is little reliable data on how much climate finance is channelled to subnational levels, but initial estimates suggest that less than 10% reaches the local level.⁶

Strengthening the availability and use of climate information services can help LDCs address the risks of climate change and build resilience. Timely, actionable and tailored weather and climate services are fundamental to addressing the challenges of climate change. Many stakeholders — from government planners to farmers, community workers, healthcare professionals, disaster risk responders and researchers — will find such services useful.⁶⁴

9.1 Lessons from the LIFE-AR evidence review

Lessons on cross-cutting issues

- Strengthening LDC institutions for climate change planning, financing and climate information services delivery is essential for delivering long-term resilience.
- Climate change planning, financing and climate information services need to be integrated into government systems from national to local levels.
- Working across sectors, government departments and jurisdictions is important for delivering climate-resilience.

Table 12. Initiatives to strengthen climate planning, financing and climate information delivery examined in the LIFE-AR evidence review

Type of initiative	Initiatives reviewed	Examples
Climate-resilient planning	60	National level: overarching climate planning (Kiribati, Zambia) Sectoral level: water (Afghanistan, Maldives, Uganda); health (Tanzania); forestry (Bhutan) Subnational level: urban infrastructure resilience (Vietnam, South Africa, the Philippines, India); local adaptation plans for action (Nepal) Landscape level: water catchments (Uganda); watershed approach (Mali) Enterprise level: agricultural value chains (The Gambia, Nepal)
Climate financing approaches	27	Subnational climate funds: DCF (Kenya, Tanzania, Mali, Senegal)* Social protection (Ecuador, Ethiopia, Kenya, the Philippines, Uganda) Insurance: agriculture (India); livestock (Kenya) Climate-resilient value chains: energy (Bangladesh, Tajikistan); livestock (Ethiopia)
Climate information delivery and use	34	Integrating climate information into long-term sectoral policies (Vanuatu, Belize) Disaster risk management approaches: forecast-based financing (Bangladesh, Mongolia)

* See Box 8 for detailed case study and lessons for LDCs

All the initiatives we reviewed are making significant efforts to strengthen climate change planning, financing and the delivery of climate information (see Table 12). More than 80% of initiatives adopted at least one of these three approaches to supporting long-term climate action. This section summarises the overall lessons we drew from these initiatives and looks in detail at lessons from a devolved climate finance initiative in Kenya, Mali, Senegal and Tanzania (Box 8), an approach that takes all three approaches to deliver place-based investment. Table 13 highlights the learning from several initiatives included in the analysis.

9.2 Strengthening national institutions

Strengthening LDCs' own institutions for climate change planning, financing and climate information services delivery is essential for delivering long-term resilience. The initiatives we reviewed highlighted three main avenues for strengthening national institutions to deliver climate-resilient initiatives:

- Improving the governance of climate change responses in planning, management and delivery of climate information
- Ensuring initiatives are implemented by national actors, and
- Mobilising domestic finance to fund resilience initiatives.

Three-quarters of the 79 nationally owned initiatives we reviewed supported national climate change governance. Most did so by either aligning with key national or subnational government policies, plans or strategies, strengthening governance systems and processes or strengthening natural resource governance.

National actors are taking the lead, implementing 60% of climate adaptation initiatives. This is mostly national or subnational government, with initiatives ranging from large national landscape management approaches or social protection schemes, such as India's MGNREGS, to smaller-scale urban infrastructure design and city-level planning, such as the initiatives in Dar es Salaam and Durban. A significant number of initiatives have integrated

climate information services into government or sectoral systems — for example, Vanuatu’s national initiative to integrate climate information into key sectoral planning processes (see Table 13) and the development of national meteorological services in Mozambique and early warning systems in The Gambia and Vietnam. Domestic private sectors are implementing a smaller group of initiatives, including national agriculture and livestock insurance initiatives in India and Kenya, business models that deliver renewable energy through private or public-private partnerships in Bangladesh, Nepal, Tanzania and Tajikistan and initiatives supporting small-scale business development (often using a cooperative business model) in natural resource value chains.

