

Oxfam Research Reports

Review of Climate Change Adaptation Practices in South Asia

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Acronyms and abbreviations

ACCRA	Africa Climate Change Resilience Alliance
ADB	Asian Development Bank
ALM	Adaptation Learning Mechanism
ARCAB	Action Research for Community Adaptation in Bangladesh
BCAS	Bangladesh Centre for Advanced Studies
BCCSAP	Bangladesh Climate Change Strategy and Action Plan
CAP	community action plan
CBA	community-based adaptation
CBO	community-based organisation
CCA	climate change adaptation
CEDRA	Climate Change and Environmental Degradation Risk and Adaptation Assessment
CRISTAL	Community-based Risk Screening Tool – Adaptation and Livelihoods
CSDRM	Climate Smart Disaster Risk Management
CVCA	Climate Vulnerability and Capacity Analysis
DDC	District Development Council
DfID	UK Government Department for International Development
DRR	disaster risk reduction
EbA	Ecosystem-based Adaptation
EIA	Environmental Impact Assessment
GDP	gross domestic product
GEF	Global Environment Facility
GLOF	Glacial Lake Outburst Flood
IPCC	Intergovernmental Panel on Climate Change
LAC	Local Adaptive Capacity
LAPA	Local Adaptation Plan of Action
LI-BIRD	Local Initiatives for Biodiversity, Research and Development
LDC	least-developed country
NAPA	National Adaptation Programme of Action
NGO	non-government organisation
NRM	natural resource management
PCVA	Participatory Capacity and Vulnerability Analysis
RDPI	Rural Development Policy Institute
RVCC	Reducing Vulnerability to Climate Change
SDC	Swiss Agency for Development and Co-operation
SLD	Shared Learning Dialogues
SLA	Sustainable Livelihoods Approach
SRI	System of Rice Intensification
TRM	Tidal River Management
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
V2R	Vulnerability to Resilience
VDC	Village Development Committee
WWF	World Wildlife Fund

Executive summary

Despite all its progress over the last quarter century, South Asia remains home to four out of every 10 of the world's poor; 600 million of South Asia's 1.5 billion people live on less than \$1.25 per day.¹ Almost half the children below five are underweight, accounting for more than half of the world's undernourished children.² Imbalances in economic growth, inequality among castes, classes, between genders, and a region beset by disasters, have added to the suffering of the poor and those most vulnerable and marginalised.

Climate change is predicted to have severe consequences for South Asia, particularly in agriculture, which employs more than 60 per cent of the region's labour force.³ Some of the predicted impacts of climate change include increased variability in both monsoon and winter rainfall patterns; increase in average temperatures, with warmer winters; increased salinity in coastal areas as a result of rising seas and reduced discharge of major rivers; weakening ecosystems; the recession of glaciers in the Himalayas; and increased frequency and/or severity of extreme weather events (floods, cyclones, and droughts).^{4, 5}

Adaptation efforts in South Asia have so far been fragmented, lacking a strong link between national climate change strategies, plans, and existing disaster risk reduction, agricultural, and other relevant policies. This disconnect partly stems from a lack of conceptual understanding and partly due to the ongoing debate as to what constitutes adaptation, and what represents good and sustainable development.

Focusing on five countries in the region (Bangladesh, India, Nepal, Pakistan, and Sri Lanka), this review captures examples of good practices in climate change adaptation (CCA) programming, in order to inform Oxfam's learning, thereby enabling it and other organisations to replicate some of these good practices in their own programmes and to advocate their adequate financing and governance.

Drawing on internet resources, reports, and material gathered from a variety of organisations, as well as from field-work in Bangladesh and Nepal, 64 adaptation projects and programmes were analysed. Out of these, 14 were found to be examples of good practice.

Good practice in South Asia

The review identified seven key lessons about good practice in the region:

1. *Participatory assessment and analysis of vulnerability and capacity:* Good practice is based on a solid assessment of the vulnerabilities, needs, and capacities of actors involved. Initiatives that begin with understanding the current vulnerability of communities to existing development challenges, together with climate change issues, help build a solid foundation from which to work. Climate change cannot be dealt with in isolation. One must also keep in mind the complex interdependence of sustainable livelihoods, disasters, water, and natural resources that would eventually help frame adaptation strategy in ways that communities can understand. This in turn helps communities to think about how to become 'climate smart' rather than regarding climate as one more burden they have to deal with. Drawing upon community experiences of the recent past and current experiences of climate variability can also help communities appreciate the extent of climate change. That would only help such communities prepare ahead for adaptation;
2. *Focus on poor, vulnerable, and marginalised beneficiaries:* Good practice means targeting and working with the most vulnerable, including women and socially-marginalised groups. Focus on the poorest, most vulnerable and marginalised communities is important because of their high dependency on climate-sensitive resources and their lack of access

to the material, social, political, and economic resources that would enable them to adapt to climate change impacts.⁶ For women, climate change can amplify existing inequalities, reinforcing the disparity between women and men in their vulnerability to climate change and their capability to cope with it.⁷ Including them throughout the entire process should therefore constitute a central concern for any intervention;

3. *Local ownership*: Good practice requires community ownership of the processes and actions. The local communities must be the driving force behind these processes and actions as well. This is true of all development planning, and adaptation is no different. Interventions that remain effective and functional, long after the NGOs have left, succeed because communities are empowered with the knowledge, skills, resources, and authority;
4. *Diversity of stakeholders*: Good practice involves a diversity of stakeholders with different knowledge practices. What all the cases reviewed have in common is that they are all inclusive. Such practices include a wide diversity of stakeholders in the process leading up to adaptation. This is important because climate change is a complex problem, with no set answer or single set of people possessing the solutions. It requires a synergy between local and traditional knowledge with 'scientific' knowledge, and a broad discussion of technologies and practices suitable to the particular context. In some cases, it requires looking at different ways of 'doing' that innovate and build on existing traditional practices;
5. *Flexible and responsive design and implementation*: Good practice involves flexibility in design and implementation, and responsiveness to changing needs. Given that the exact impacts of climate change are uncertain, particularly in the local context, communities can best adapt to climate change through programmes that empower them to work together, make decisions, and build their collective capacity, in order to manage current risks and hazards and promote flexibility in terms of adapting to future uncertainty. A social learning process that includes vulnerable and marginalised groups can also help identify the best practices that will benefit those most at risk;
6. *Future-looking*: Good practice does not only help communities address immediate concerns, but also helps them prepare for the long-term future. While the impacts of climate change are set to intensify over time, it is important that development interventions address current hazards and increased climate variability in the longer term. Communities having to cope with such problems would naturally attach a high priority to such interventions. These communities do realise that their poverty arises out of climate impact across several sectors. Thus helping them prepare for the future is important to ensure their self-reliance and resilience. This means that the outcomes set for projects and programmes should have short-, medium-, and long-term outcomes.
7. *Build adaptive capacity at multiple levels and within existing institutions*: Good practice involves working with local government (such as municipality or district) to build adaptive capacity. While working at a community level is necessary, the response is not sufficient on its own, for effective adaptation. Working with local government is critical because it is at this level that many government policies are implemented. This level to some extent influences those policies too. It is also at this level that the impacts of climate change are most clearly manifested. Building adaptive capacity for the most vulnerable therefore requires a dual approach: first, a 'bottom-up', locally-inclusive approach to adaptation planning that is sensitive to the disaggregated nature of climate change vulnerability and the fault lines of social exclusion at the local level; and second, this local-level adaptation must be supported by meso- and higher-level institutions that enable access for poor and excluded groups to the assets and institutional system that will help them build adaptive capacity and act as the means of delivery for external resources to facilitate adaptation.⁸

Gaps in current knowledge and what is needed

The review identified a number of areas where there is a gap between knowledge, capacity, and experience in the region, and what is needed. These are set forth below.

1. Better research across issues:

- Two major 'hotspots' (the Eastern Ganges Basin and major river deltas) where large populations in vulnerable areas require research to better understand how they are likely to be affected and how they can adapt;⁹
- Climate and hydro-geological changes: More information and statistical analysis related to climate and hydro-geological changes in the region is needed, along with better communication between decision makers and the scientific community. There is also a need for better climate risk assessment methods, increased financial capacity of governments for funding climate change studies, and better real-time information on rainfall and water level for operational schemes;¹⁰
- Climate-induced migration: More research is urgently required, as migration is already putting a strain on resource-poor local municipalities, peri-urban centres, and crowded cities;¹¹
- Factors enabling and constraining autonomous adaptation: Although autonomous adaptation is likely to become more common and widespread than planned adaptation, most research and policy dialogue have so far focused on the latter. Research across a number of related areas to better understand the drivers of autonomous adaptation would benefit the region;¹²
- Role of financial mechanisms in spreading risk: As pressure increases on traditional risk-sharing strategies (borrowing from family, friends, and social networks) so does the exploitative nature of moneylenders, particularly during a disaster; as such, how people access financial institutions for micro-credit, insurance, and financial services requires further research and documentation;¹³
- Managing land and enhancing livestock productivity: Given the declining availability and quality of pastures in drought-prone areas, there is a need to rethink how community-based management of common resources can work in a context where social relations between sedentary population (farmers) and pastoral groups are exacerbated by conflict.¹⁴

2. River basin management:

There is currently no organised system of river basin management across the region. Neither is there a long-term strategy for water management.¹⁵ This is compounded by lack of co-ordination between agencies, low investment, lack of clear regulation on land use, and inefficient use of water, especially for agriculture. What is needed is better co-operation between stakeholders to: advance monitoring and statistical analysis of their particular basin; disseminate information to communities and other institutions; operationalise flood and river flow forecasting and alert systems; better understand the different types of interventions needed to regulate river flow during wet and dry seasons; and manage natural resources more effectively particularly through more efficient water and land use.

3. Capacity-building:

Gaps in capacity, knowledge, and experience are common across South Asia, especially as far as it concerns the dissemination of concepts and experiences on effective adaptation strategies.¹⁶ Moreover, while knowledge varies across the region, a common

challenge is the way in which knowledge and learning are structured. This might predicate the need for new approaches to share experience and expertise.¹⁷ These approaches should value diversity, rather than uniformity, in local and regional response strategies aimed at fostering resilience.¹⁸ Most importantly, new approaches will need to build practical local strategies for experimentation, local and scientific risk assessment, and systematic sharing of research results.¹⁹ Some strategies to achieve greater knowledge in the region could include:

- Building relationships and developing common understanding and shared knowledge among various groups, including politicians and researchers;
- Strengthening the structure of organisations responsible for disseminating information;
- Collaborating to embrace innovations and create synergy among communities, the private sector, and government allowing them to work from the local to the global level, rather than focusing on strategies that emerge out of a fixed mind-set;
- Documenting management initiatives, particularly those involving the participation of the local people and organisations, as well as the government;
- Building the basis for informed dialogue through broad-based communication strategies that reach key audiences, forums, social networks, and partnerships triggering discussion and debate;
- Building research capacity at various levels of government and among public, private, and community organisations;
- Access to funding and ensuring that research institutions are guaranteed intellectual independence.²⁰

4. **Monitoring and evaluation frameworks for adaptation practice:**

At present, there is a lack of information on how to monitor and evaluate CCA, including benchmarks or a framework that is inclusive, practical, and replicable at the community level. Consequently, organisations must work together to develop frameworks that are complementary, easy to use, and accessible. Without such a framework it is impossible to measure progress against goals and ascertain what succeeds or what fails amid a changing climate.

5. **Documenting good practice:**

While we are all still learning about adaptation, and its practice has still to mature, documenting and sharing lessons learned is especially important. This includes not only documenting the 'what', but also details of the 'how', to explain the process of working with communities and other stakeholders, the approaches, methodologies and relevant tools, and why these are important. This also includes details on the early successes and challenges of particular projects and programmes, given the need to learn both from what works and, just as vitally, from what does not. In order for this to happen, there needs to be increased investment in the skills of staff and partners, thereby enabling them to draft their work in a manner that promotes education of people not involved with that specific project.

1 Introduction

1.1 Background

Climate change is already affecting a large number of people across South Asia in different ways. This includes increased variability in both monsoon and winter rainfall pattern; increase in average temperature, with warmer winters; increased salinity in coastal areas, as a result of rising sea level and reduced discharge from major rivers; weakening ecosystems; the recession of glaciers in the Himalayas; and increased frequency and/or severity of extreme weather events (floods, cyclones, droughts).²¹ The region is particularly vulnerable to climate change owing to high population density and concentrated poverty, and existing climate variability. Climate change has the potential to compound the prevailing development problems and increase pressure on key resources needed to sustain growth.

South Asia is still home to a predominantly rural population with more than 70 per cent of its people living in villages despite rising migration to urban centres.²² Per capita growth in agricultural production is low, at 2 per cent, failing to keep pace with gross domestic product (GDP) growth.²³ Poor productivity means that despite employing 60 per cent of the region's labour force, agriculture represents only 22 per cent of the region's GDP. That is manifested by the fact that some countries (Afghanistan, Bangladesh, and Nepal) are net food importers.²⁴ Those living in poverty find it even more difficult as the situation is exacerbated by unequal distribution and access to land, where many are neither tenant farmers nor farm owners.²⁵ The situation is particularly precarious for women as they own less than 5 per cent of total land in the region.²⁶

Climate change is predicted to have severe consequences on agriculture and the rural poor in South Asia. Long-term changes in temperature and precipitation have direct impacts on yield. Moreover, resilience is typically low in rural areas as the existing asset base is limited, and services are often insufficient.²⁷ Agriculture in South Asia is heavily reliant on the monsoons, which account for more than 70 per cent of the region's annual precipitation.²⁸ Given that approximately three-fifths of the cultivated area in South Asia is rain-fed, the onset, duration, spatial extent, and total precipitation of the monsoon are critical factors in determining the livelihoods of large majority of people in rural areas.²⁹ Global warming is likely to affect all these factors. For example, in India, monsoonal rainfall has decreased by approximately 5 to 8 per cent since the 1950s, and this pattern may have contributed to more intense, longer, and more widespread droughts across the region, as illustrated by the recent droughts of Rajasthan and Madhya Pradesh in India and the Sindh and Baluchistan provinces in Pakistan.³⁰

Floods, droughts, and cyclones, which already have a massive impact on South Asia, are likely to become more severe and/or more frequent across the region as a result of climate change.³¹ In India, the area affected by floods more than doubled in the 50 years between 1953 and 2003.³² In Bangladesh, 60 per cent of the country is already flood prone.³³ The 2010 floods in Pakistan affected 20 million people and were the worst in the region since 1929.³⁴

Sea level rise will have a significant impact on the low-lying coastal systems and islands. Much of the Maldives may be submerged by the end of the century if the worst-case scenario becomes a reality.³⁵ Up to a fifth of Bangladesh will be inundated, affecting over a tenth of the population.³⁶ Sea level changes also have effects on salinity levels, thereby amplifying storm-surge effects, and changing both sedimentation patterns and ocean currents.³⁷ By the end of the century, 125 million people across Bangladesh, India, and Pakistan could be rendered homeless by rising sea levels.³⁸ All of these changes will have significant impacts on livelihoods.

With its heavy reliance on the monsoons and snow-fed rivers, water availability in South Asia is highly sensitive to climate change. In the short term, the retreating glaciers in the Himalayas will increase risk of flood, due to more runoff in the main South Asian rivers. However, in the long term, there can be no replacement for the water provided by the glaciers and their retreat could result in water shortage at an unprecedented scale, with a steep decrease in annual river flows. The Himalayan glaciers are the source of nine of the largest rivers in Asia. The Ganges, Brahmaputra, and Indus river basins practically feed over half a billion people. These people are heavily dependent on agriculture and fisheries³⁹, both of which will be negatively impacted by a reduction in freshwater availability. This could also seriously jeopardise food security for millions across South Asia.⁴⁰

Adaptation

While there is a consensus concerning the substantial impact of climate change in South Asia, there is still limited understanding at a more local level of what the precise impacts of climate change may be and how communities should adapt. A lack of meteorological data and modelling has hampered this understanding.

At a national level, least-developed countries (LDCs) in South Asia have developed their own National Adaptation Programmes of Action (NAPA) – Bangladesh in 2005 and Nepal in 2010. Moreover, several countries have developed national climate change strategies and action plans, including the Bangladesh Climate Change Strategy and Action Plan (BCCSAP), the National Climate Change Adaptation for Sri Lanka 2011-2016, the National Action Plan on Climate Change in India, and the draft National Climate Change Policy in Pakistan. These plans and policies have not yet resulted in significant adaptation efforts at the national level and, in many cases, only a limited amount of resource have so far been committed.⁴¹

The climate change adaptation (CCA) policy approach has also been fragmented, with climate change strategies and plans not strongly linked with existing DRR, agricultural, and other relevant policies. This fragmentation is partly driven by a lack of conceptual understanding and an ongoing debate on what constitutes adaptation, and what represents good and sustainable development.

Various international and national NGOs have started to develop CCA programmes in different South Asian countries. These programmes and the approaches taken vary tremendously, from 'stand-alone' projects to adaptation that is entirely mainstreamed in development programmes.

1.2 Rationale

In South Asia, despite various initiatives from different organisations, there is still a lack of evidence-based examples of successful adaptation programmes, as well as comprehensive documentation of key criteria for success or reasons for failure. This review of CCA practices captures examples of good practice in CCA programming in South Asia, in order to inform Oxfam's learning, thereby enabling it and other organisations to replicate some of these good practices in their own programmes and to advocate adequate financing and governance.

The following countries have been included in this review: Bangladesh, India, Nepal, Pakistan, and Sri Lanka. Afghanistan has not been included because of its lack of climate change related programmes. Bhutan and the Maldives were not included because these are not countries in which Oxfam currently works. The review focuses on programmes and practices (and not on policies or theoretical framework), and the majority of cases reviewed are community based. This not only reflects the type of work Oxfam is interested in, but also the majority of the work currently taking place in the region with like-minded NGOs. It is not intended to present an exhaustive list of CCA programmes in the region. Rather, it is intended to select and present examples of programmes that highlight good practice and innovation in programming, that offer learning to Oxfam and others.