LDCs are strengthening domestic finance systems, though only a few of the initiatives we reviewed were delivering domestic climate finance to build climate resilience. Half of these used existing social protection delivery systems to channel finance to beneficiaries when climate shocks or natural disasters occur. For example, the Philippines used the KC-NCDDP to channel finance to communities affected by Typhoon Haiyan. Seventeen initiatives also strengthened public finance management systems for improved delivery of climate finance — for example, using climate budget codes to monitor and track domestic climate financing in Bangladesh and Nepal.

Some — including Afghanistan’s mainstreaming of climate resilience into water and natural resource management sectors, India’s MGNREGA social protection programme and Fiji’s relocation of vulnerable coastal communities — used domestic public finance to fund climate-resilient actions. Most (including PSNP in Ethiopia and HSNP in Kenya) were largely financed by international donors with small contributions from the domestic public sector, although many of these, including PSNP and HSNP, have still been able to have strong government ownership of the approaches even with the financing support. Ten per cent of initiatives were financed through public-private partnerships with the domestic private sector. These include crop and livestock insurance schemes in India and Kenya and renewable energy and other climate-resilient technologies in Bangladesh, Nepal, Tanzania and Tajikistan.

9.3 Vertical integration from national to local levels

Integrating climate change planning, financing and climate information services into government systems from national to local levels is critical for delivering long-term resilience. Nearly two-thirds of the initiatives we reviewed supported vertical integration of climate actions into government planning systems from national to subnational levels. These included national and sectoral climate plans and interventions that integrated national and subnational climate information into national and sectoral planning processes, landscape management initiatives, urban and infrastructure planning and basic service delivery.

A quarter of the initiatives also supported approaches to channelling finance from national to local levels; these had different types of objective and different delivery mechanisms. These include:

- Social protection programmes providing cash transfers to households that have integrated disaster risk financing or shock-responsive delivery mechanisms to scale up in times of emergency. These include Uganda’s NUSAF III social protection initiative (see Box 3) and shock-responsive initiatives in the Philippines that have used existing financing channels to deliver international humanitarian relief to subnational levels in response to Typhoon Haiyan (see Table 3).
- Crop and livestock insurance programmes, such as KLIP, that transfer finance to the local level when climate thresholds are exceeded. KLIP links insurance providers, government and pastoralist communities in Kenya to provide subsidised insurance coverage for pastoralists that provides compensation for livestock deaths when severe droughts occur.
- National systems that track subnational climate budgetary expenditure in Bangladesh and Nepal to measure the percentage of national government financing for climate action across all government spending sectors.
- Internationally funded initiatives that provide seed capital for climate-resilient investment at local levels, such as CLIMADAPT in Tajikistan and the IDCOL solar home system programme in Bangladesh. These donor-financed initiatives provide capital to banks

and development financing institutions who offer climate-smart technologies using specialised financial incentives that are affordable to low- and middle-income households.

- Local planning approaches such as the DCF model in Kenya, Tanzania, Mali and Senegal where subnational actors make decisions on locally relevant climate-resilient investments (see Box 8).

9.4 Horizontal collaboration across different sectors, actors and government bodies

Working across sectors, government departments and jurisdictions is also important for delivering climate-resilient initiatives. Over half the initiatives we reviewed delivered horizontal collaboration by taking a multi-sectoral approach to resilience building. Two-thirds of these worked across government departments at subnational levels to deliver resilience interventions, while a third worked across ministries at national level to support climate adaptation responses.

The nature and extent of collaboration across government departments varies by type of initiative and context. Agriculture and value chain initiatives often create linkages between subnational extension services provided by the Ministry of Agriculture and other departments involved in promoting irrigation, animal husbandry, forest management, fisheries and aquaculture and meteorological services.

Landscape management initiatives differ in their level of horizontal integration, depending on the type of landscape in question — forest, watershed, rangeland and so on. But landscape management approaches usually cross subnational political jurisdictions so often involve coordination with different technical ministries responsible for specific resources and shared governance arrangements across administrative boundaries.

Social protection and basic services initiatives are less associated with horizontal collaboration within government. Social protection initiatives predominantly integrate vertically within a ministry, particularly when delivering cash transfers or pensions. Labour guarantee schemes, on the other hand, are more likely to involve cross-ministry collaboration at subnational levels to

implement public works projects that involve coordinating infrastructure projects with other line ministries at local level.

Delivering long-term climate resilience requires building partnerships with a diverse group of stakeholders. Two-thirds of the initiatives we reviewed built resilience through partnerships with different groups of actors — including national and subnational governments, the private sector, civil society, financial service providers, meteorological agencies, research organisations, communities and households. The exact nature of collaboration between groups of actors depends on the type of initiative and local context.

Initiatives that increase **basic service** provision create partnerships with governments, donors, humanitarian agencies, civil society, infrastructure and technology providers, communities and households to improve access to these services. This includes cross-department planning for relocating communities in Fiji (see Box 4), collaboration with different actors to build typhoon-resilient buildings in Vietnam (Table 5) and collaboration between donors, financial service providers, technology companies and community savings groups to deliver solar home systems in Bangladesh.

Climate-smart agriculture value chain initiatives launched by multilateral donors and NGOs are often designed to link producers, financial services, technology and other input providers, government extension workers, meteorological agencies or other climate information providers, buyers and distributors working along the value chain to improve production and promote market integration (see Table 8).

Landscape management initiatives tend to create linkages between subnational governments, community organisations and user groups, civil society, public utilities, private sector actors and households to govern natural resource use and management. Examples of horizontal collaboration for landscape management approaches include transboundary management of water resources in the Niger Basin, catchment-based integrated water resource management in Uganda (see Box 3), linkages across value chain actors for forestry management in The Gambia and collaboration between local government, civil society and communities for city-level landscape management in Fiji (see Table 13).

Table 13. Issues to consider for strengthening climate planning, financing and climate information delivery

Issue	Example	
Clarifying governance of climate risk and strengthening institutional capabilities for their mandates	Kiribati Adaptation Programme (KAP) Kiribati ⁶⁵	KAP aimed to reduce Kiribati's vulnerability to climate change, climate variability and sea level rise by raising awareness of climate change, assessing and protecting available water resources and managing inundation. To achieve this, Kiribati undertook actions to improve water supply management; coastal management protection measures such as replanting mangroves and protecting public infrastructure; strengthening of laws to reduce coastal erosion; and population settlement planning to reduce personal risks. The programme was implemented in three phases. Phase 1 began the process of mainstreaming adaptation into national economic planning and identified priority pilot investments for Phase 2. It also involved an extensive process of national consultation and was closely linked with preparing the National Development Strategy and Ministry Operational Plans. Phase 2 developed and demonstrated the systematic diagnosis of climate-related problems and the design and implementation of cost-effective adaptation measures, while continuing to integrate climate risk awareness and responsiveness into economic and operational planning. Phase 3 used lessons from Phase 2 to inform the design and preparation of an expanded programme for climate change adaptation that incorporates disaster risk reduction measures, which are closely linked to climate change adaptation initiatives in Kiribati. After the project formally ended, the government continued engagement in two priority areas: water resource management and coastal resilience. Its national adaptation programme for action identified these as the country's top priorities; they are also the priorities of the KAPII pilot programmes implemented in conjunction with government ministries.
Vertical integration of climate change into planning, financing and climate information from national to local levels	Integrating climate information into key national sectors Vanuatu ⁶⁶	To address Vanuatu's vulnerability to various climate impacts, the government's Meteorological and Geohazard Department is working with the Secretariat of the Pacific Regional Environment Programme to plan long-term policies and inform and prepare the public to manage the expected changes in climate. The initiative will expand the use of climate information services, addressing information gaps and priority needs at national, provincial and local community levels across five targeted sectors: tourism, agriculture, infrastructure, water management and fisheries. It will generate, provide and contextualise information and knowledge derived from climate research for decision making at all levels of society. This will inform adaptation to climate variability and change and provide people and organisations with timely, tailored climate-related knowledge and information that they can use to reduce climate-related losses and enhance benefits, protecting lives, livelihoods and property. The initiative will do this by enhancing: • The capacity and capability of national development agents to understand, access and apply climate information services • Climate information services, communications, knowledge productions, tools and resources for practical application to development processes • The reliability, functionality, utility and timeliness of underlying climate information service delivery systems and data collection infrastructure, and • Scientific data, information and knowledge of past, present and future climate to facilitate innovative and resilient development.