1.3 Objectives

The aims of the review are as follows:

1. Mapping out examples of CCA programmes in South Asia and identifying those that have the most to offer in terms of learning for Oxfam;
2. Identifying why these programmes can be considered good practice and which approaches and tools were used to support them;
3. Presenting these approaches and tools succinctly in a way that informs Oxfam's learning and can be easily understood by programme staff;
4. Identifying gaps in knowledge to help shape future research and improve CCA programmes;
5. Emphasising, wherever possible, gender issues in CCA programming, and highlighting good practices and approaches related to women and CCA.

1.4 Methodology

The assignment began with a review of existing literature to understand the differing contexts and background to programming in the region. This included the identification of reports detailing CCA programmes in South Asia and their analysis.

This was followed up by travel to two countries in the region, Bangladesh and Nepal, to meet and conduct semi-structured interviews with key practitioners who were developing and implementing CCA programmes. Field investigations and interviews with more than 80 practitioners, policy makers and government officials (70 per cent male, 30 per cent female) were undertaken in March and April 2011; two weeks were spent in Nepal and three weeks in Bangladesh. This also included visits to a number of promising programme sites to meet with partners and beneficiaries on the ground, as well as to attend the Fifth International Conference on Community-Based Adaptation to Climate Change (Dhaka, 28-31 March 2011), which provided the opportunity to meet practitioners from the region.

Throughout the review, the focus has been on collecting practical information on different projects and programmes that capture the diversity of various efforts in the region, including location, scale, sector, strategic emphasis, and the climate impacts being addressed.

1.5 Limitations

The review has a number of limitations. First, owing to financial and time constraints, it was not possible to visit all five countries selected for the review. Consequently, face-to-face meetings with those working on climate change programming issues were limited to Bangladesh and Nepal. Partly to make up for this, face-to-face meetings were held with practitioners from India, Pakistan, and Sri Lanka who were attending the CBA Conference in Dhaka. However, as a result, the review was able to collect more information from Bangladesh and Nepal than from India, Sri Lanka, and Pakistan. Second, while conducting a review of adaptation practice in the region could take many months, this endeavour, including literature review, fieldwork, and report writing took 45 days. This has meant that the author has had to make choices about which projects and programmes to focus attention on. Furthermore, with the exception of four field visits to project sites (two each in Bangladesh and Nepal), the author was only able to review projects and programmes where there was written documentation. This has limited the review given that many relevant activities and projects have not yet been documented. Equally, a reliance on English-language documentation has also excluded some projects and programmes. Finally, some bias in the review may have occurred as a result of organisations emphasising the positive aspects of programming over negative ones. In order to mitigate this, the researcher has used her own judgement to assess the success and impact of such programmes.

1.6 Challenges

There were many challenges faced in completing this assignment. First, it was difficult to define the scope of the review because there are no set criteria for what constitutes CCA, both in terms of definition and what organisations themselves consider adaptation. In fact, much of what many organisations now include in their climate change portfolios is work that has been around for many years, including, among others, DRR programming, natural resource management (NRM), and water management. Second, there were many challenges in assembling the key information needed to inform the review, which stemmed from scattered information and from many programmes that were either undocumented or lacking robust analysis. Third, and on a related note, while it was hoped that some of the five countries in this report would have completed their own review of in-country programmes, this was unfortunately not the case. This made the collection of examples of projects and programmes more time consuming and difficult. Finally, given that CCA programming is still in its infancy in the region, it has been difficult to assess the impact and success of programming. This is compounded by the fact that there is no recognised monitoring and evaluation framework in existence that looks specifically at CCA.

1.7 Report structure

The report is divided into six sections:

- Section 1** provides an introduction to the report and includes information on the background of assignment, as well as outlining the rationale, objective, and outputs. It also describes the limitations and challenges faced during the assignment. It concludes by outlining the structure of the report;
- Section 2** provides an overview of CCA and Oxfam's approach;
- Section 3** presents an overview of some of the different approaches and tools used in these programmes and the region as a whole;
- Section 4** provides a selection of good practice and/or innovative CCA programmes in South Asia. These are organised country-by-country;
- Section 5** provides some thoughts on what constitutes good practice and innovation and how some of the case examples provide learning for Oxfam in the region;
- Section 6** identifies gaps in knowledge needed to shape future research and improve CCA programmes.

In addition to this, there are five appendices:

1. A list of all persons interviewed as part of the assignment, their organisations and contact details;
2. A matrix of all projects/programmes reviewed, including a brief description of their main components;
3. A matrix of most commonly used methodologies/tools in the region;
4. Examples of adaptation technologies in South Asia;
5. A list of selected websites containing information, online databases, and knowledge platforms, where examples of adaptation can be found.

2 Framing adaptation: Oxfam's approach

In order to assess the range of climate change projects and programmes in South Asia, it is useful to first understand how Oxfam frames adaptation and how it approaches adaptation.

Oxfam's wealth of experience in development theory and practice provides a great foundation for its work on climate change, especially given that its development work has proven time and time again that taking a holistic, people-centred, and rights-based approach to poverty and injustice is the best way to achieve effective and sustained poverty reduction. Climate change, as a multi-dimensional issue, can benefit from this type of approach not only to lift people out of poverty, but also to enable them to manage risk, uncertainty, and change; and to make them agents of their own destiny to shape, create, and respond to changes throughout their lives.⁴² This is important as climate change crosses spatial and temporal scales, cuts across many areas of development, and requires efforts across Oxfam's humanitarian, long-term development, and advocacy efforts.

Box 1: Key definitions

Adaptive capacity: The potential of individuals, communities, and societies to be actively involved in the processes of change in order to minimise negative impacts and maximise any benefits from climate change.

Climate change: A change in weather that persists for decades or longer, arising from human activity that alters the composition of the atmosphere (i.e. greenhouse gas emissions).

Climate change adaptation (CCA): Actions that people and institutions take in anticipation of, or in response to, changing climate. This includes changes to things they do, and/or the way they do them.

Climate resilience: Where adaptive capacity relates to the ability to influence and respond directly to the processes of change (to shape, create or respond to change), resilience is the ability to absorb shocks or ride out changes.

Climate variability: Natural variations in the climate that are not caused by greenhouse gas emissions (e.g. it rains more in some years and less in others).

Disaster risk reduction (DRR): The concept and practice of reducing disaster risk through systematic efforts to analyse and manage the causes behind disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and environment, and improved preparedness for adverse events.

Mitigation: Measures to reduce greenhouse gas emissions (note that the term 'mitigation' is used differently by DRR practitioners, who use it to mean reducing or limiting the adverse impact of hazards and related disasters).

Vulnerability: The characteristics and circumstances of a community, system, or asset that make it susceptible to the damaging effects of climate change and other hazards.

Source: Oxfam GB (2009d) *Introduction to Climate Change Adaptation: A Learning Companion*, Oxfam Disaster Risk Reduction and Climate Change Adaptation Resources.

CCA as a concept and an approach is broad and not yet fully established within international development.⁴³ Varying definitions exist and are used in different ways to best serve the purposes of different actors involved in climate change.⁴⁴

The most influential definitions, however, are those of the United Nations Framework Convention on Climate Change (UNFCCC) and the Intergovernmental Panel on Climate

Change (IPCC). Oxfam has adapted to these definitions to provide one that is more suitable for working with communities: 'Actions that people and institutions take in anticipation of, or in response to, a changing climate. This includes changes to the things they do, and/or the way they do them.'⁴⁵

Taking a CCA approach to development involves working at different planes, combines local and indigenous knowledge with science, requires long-term planning and flexibility to accommodate uncertainty. At the same time this approach involves assisting communities cope with present circumstances by reducing vulnerability and increasing adaptive capacity.⁴⁶

While Oxfam is still in the process of developing its approach to CCA, it has made remarkable progress in defining adaptation. Moreover it has developed means that take into account the complex nature of climate change across the varying contexts in which it operates. In particular, Oxfam considers the following elements as crucial for adaptation:

- Investing in communities' ability to shape, create, and respond to change by building adaptive capacity;
- Empowering (and enriching with resources) local levels of government to be genuine agents of change for the communities they serve;
- National planning that is informed by bottom-up vulnerability assessment in order to create an enabling environment for adaptation.