Box 8. Devolved climate finance: lessons from Kenya, Mali, Senegal and Tanzania⁶⁷

Kenya, Tanzania, Mali and Senegal have developed innovative mechanisms to ensure that climate finance reaches those who are most vulnerable to climate change. Governments in these countries are using the architecture of decentralisation to establish subnational climate change funds that invest global and national climate finance in support of community-prioritised investments in public goods that build local resilience to climate change

The devolved climate finance (DCF) approach establishes nationally owned mechanisms to channel climate finance to local governments. It sets up climate adaptation funds (CAFs) at local levels under the discretionary authority of elected local authorities with transparent fiduciary mechanisms and high levels of accountability to local communities. As public funds, the CAFs can be capitalised from various sources, including local government budgets, national climate funds, bilateral and multilateral donors and accredited national implementing entities of the GCF. In Kenya, Wajir and Makueni Counties passed legislation to allocate an annual minimum of 2% and 1% of their county development budgets, respectively, to capitalise their county CAFs.

DCF mechanisms enable poor and vulnerable households to prioritise investments based on local needs that will provide resilient pathways out of poverty and climate vulnerability. DCF emphasises citizen-led and rights-based approaches to planning and prioritising public funding for sustainable development and poverty reduction. Local adaptation committees made up of elected community representatives and technical experts from local government are established to prioritise climate-resilient investments. In Tanzania and Mali, women and men are represented equally on these committees; women's representation is lower in Kenya and Senegal, at 30–35%.

Communities have prioritised 240 investments using the DCF mechanism, which will help almost 1.5 million people adapt to climate change. Ninety per cent of CAF funds finance local adaptation investments and 10% is allocated to administration, monitoring and evaluation. The investments support livelihood systems by rehabilitating and expanding water facilities for livestock and domestic use, improving access to livestock health services and supporting market development. They cover investments in weather stations and food storage and processing facilities, fish farming and solar energy. This variety of proposals will help almost 1.5 million pastoralists, farmers and their families to withstand the pressures of

an increasingly variable and unpredictable climate and improve their wellbeing.

Lessons for LDCs

DCF mechanisms can help ensure that global climate finance reaches local level, where it is needed most.

Climate finance must reach the communities that need it most so they can prioritise adaptation responses that are based on their own needs. Communities already have a strong foundation of local knowledge around the underlying risks to their livelihoods and drivers of climate vulnerability; leveraging this knowledge helps build more robust climate adaptation responses. By enabling local people to prioritise investments based on their own needs, DCF mechanisms can help promote social inclusion and gender equality, particularly if there is equal participation in investment decisions.

DCF can support short-term investments that tackle poverty, while building the long-term institutional capacity needed to manage future climate risks. An important lesson emerging from the first round of DCF investments is that tackling immediate needs common to many dryland areas is essential, before engaging local communities to invest in adaptation strategies that address longer-term risks. Addressing these immediate needs can also yield long-term gains. Building agile and inclusive institutions that engage communities in setting priorities that respond to immediate vulnerability creates and institutionalises adaptive capacity to manage longer-term climatic shifts.

Developing strong national and subnational institutions to channel climate finance to local level can help deliver long-term and far-reaching results. The DCF approach works within national devolution and decentralisation frameworks. It has ensured domestic ownership by working with national and subnational institutions to develop transparent governance and fiduciary processes that will channel and deliver climate finance to the local level. This has led to strong vertical integration of climate change governance and finance at national and subnational levels. Looking to the future, it can deliver far-reaching impacts as more subnational governments in Kenya, Mali, Senegal and Tanzania look to develop CAFs in their own jurisdictions. In Kenya, where DCF has been implemented the longest, DCF mechanisms now cover nearly 30% of the country.