These are all identified elements of effective development that are frequently sidelined, but which adaptation demands to be kept in front and centre.⁴⁷ Furthermore, while not all adaptation interventions are necessarily new, the decisions making process and how transformational development happens deserves special attention.⁴⁸ Oxfam therefore takes a robust decision-making approach for selected interventions:

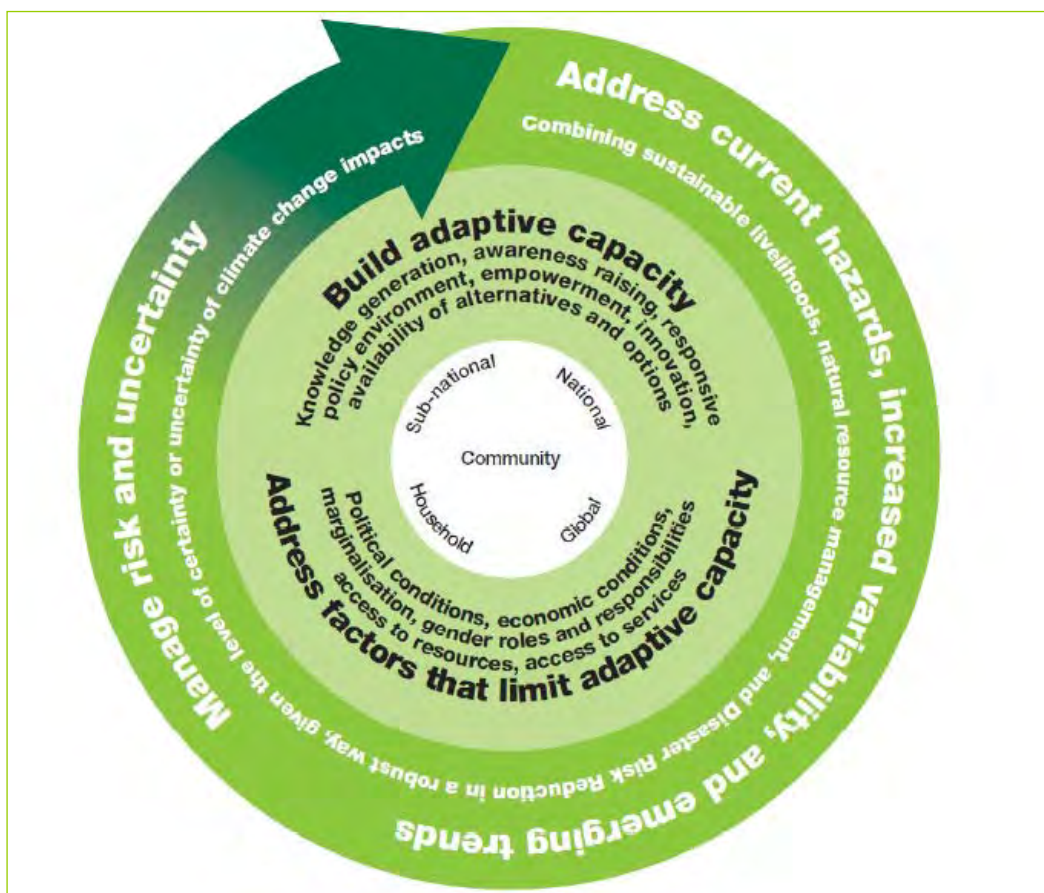
- Address current hazards, increased variability, and emerging trends;
- Manage risk and uncertainty;
- Build adaptive capacity.⁴⁹

Interventions should aim to span the range of what is known and unknown about climate change in a specific location. This range starts with addressing the current hazards, increased variability, and emerging trends. It extends through to managing risk and uncertainty of impacts where the direction and scale are uncertain. Building adaptive capacity and addressing those factors that limit this across all levels must also be combined, starting at the community level. However, enabling communities to adapt requires engagement across multiple levels beginning with the household going all the way up to the global level.

Adaptation is not a choice between reducing general vulnerability and preparing for specific hazards; rather it is a process of assessing and reassessing conditions and information related to climate change impacts and to the factors that leave people unable to adapt.⁵⁰ Achieving transformational changes in the lives of people living in poverty in a changing climate demands enormous political will and investment. It demands flexibility and learning through every institution, from household to government.⁵¹ It requires an approach that combines bottom-up with top-down processes; local knowledge and scientific knowledge; reducing vulnerability and addressing impacts; specific responses and managing uncertainty; sustainable livelihoods, NRM and DRR approaches; and change and learning how to change.⁵²

This approach is summarised in figure 1.

Figure 1 Oxfam's approach to CCA



Source: C. Pettengell (2010) *Climate Change Adaptation: Enabling People Living in Poverty to Adapt*, Oxfam Research Report, Oxford: Oxfam GB.

Of course, Oxfam's approach to adaptation represents only one of many that are being developed by humanitarian, aid, and development organisations around the world, which are also rising to the challenges of climate change. However, the proliferation of approaches, accompanying methodologies, and tools has resulted in continuous discussion about which approach is the best or most comprehensive, and has led to confusion about how best to characterise CCA. While this discussion is a necessary component of developing approaches to tackle climate change, and is part of how organisations learn from one another, it is important to realise that no one model or method has all the answers, and what works in one context might be inappropriate for another. A framework therefore is useful only insofar as it helps to understand what is happening and provides an assessment system for what has been undertaken, is under way, or is being planned.

Box 2: Climate change, food security, and agriculture

Oxfam Novib's entry point for adaptation in the region is to assess people's vulnerabilities by focusing particularly on how climate change manifests as a driver of food insecurity. It is through that lens that it aims to address the impacts of climate change on food and agriculture, livelihood systems of smallholders, and landless households who live in poverty-stricken and disaster-prone areas of South Asia. The following are five inter-related components needed to achieve that goal:

1. *Agricultural adaptation*: Using vulnerability assessments to identify specific climate risks facing different livelihood groups in target areas, this component works with smallholders and tries out traditional and innovative strategies that are climate-resilient;
2. *Livelihood diversification*: This component focuses on the identification of niche products and services, and employment opportunities, as well as the modelling of best practices in promoting economic leadership;
3. *Strengthening community resilience to climate shocks*: This component focuses on improving community-level mechanisms in disaster risk reduction, preparedness and management, as well as micro-insurance schemes;
4. *Increasing the responsiveness of national governments to climate change*: This component looks to co-ordinate the lobbyists and a range of advocacy groups more effectively, facilitating and following up on liaison with the government, conducting media campaign highlighting human impacts of climate change and the required actions, and mass mobilisation activities;
5. *Regional advocacy, linking, and learning*: This component supports stakeholders to advocate policy changes regionally, primarily through the South Asian Association for Regional Cooperation (SAARC), the main regional body, as well as linking knowledge gained through advocacy across Oxfam and other organisations.

Source: Oxfam Novib (2010) South Asia Food Security and Climate Change: Afghanistan, Bangladesh and Pakistan 2010-2015.

3 Approaches, methodologies, and tools

Many of the approaches, methodologies, and tools used in South Asia are based on those that already exist from traditional development, particularly sustainable livelihood and DRR. This is a function of the close relationship between climate change, sustainable livelihoods, and DRR; it makes sense to base CCA approaches on what has already emerged out of decades of development work.

The majority of approaches are designed to help practitioners undertake climate change analysis when designing new programmes or screening existing ones. This is because greater understanding is needed in terms of tracking how climate change affects and may affect communities in a certain location or context.

Described below are approaches considered to have been most enriching for Oxfam and others in South Asia (see Appendix 3 for a full list of the approaches, methodologies, and tools reviewed).

3.1 Vulnerability to Resilience⁵³

Vulnerability to Resilience (V2R), developed and is used by Practical Action across a range of its work, is a framework for analysis and action aimed at reducing vulnerability and strengthening the resilience of individuals, households, and communities. As a framework, it sets out the key factors that contribute to peoples' vulnerability, such as exposure to hazard and stress, fragile livelihood, uncertain future, and limited governance. This framework provides detailed explanation of the linkage between those factors, as well as ideas for action to strengthen resilience. The V2R framework was developed to address the need to work in a more integrated manner, in order to tackle the causes and consequences of vulnerability. It fully integrates climate analysis and action within an existing holistic approach, which can be applied in multiple situations, rather than merely being an 'add-on' analysis. In this way, it aims to avoid distinguishing between livelihoods, DRR, and climate change activities, and instead sees them as different elements of vulnerability. Its objectives are as follows:

- To address the multidimensional nature of poverty through an integrated approach that considers all of the underlying core factors of poverty;
- To reduce vulnerability and strengthen the resilience of individuals, households, and communities.

There are five steps in the analysis component of the framework:

1. *Analysis of vulnerability outcomes:* This aims to build a picture of the key aspects of vulnerability experienced in the community in order to identify which aspects are most relevant, how prevalent they are, and which groups are most at risk;
2. *Analysis of hazards and stresses:* This aims to gather as much information as possible about the different types of hazard and stress that impact different groups within the community, as well as the community as a whole; the extent of their exposure; and any measure already being taken to reduce exposure;
3. *Analysis of livelihoods:* This explores in detail the characteristics of the groups that are least able to cope and recover from hazards and stresses. The aim is to identify the most vulnerable whose livelihoods are most at risk;
4. *Analysis of future uncertainty:* This aims to uncover some of the significant changes that over time can contribute to vulnerability. Some of these issues may have already been mentioned in earlier steps and can be explored further in detail;

5. *Analysis of governance*: This provides guidance on how to understand the roles played by different organisations within and outside the community. This aims to identify some of the underlying factors of livelihood and hazard analyses.

For the action component of the framework, information gathered from the analysis is drawn together to identify priorities and turn them into local action plans. While the framework does not go into detail about how this is done, it does suggest an approach called 'community-based planning', which Practical Action has developed over a number of years. Community-based planning proposes tools for consolidating information obtained from community analysis, for verification of information, and for prioritisation of issues. The top priorities are then transformed into a community 'vision' – that is, a statement of what they wish to achieve over a certain period (e.g. 10 years) – and a set of objectives. Finally, small projects or activities are developed to achieve each of these objectives, identifying what can be done by the community, and where external support or financing will be needed. These plans can then be shared with institutional stakeholders (local government, NGOs, and the private sector) who may be able to support implementation.

3.2 Climate Vulnerability and Capacity Analysis⁵⁴

The Climate Vulnerability and Capacity Analysis (CVCA) framework, developed and used by CARE across a range of climate change-related work, integrates CCA into a holistic response aimed at building the resilience of communities to withstand the range of shocks and stresses they are exposed to. The process involves four interrelated strategies:

- Promotion of climate-resilient livelihoods strategies, in combination with income diversification and capacity-building for planning and improved risk management;
- DRR strategies to reduce the impact of hazards, particularly on households and individuals;
- Capacity development for local civil society and government institutions so that they can provide better support to communities;
- Advocacy and social mobilisation to address the underlying causes of vulnerability.

These strategies sit within an enabling environment that includes influencing policies at regional, national, and international levels.

Building on the framework, the CVCA process uses a series of guiding questions to analyse information at national, local, government/community, and household/individual levels. With the information gathered, users should be able to draw conclusions about adaptive capacity in the target communities and to design appropriate interventions. A selection of guiding questions and other tools for gathering and analysing data are used.

The analytical tools used to help understand the bigger picture and the context include secondary research, institutional mapping, policy analysis, and key informant interviews. These can be followed up with more participatory tools at the community level, such as focus groups, seasonal calendars, historical timelines, hazard mapping, etc.

Once the relevant data has been gathered and validated, it needs to be documented and disseminated to ensure that the basis for decisions is clear. CARE suggests including the following information in the report: information on the process itself; a description of the climate context; linkage between livelihoods and climate change; information on changing disaster risk; information on the institutional context relating to climate change; and the underlying causes of vulnerability.

The process of doing the CVCA provides insights into the following:

1. Policy and institutional issues that help or hinder communities to adapt to climate change;

2. Inequalities within communities and households that make certain groups more vulnerable;
3. The actual impacts of climate change 'first hand'.

This information can then be used to assist in decision-making around adaptation advocacy and/or the integration of adaptation into existing or new projects.

3.3 Community-Based Risk Screening Tool – Adaptation and Livelihoods⁵⁵

The Community-Based Risk Screening Tool – Adaptation and Livelihoods (CRiSTAL) is a popular framework and computer-based screening tool that was developed by the International Institute for Sustainable Development (IISD). It is aimed at helping project managers and planners to: systematically understand the links between local livelihoods and climate; assess a project's impact on livelihood resources that are vital to adaptation; and devise adjustments that improve a project's impact on livelihood resources. This represents one of the first tools developed specifically for climate change issues; its focus is on CCA and livelihoods, and it uses stakeholder consultation, participatory workshops, and secondary research as strategies for undertaking screening.

CRiSTAL is designed to fill a perceived gap within projects that have not been designed with an explicit consideration of climate risks in a particular community and how they can affect local livelihoods. It is also designed to help projects take into account the longer-term implications of climate change, including how project activities might be affected by the impacts, and how they may influence local adaptive capacity. This second point is the primary focus of CRiSTAL.

The approach of CRiSTAL can be summarised as follows:

1. It draws from the Environmental Impact Assessment (EIA) model, and uses the Sustainable Livelihoods Framework (SLF) to help users focus on elements of coping and adaptive capacity at the local level;
2. It helps strengthen resilience to current climate risks and stresses, as a basis for adaptation to longer-term climate change;
3. It promotes the use of stakeholder consultations using participatory methods to elicit information on local livelihood and climate contexts;
4. It presents CRiSTAL as a component of a larger compendium of tools and methodologies for CCA.

CRiSTAL is divided into two modules, each based on two framing questions (see Table 1).

Table 1: Community-Based Risk Screening Tool – Adaptation and Livelihoods (CRiSTAL)

Module 1: Synthesising information on climate and livelihoods	Module 2: Planning and managing projects for adaptation
<p>Q1: What is the climate context?</p> <ul style="list-style-type: none"> • What are the anticipated impacts of climate change on the project area? • What climate hazards are currently affecting the project area? • What are the impacts of these hazards? • What are the coping strategies used to deal with these impacts? <p>Q2: What is the livelihood context?</p> <ul style="list-style-type: none"> • What resources are important to local livelihoods in the project area? • How are these resources affected by current climate hazards? • How important are these resources to the coping strategies? 	<p>Q3: What are the impacts of project activities on livelihood resources that:</p> <ul style="list-style-type: none"> • Are vulnerable to current climate hazards? • Are important to local coping strategies? <p>Q4: How can project activities be adjusted to reduce vulnerability and enhance adaptive capacity?</p> <ul style="list-style-type: none"> • How feasible is it to implement these changes in terms of local priorities/project finances/ institutional capacity/a supportive policy framework/risks associated with future climate change?

Source: *Community-based Risk Screening – Adaptation and Livelihoods (CRiSTAL) (2007) A Decision Support Tool for Assessing and Enhancing Project Impacts on Local Adaptive Capacity to Climate Variability and Climate Change.*

The first module is designed to help users collect and organise information on the climate and livelihood context of the project area, preferably through stakeholder consultations and other participatory methods. The information gathered and organised in Module 1 provides a basis for the analysis undertaken in Module 2. The second module uses the information from Module 1 to help project planners and managers understand how project activities affect livelihood resources that are either vulnerable to climate risk or important for coping strategies. In doing so, users can try to (re)design project activities in a way that maximises opportunities for enhancing adaptive capacity.

In order to progress through both modules, the following four stages are used:

1. *Getting started:* This requires learning about how the CRiSTAL tool works and involves looking through each of the tabs in the tool to become familiar with their layout and what information is required, so that, when completing the stages, the relevant data can be entered. Users begin by filling out basic project information, such as name, location, implementing agency, and project description. Once this is completed, users can move on to the second stage;
2. *Setting the climate context:* This stage involves answering a set of questions through consultations with community groups and other key stakeholders, and background research. The questions could include: what are the potential climate change impacts in the project area; what are the current climate hazards; what are the impacts of these climate hazards; and what strategies do people use to cope with these impacts. Once the climate context has been defined the user can move onto the third stage;
3. *Setting and analysing the livelihood context:* This step is designed to assist in the collection and organisation of information on local livelihoods. Part of this analysis includes highlighting livelihood resources that have a strong relationship to the climate hazards and coping strategies. Key questions for this stage are as follows: what resources are important to peoples' livelihoods in the project area; to what extent are these resources negatively affected by current climate hazards identified in the previous step; and to

what extent do these resources influence current coping strategies, also identified in the previous step. Within the context of the previous step, information gathered should come from community consultations, key stakeholders, and background research. Once the first three stages are completed the user has completed the first module and can move on to Module 2, which represents the fourth (and final) stage of the process;

4. *Project activity screening and revision:* In this stage, livelihood resources, which were identified in the previous stage and that are strongly influenced by selected climate hazards, and/or important for coping strategies, serve as the basis for evaluating project impacts. This is an important stage, as it will help the user decide on what actions to take to reduce vulnerability and increase adaptive capacity. Adjustments to project activities should strengthen or expand livelihood resources and minimise overall impacts on livelihood resources. Once project activities have been adjusted they also need to be checked to see if they are sustainable with climate change, before identifying synergies and/or barriers to implementing revised project activities.

3.4 Climate Smart Disaster Risk Management⁵⁶

The Climate Smart Disaster Risk Management (CSDRM) approach was developed by Strengthening Climate Resilience, which is a consortium comprising Christian Aid, Plan International, and the Institute for Development Studies. CSDRM has been developed to gain a better collective understanding of how current efforts to manage disaster risk can be enhanced and scaled-up, in order to cope with the impacts of climate change through an integrated approach to disasters, development, and climate change. Currently being trialled by Christian Aid and Plan International in the South Asia region, it provides a guide to strategic planning, programme development, and policy making, and can be used to assess the efficacy of existing DRM policies, projects, and programmes in the context of climate change.

The CSDRM approach has three interconnected pillars of actions: 1) tackle changing disaster risks and uncertainties; 2) enhance adaptive capacity; and 3) address poverty, vulnerability, and their structural causes. These are based on existing and longstanding development concepts that mostly relate to the growth of vulnerability from root causes to unsafe conditions;⁵⁷ and to those concerned with resilience, adaptive capacity, and uncertainty.