10. CONCLUSION

We, the LDCs, face unique and unprecedented challenges to end poverty and achieve sustainable development in the context of escalating climate risks. Our 2050 Vision presents a long-term focus that will guide our increasing ambition and greater strategic investment and help us build our capabilities, systems and institutions for sustainable development. It will guide the development of our NDCs and NAPs over the coming decades and help us work together to build climate resilience and national development and eradicate poverty, delivering the SDGs, the Paris Agreement and the Sendai Framework for Disaster Risk Reduction.

The LIFE-AR initiative will help us translate the overarching LDC vision to our own national contexts, defining for ourselves how we will deliver a climate-resilient future. To assist this process, the front-runners and leaders among LDCs will take this work forward in-country and share their learning and best practice across the whole LDC Group. LIFE-AR will support the front-runners to develop their own 2050 national vision or LTS for a climate-resilient future and help us build and strengthen our structures, systems and institutions in-country to create effective delivery mechanisms for a high-quality, long-term, transparent and effective

climate response. These delivery mechanisms will build or strengthen existing structures in-country to ensure support reaches those who need it most at local level, effectively integrate national and local responses and support collaboration across sectors for an effective cross-sectoral response. This work will provide initial learnings and examples that will help guide and support other LDCs over the next phases of the LIFE-AR initiative to ensure we continually share learning across all LDCs through regional clusters and platforms for peer-to-peer support.

Our youth are the custodians of our future. The LDC population doubled between 1980 and 2010 and is projected to do so again by around 2050. By 2030, around 46% of our population will be under the age of 20 and only about 6.5% will be over 60. By 2050, one in four of the world's 15–24 year-olds will live in an LDC.⁶⁸ The next generations will feel the brunt of climate impacts. Our youth are a vulnerable group that needs to be accounted for in the delivery of effective adaptation and resilient interventions and the people who will be implementing those interventions in the years to come. Initiatives such as LUCCC are training and building the capacity of our young people so they can take the lead in delivering the vision up to 2050 and beyond.

NOTES

- 1 IPCC (2018) Global Warming of 1.5°C. See www.ipcc.ch/sr15/
- 2 IPBES Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (2019) Global assessment report on biodiversity and ecosystem services. See www.ipbes.net/news/ipbes-global-assessment-preview
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- 4 Rai, N, Soanes, M, Norton, A, Anderson, S, Steele, P, Tenzin, J and MacGregor, J (2015) A fair climate deal in Paris means adequate finance to deliver INDCs in LDCs. See <https://pubs.iied.org/pdfs/17333IIED.pdf>
- 5 Oxfam (2018) Climate finance shadow report 2018. See www-cdn.oxfam.org/s3fs-public/file_attachments/bp-climate-finance-shadow-report-030518-en.pdf
- 6 Soanes, M, Rai, N, Steele, P, Shakya, C and MacGregor, J (2017) Delivering real change: getting international climate finance to the local level. See <http://pubs.iied.org/10178IIED/>
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The LDC Ministerial Group and LDC Chair officially welcomed and launched LIFE-AR at COP24. It has been a deliberative process across LDCs, guiding the development of this 2050 Vision, offer and ask. Under the direction, guidance and expertise of the LDC Ministerial Group, LDC Advisory Group, LDC Chair and LIFE-AR technical lead, six technical workshops with almost 200 experts across Anglophone and Francophone Africa and Asia Pacific – as well as over 400 experts brought together at COP, CBA and the NAP expo, a public call for evidence eliciting 100 submissions and 80 interviews – have captured the rich insights and experience of LDC experts and resilience partners to shape this, our 2050 Vision.

About LIFE-AR

The Least Developed Countries (LDC) Initiative for Effective Adaptation and Resilience (LIFE-AR) is an LDC-led, LDC-owned initiative to develop a long-term vision for delivering a climate-resilient future. LIFE-AR outlines the ambitious commitments that we LDCs are making together to ensure we leave no LDC behind.

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