Table 2: The CSDRM approach

1) Tackle changing disaster risks and uncertainties	2) Enhance adaptive capacity	3) Address poverty, vulnerability, and their structural causes
<p>1a) Strengthen collaboration and integration between diverse stakeholders working on disasters, climate, and development</p> <ul style="list-style-type: none"> • To what extent are CCA, DRM, and development integrated across sectors and scales? 	<p>2a) Strengthen the ability of people, organisations, and networks to experiment and innovate</p> <p>How are the institutions, organisations, and communities involved in tackling changing disaster risks and uncertainties creating and strengthening opportunities to innovate and experiment?</p>	<p>3a) Promote more socially just and equitable economic systems</p> <p>How are interventions challenging injustice and exclusion and providing equitable access to sustainable livelihood opportunities? Have climate change impacts been considered and integrated into these interventions?</p>

<ul style="list-style-type: none"> • How are organisations working on disasters, climate change, and development collaborating? 		
<p>1b) Periodically assess the effects of climate change on current and future disaster risks and uncertainties</p> <ul style="list-style-type: none"> • How is knowledge from meteorology, climatology, social science, and communities about hazards, vulnerabilities, and uncertainties being collected, integrated, and used at different scales? 	<p>2b) Promote regular learning and reflection to improve the implementation of policies and practices</p> <ul style="list-style-type: none"> • Have DRM policies and practices been changed as a result of reflection and learning-by-doing? • Is there a process in place for information and learning to flow from communities to organisations and vice versa? 	<p>3b) Forge partnerships to ensure the rights and entitlements of people to access basic services, productive assets and common property resources</p> <ul style="list-style-type: none"> • What networks and alliances are in place to advocate the rights and entitlements of people to access basic services, productive assets, and common property resources?
<p>1c) Integrate knowledge of changing risks and uncertainties into planning, policy, and programme design to reduce the vulnerability and exposure of people's lives and livelihoods</p> <ul style="list-style-type: none"> • How is knowledge about changing disaster risk being incorporated and acted upon within interventions? • How are measures to tackle uncertainty being considered in these processes? How are these processes strengthening partnerships between communities, governments, and other stakeholders? 	<p>2c) Ensure policies and practices to tackle changing disaster risk are flexible, integrated across sectors and scales, and have regular feedback loops</p> <ul style="list-style-type: none"> • What are the links between people and organisations working to reduce changing disaster risks and uncertainties at community, sub-national, national, and international levels? • How flexible, accountable, and transparent are these people and organisations? 	<p>3c) Empower communities and local authorities to influence the decisions of national governments, NGOs, and international and private sector organisations, and to promote accountability and transparency</p> <ul style="list-style-type: none"> • To what extent are decision-making structures de-centralised, participatory, and inclusive? • How do communities, including women, children and other marginalised groups, influence decisions? • How do they hold government and other organisations to account?
<p>1d) Increase access of all stakeholders to information and support services concerning changing disaster risks, uncertainties and broader climate impacts</p>	<p>2d) Use tools and methods to plan for uncertainty and unexpected events</p> <ul style="list-style-type: none"> • What processes are in place to support governments, communities, and other 	<p>3d) Promote environmentally sensitive and climate smart development</p> <ul style="list-style-type: none"> • How are environmental impact assessments including climate change?

<ul style="list-style-type: none"> • How are varied educational approaches, early warning systems, and media- and community-led public awareness programmes supporting increased access to information and related support services? 	<p>stakeholders to effectively manage the uncertainties related to climate change? How are findings from scenario planning exercises and climate-sensitive vulnerability assessments being integrated into existing strategies?</p>	<ul style="list-style-type: none"> • How are development interventions, including ecosystem-based approaches, protecting and restoring the environment and addressing poverty and vulnerability? To what extent are the mitigation of greenhouse gases and low emissions strategies being integrated within development plans?
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Sources: Mitchell, T. and M. Ibrahim (2010) *Climate Smart Disaster Risk Management*, Brighton, UK: *Strengthening Climate Resilience, Institute of Development Studies*; and Mitchell, T. et al. (2010) *Climate Smart Disaster Risk Management, Strengthening Climate Resilience*, Brighton, U.K: *Institute for Development Studies*.

In terms of approach, it builds on DRM, CCA, and development concepts and approaches, and aims to accelerate progress on the ‘disaster-resilient communities’ within the context of the Hyogo Framework for Action.⁵⁸ However, it also places added emphasis on managing uncertainty, particularly through enhancing adaptive capacity, and the critical importance of holistically addressing poverty and vulnerability.

In order to use the CSDRM approach, the twelve actions across the three pillars should be treated as a menu, and any interventions or policy should aim to integrate actions across all pillars rather than focusing on one. Guiding questions are also provided for each of the three pillars.⁵⁹ While these are not exhaustive and do require tailoring to specific contexts and situations, they provide guidance on how to begin the process.

3.5 Shared Learning Dialogues⁶⁰

The Shared Learning Dialogues (SLD) process was developed by the Institute for Social and Environmental Transition and has been used in a number of projects and programmes in Bangladesh and Nepal. It aims to support stakeholder-based shared learning processes and assist in bringing together available knowledge on climate change from a multitude of stakeholders from various levels, including local knowledge and perceptions. The SLD process is designed to ensure that vulnerable populations have the opportunity to participate in CCA processes and to build their own adaptive capacity.

The process begins with a joint meeting of stakeholders (making sure that there is wide range of views represented), where a brief summary of the issue (in this case climate change) is presented by organisers. Other participants are then invited to provide critical comments, insights, additional information, data, and suggestions drawn from their own experiences. Particular attention is paid to identifying points of entry where all participants agree on key issues and knowledge gaps. Subsequently, regular meetings take place throughout the duration of a project or programme to provide a systematic feedback mechanism.

The core goal underlying the SLD process is the growth of common understanding regarding the issues being discussed and the agreement of actions to address them. While this takes time, evidence in programming also backs the need for this goal to be central to work involving a wide range of stakeholders dealing with the complex issues surrounding climate change.

The practical outcomes of an SLD process that identifies avenues for responding to the specific risks recognized by different communities should aim to be: broadly owned by those set to implement them; sustainable over time; technically effective; and economically and financially cost effective.

3.6 Ecosystem-based Adaptation⁶¹

Ecosystem-based Adaptation (EbA) is an approach to climate change that integrates biodiversity and ecosystem services into an overall strategy. Supported by the World Wildlife Fund for Nature (WWF) and other organisations in the region, it is a holistic approach that includes sustainable management and the conservation and restoration of ecosystems, in order to provide services that help people to adapt. As an approach, it does not focus solely on technological solutions; rather, it uses healthy ecosystems to assist people to become more resilient and to adapt to climate change. Healthy ecosystems can provide drinking water, habitat, shelter, food, raw materials, a barrier against disasters, a source of natural resources, and many other ecosystem services on which people depend for their livelihoods. As natural buffers, ecosystems are also often cheaper to maintain and often more effective than physical engineering structures, such as dykes or concrete walls.

EbA involves a wide range of ecosystem management activities, including:

- Sustainable water management, where river basins, aquifers, flood plains, and their associated vegetation are managed in a way that provides water storage and flood regulation;
- DRR, where the restoration of coastal habitats, such as mangroves, can be a particularly effective measure against storm surges, saline intrusion, and coastal erosion;
- Sustainable management of grasslands and rangelands to enhance pastoral livelihoods and increase resilience to drought and flooding;
- Establishment of diverse agricultural systems, where using indigenous knowledge of specific crop and livestock varieties, maintaining crop and livestock diversity, and conserving diverse agricultural landscapes can help to secure food provision in changing local climatic conditions;
- Strategic management of shrub lands and forests to limit the frequency and size of uncontrolled forest fires;
- Establishment and effective management of protected area systems to ensure the continued delivery of ecosystem services that increase resilience to climate change.

Early lessons from this approach suggest there are some fundamental guiding principles for developing effective EbA strategies. These include:

- *Involving local communities:* Community participation is an important element and EbA measures are more successful when the local population participates in both planning and implementation;
- *Multi-partner strategy development:* EbA presents a tangible opportunity to solve climate change problems by aligning conservation, development, and poverty alleviation interests;
- *Building upon existing good practices in NRM:* The most effective EbA strategies apply established best practices in land, water, and natural resource management to confront some of the new challenges posed by climate change;
- *Adopting adaptive management approaches:* EbA strategies should support adaptive management options that facilitate and accelerate learning about appropriate adaptation options for the future. Climate impacts and EbA measures should be monitored carefully so that management actions can be appropriately adjusted in response to changing conditions;
- *Integrating EbA with wider adaptation strategies:* Successful adaptation depends upon integrating EbA initiatives with other risk management components, such as early warning systems, awareness-raising, and, in some cases, with physical infrastructural interventions;

- *Communicating and educating*: Successful EbA initiatives depend on knowledge transfer, capacity-building, integrating science and local knowledge, and raising awareness about climate change impacts and the benefits and potential of sound ecosystem management.

As with all adaptation interventions, EbA has its limitations. Even healthy, resilient ecosystems are unable to protect communities from all climate or extreme weather-related impacts; in some cases, this results in the implementation of engineering solutions rather than, or alongside, EbA measures. Moreover, there are ecological limits to EbA, especially if temperatures increase by more than two degrees Celsius.

3.7 Local Adaptive Capacity Framework⁶²

In addition to the approaches and tools described above, it is worth mentioning one that is being developed and trialled outside of the region – in Africa – as it is an innovative framework for analysing adaptive capacity at the local level and could be applied in the South Asia context. The Local Adaptive Capacity (LAC) Framework is currently under development as part of ACCRA, a consortium comprising CARE, Save the Children, Oxfam, World Vision, and the Overseas Development Institute.

The LAC Framework has been designed to help practitioners understand and assess adaptive capacity at the local level. Developed as a framework to carry out research on social protection, DRR, and livelihoods programming, it goes beyond asset-based approaches to adaptive capacity, which focused on assets and capital as indicators and that were found to mask the role of processes and functions in supporting adaptive capacity. The LAC Framework therefore tries to understand adaptive capacity by recognising various intangible processes, such as: decision-making and governance; the fostering of innovations, experimentation, and opportunity exploitations; and the structure of institutions and entitlements. This moves it away from a framework that simply looks at what a system *has* that enables it to adapt, to one that recognises what a system *does* to enable it to adapt.⁶³

The focus of the LAC Framework is currently on systems at local levels in recognition that little research and analysis has been done on adaptive capacity at community or household levels. The Framework lays out five distinct, albeit interrelated, characteristics of adaptive capacity, with the underlying assumption that positive impacts on these characteristics should enhance the system's capacity to adapt. It is based on interventions that can be considered 'good development'; those that address the underlying causes of vulnerability to climate change and, as such, can be considered to provide a useful approach across a range of settings, as opposed to one that only deals with certain climate impacts.

The five characteristics of the LAC Framework are as follows:

1. *Asset base*: The availability of key assets that allow the system to respond to evolving circumstances;
2. *Institutions and entitlements*: The existence of an appropriate and evolving institutional environment that allows fair access and entitlement to key assets and capitals;
3. *Knowledge and information*: The ability of a system to collect, analyse, and disseminate knowledge and information in support of adaptation activities;
4. *Innovation*: The creation of an enabling environment that fosters innovations, experimentation, and the ability to explore niche solutions in order to take advantage of new opportunities;
5. *Flexible, forward-looking decision-making and governance*: The anticipation of, incorporation, and response to changes with regards to governance structures and future planning.

These characteristics influence and determine the degree to which a community is resilient and responsive to changes in the external environment. As characteristics they are interdependent.

Table 3: LAC Framework

Characteristic of adaptive capacity	Illustrative elements
Asset base	<ul style="list-style-type: none"> • The combination of appropriate human, social, financial, physical, and natural capital to best prepare the system to respond to a changing climate; • The interplay of appropriate assets in light of a changing climate.
Institutions and entitlements	<ul style="list-style-type: none"> • Local institutions and informal organisations that ensure equitable access and entitlement to key resources by all groups, including those that are marginalised; • Active participation by all groups in the planning and decision-making process; • Empowerment and voice to generate opportunities as a basis for adaptation.
Knowledge and information	<ul style="list-style-type: none"> • Appropriate systems for data gathering, informational analysis, and dissemination; • Climate-related information for key stakeholders; • General awareness-raising; • Key stakeholders are using knowledge and information to adapt.
Innovation	<ul style="list-style-type: none"> • A willingness to adapt, learn, and fail; • The ability to create new ideas, skills, and technology; • The ability to take advantage of new opportunities; • The availability of assets and institutions to help foster innovation.
Flexible forward-looking decision making and governance	<ul style="list-style-type: none"> • Ability of formal organisations to be responsive in light of changing circumstances; • Actions and co-ordination by stakeholders at multiple levels (horizontal, vertical, and intersectoral); • A transparent and accountable planning and decision-making process.

Source: ACCRA (n.d.) 'Consultation Document: the ACCRA Local Adaptive Capacity Framework (LAC)'.

There are a number of scenarios in which the LAC Framework could be applied. Programmatically, it could be used to develop indicators to inform monitoring and evaluation, to guide the design of projects, and to mainstream CCA considerations into existing programmes. It could also be used to inform or assess local or national level government and NGO policies and strategies.

4 Adaptation in South Asia: taking stock

This review chose 64 projects and programmes from five countries in South Asia. The selection looked to capture the diversity of efforts in the region, including location, scale, sectorial focus, strategic emphasis, and climate impacts being addressed. Initiatives chosen were practice-based (not policy-focused) and ranged from community-based efforts to national-level programmes. For each example selected, there had to be evidence of practical, on-the-ground activity, rather than merely research.

Characterising the examples was very challenging, as project and programme descriptions used different terminologies to describe adaptation. Moreover, many of the projects and programmes were complex, with multiple sources of funding and implementers, strategies, locations, impacts, and vulnerability drivers. This made comparisons between examples difficult, especially when the information provided in some cases was scant compared to others. This was further compounded by the limited amount of time dedicated to the review. A more detailed analysis is certainly needed, along with better documentation of adaptation work being undertaken.

While the majority of examples are not yet mature enough to assess in terms of impact, they are the most promising of those reviewed, and are representative of the different types of interventions taking place, in terms of scale, sectorial focus, strategic emphasis, and the climate impacts being addressed.

Table 4: Case examples by country

Country	Case examples included in overall review	Case examples reviewed in detail
Bangladesh	25	4
India	16	2
Nepal	9	3
Pakistan	5	3
Sri Lanka	9	2
Total	64	14

Of the examples reviewed, the largest number were found in Bangladesh, which appears to be a reflection of the amount of work being undertaken in that country; while Pakistan had the least number of cases, which could be a reflection that work on CCA is still relatively limited here. The floods in 2010 would certainly be a strong incentive to develop further adaptation programming.

A significant number of the examples had a rural focus, with adaptation efforts in urban settings seemingly limited. In terms of location, the largest number of examples was found at the community level, reflecting in part the focus of the review, but also that efforts to date have predominantly taken place at this level. In terms of sectors, a large majority of examples reflected an agricultural focus, with water, sustainable livelihood, and DRM also featuring heavily.

Taking together all the cases reviewed, it is possible to develop an understanding of the varying nature of climate change, sectors being affected, and the impacts and interventions currently being practised. These are summarised in Table 5.

Table 5: Climate change impacts and examples of interventions in South Asia

Change	Sector	Impact	Intervention example
Increase in temperature	Agriculture	<ul style="list-style-type: none"> Altered cropping seasons; Increase in evapo-transpiration; Increase in irrigation water requirements; Heat stress on crops and livestock. 	<ul style="list-style-type: none"> Introduction of short cropping varieties; Diversification of crops; Introduction of heat/moisture tolerant seed varieties; Increase soil organic content/ low tillage agriculture; Water conservation crop management practices; Tree planting to provide shade and fodder for livestock.
	Water resources	<ul style="list-style-type: none"> Increase in glacial melt, snow melt impacting river flows; Increase in water requirements and/or reduced water availability; Formation of glacial lakes leading to outbursts in longer term; Worsening availability of fish stocks. 	<ul style="list-style-type: none"> Introduction of water storage methods; Water conservation; Monitoring and early warning systems for glacial lake outburst floods (GLOFs); Conservations of coastal mangroves and other vegetation.
	Human health	<ul style="list-style-type: none"> Increase in heat stroke; Increase in malaria, dysentery, and other diseases; Decline in productivity. 	<ul style="list-style-type: none"> Introduction of mosquito nets in new areas; Education and awareness about heat-related illnesses.
Changes in rainfall patterns and/or seasonality	Agriculture	<ul style="list-style-type: none"> Increased run off/soil erosion; Farmers uncertain when to cultivate, sow, and harvest; Crops damaged by unseasonable heavy downpours; Reduction in agricultural seasons. 	<ul style="list-style-type: none"> Appropriate, accessible, and reliable seasonal and weather forecasts; Crop diversifications and crop mixing; Livelihood diversification; Crop insurance; Floating gardens during times of inundation.
	Water	<ul style="list-style-type: none"> Shift in monsoon season; Erratic/intensive rains; Reduced water recharge; Increased frequency/severity of floods; Increased frequency/severity of droughts. 	<ul style="list-style-type: none"> Rainwater harvesting at household level; Checks on dams, plantations; Improved drainage; Protected/raised food, water, and sanitation; Community water management committees.
Sea level rise	Coastal livelihoods / resources	<ul style="list-style-type: none"> Increase in salt water intrusion; Increase in cyclones/flooding; Loss of land to sea/ erosion; Increased frequency/severity of storm surges. 	<ul style="list-style-type: none"> Introduction of salt tolerant crops/species; Livelihood diversification; Monitoring and early warning systems for cyclones and storm surges; Sea defences; Protected/raised food, water, and sanitation; Mangrove rehabilitation.

4.1 Adaptation in Bangladesh

With the exception of the hill regions in the northeast and southeast, and terrace land in the northwest and central zones, Bangladesh is one of the largest deltas in the world. It is formed out of a dense network of more than 230 rivers, including the Ganges, the Brahmaputra, and the Meghna.⁶⁴ Surrounded by India to the west, north and east, by Myanmar to the southeast, and with a coast along the south, Bangladesh has a total land area of 147,570 square kilometres.⁶⁵

Bangladesh is viewed as one of the world's most vulnerable countries to climate change owing to its geographical location, poor socio-economic development, a reliance on rapidly degrading and depleting natural resources, and regularly occurring natural disasters.⁶⁶ Every year, one or more disasters affect people's lives in some part of the country. These include: floods, cyclones and storm surges, flash floods, droughts, earthquakes, riverbank erosion and landslides.⁶⁷ Flooding, in particular, has been a recurring phenomenon in the country, with 20-25 per cent of the land being affected each year, and this is set to increase in frequency and severity as a result of climate change, along with cyclones, tidal surges, sea level rise, erratic rainfall, and changes in the monsoon.⁶⁸ As a result, Bangladesh's poor and marginalised people are at risk of falling deeper into poverty and, in some cases, destitution. The threats are particularly acute for those living in low-lying deltaic areas, where a sea level rise of 45cm would directly affect 35 million people.⁶⁹

At a national level, Bangladesh is considered to be one of the most active countries in terms of planning and action on climate change. It completed its Initial National Communication on Climate Change in 2002 and since then has developed a NAPA (in 2005), and has most recently developed a National Climate Change Strategy and Action Plan (2008), which outlines a comprehensive strategy and plan of action for tackling climate change. This is built on six pillars, which are aimed at being an integral part of national development policies, plans, and programmes:

1. *Food security, social protection, and health* to ensure that the poorest and most vulnerable in society, including women and children, are protected from climate change and that all programmes focus on the needs of this group for food security, safe housing, employment, and access to basic services, including health;
2. *Infrastructure* to ensure that existing assets are well maintained and fit for purpose, and that urgently needed infrastructure is put in place to deal with the likely impacts of climate change;
3. *Comprehensive disaster management* to strengthen further the country's disaster management systems in order to deal with increasingly frequent and severe calamities;
4. *Research and knowledge management* to predict the likely scale and timing of climate change impacts on different sectors of the economy and socio-economic groups; to underpin future investment strategies; and to ensure that Bangladesh is networked into the latest global thinking on climate change;
5. *Mitigation and low carbon development* to evolve low carbon development options and implement these as the country's economy grows over the coming decades;
6. *Capacity-building and institutional strengthening* to enhance the capacity of government ministries and agencies, civil society, and the private sector, in order to meet the challenge of climate change.⁷⁰

Recently, a long-term programme of action research, focusing on community-based adaptation (CBA) across five major livelihood zones, was set up by a consortium of international NGOs and several international and national research institutions. The goals of the Action Research for Community Adaptation in Bangladesh (ARCAB) programme are: to carry out action research into knowledge and actions for adaptation at the community level

aimed at supporting the development of climate-resilient communities and at understanding the links between rural and urban places; and to develop knowledge on how to spread information about adaptation to other communities with similar livelihoods within the zones, thereby scaling up the adaptation process rapidly.⁷¹ Although it is located in a single country, ARCAB is designed to work at an international level with a number of international action and research partners, with lessons to be shared with other developing, as well as developed, countries, particularly other deltas and similar ecosystems.⁷²

In terms of projects and programmes already being implemented on the ground, Bangladesh provided the largest number of projects and programmes from the five countries reviewed. As a result, 25 projects were reviewed and four were selected to show a range of adaptation approaches across Bangladesh.

4.1.1 Tidal River Management⁷³

Organisation:	Uttaran
Location:	Hari River Basin, southwest Bangladesh
Sector(s):	Agriculture, water, livelihoods
Climate impacts:	Floods, water logging, sea level rise
Strategies:	Community participation, indigenous knowledge, traditional water management practices, multi-stakeholder engagement

Tidal River Management (TRM) has been taking place in the waterlogged, deltaic, and low-lying areas of southwest Bangladesh for generations, and, while it was not originally conceived as a way to adapt to climate change, the technique employed may offer hope for communities as risk of sea level rise in similar areas. TRM is the name given by water experts to a technique practised by local people. First noticed in the 1930s, it is a community practice of 'overflow' irrigation which uses sedimentation to raise land out of the water. The technique harnesses the tides themselves to carry out sediment deposits and silt, thereby raising the level of low-lying lands and reclaiming them for agricultural use. In order for this to happen, the target area (ideally between 500 and 600 hectares) must be enclosed by embankments. The tide is then allowed to enter through one main opening. Within the enclosed area, the incoming tide must be able to reach as far as possible and then return to sea freely on the outgoing tide. This ensures that the incoming tide brings with it as much sediment as possible before depositing it and returning back to sea. Once a certain portion has risen to an ideal level, the embankment is closed and another area opened for the process to be repeated.

As this is a community-driven process, those involved must work together and agree to set aside each area of land for the TRM process to take place and for it not to be used for any other purpose. During this time the landowners will not be able to use this area and may have to be compensated. Consultations within communities and landowners allow for this to happen.

As a result of Uttaran's work with communities, around 650 hectares of land on the Hari River Basin has been raised by 1.5m over a one-year period. However, the practice is still to be universally recognised and much advocacy work needs to be done before it can be tried out elsewhere.

More recently, Uttaran and communities involved in the project worked with the Institute of Water Modelling to conduct a detailed technical study and monitoring survey on one of the TRM sites, Bhayna Beel, and found that TRM had helped increase river flow and depth and had reduced the incidence of water logging.

To date, other benefits of the project include:

- Formation of new alluvial land in tidal wetlands as a result of sediment deposits;
- Greater conservation of bio-diversity and a return to more ecological balance;
- Enhanced livelihoods through agriculture and fisheries;
- Mitigation of flood hazards;
- Possible mitigation of climate change induced by sea level rise.

It is interesting to note the last point offers a possible option for reducing the impact of sea level rise in low-lying areas. In raising the height of land through the TRM, communities may be able to keep some of their land from being submerged by sea level rise. Of course, this will only be possible if sea level rise is kept under 1m or so.

Community involvement has been central to this process and, most recently, a detailed planning document, entitled 'People's Plan', was drafted to bring together a wide variety of stakeholder views into a single document that represents the communities' needs to restore the river and water bodies of the areas using TRM. These include: a strategic plan for TRM in the region, an inter-river linking network, revival of so-called 'dead' rivers, and management of canals and waterlogged areas inside permanent embankments.

4.1.2 Reducing Vulnerability to Climate Change⁷⁴

Organisation:	CARE
Location:	Jessore, Narail, Gopalganj, Satkhira, Khulna and Bagerhat Districts, southwest Bangladesh
Sector(s):	Agriculture, livelihoods, coastal resources, water
Climate impacts:	Floods, sea level rise, cyclones, extreme weather events, changes in the monsoon season
Strategies:	Capacity-building, participatory research, creation of alternative incomes sources, adapting traditional practices, awareness-raising, gender-specific interventions, institutional development

The Reducing Vulnerability to Climate Change (RVCC) project took place between 2002 and 2005 in six districts in southwest Bangladesh, an area that is already affected by climate change. The project was designed to reduce community vulnerability to climate change by promoting sustainable development and building local-level capacity. A total of 16 partner NGOs were involved in the project, as well as a variety of local professional, educational, and social organisations, and local government. The project had four outcomes and a number of strategies and indicators to measure performance:

1. Vulnerable households needed to demonstrate improved capacity to innovate their livelihood strategies, thereby reducing vulnerability to climate change. This would be achieved through increases in agricultural food production, alternative livelihoods, availability of food, access to safe water, safe housing, and improved health conditions and personal safety.
2. Communities needed to demonstrate increased capacity to develop and implement community-level adaptation strategies. This would be achieved by increasing access to common property resources, and by reducing threats through community-based initiatives.
3. Local partners needed to demonstrate increased capacity to collect and disseminate information related to climate change, and to advocate government action. This would be achieved through awareness-raising activities and public campaigning.

4. Project partners needed to interact regularly with national-level climate change stakeholders on policy and advocacy issues. This would be achieved by contributing to the national NAPA process, and by encouraging national stakeholders to provide feedback on the various activities under the first three outcomes.

The ways in which the project was designed and implemented demonstrated a community-based approach. This began by examining the various vulnerabilities of each region using secondary data, which was then used within communities to improve understanding of the differing vulnerability contexts. Since there was no model for such work, the project used the Sustainable Livelihoods Framework (SLF), which was developed by the UK Government Department for International Development (DfID), along with the Participatory Capacity and Vulnerability Analysis (PCVA), to identify and prioritise different vulnerabilities perceived by the community. These were then used as a basis to identify context-specific adaptation measures.

During the project a number of strategies and measures were implemented to achieve the overall goals:

- *Creating alternative income opportunities:* A number of traditional and new practices were employed to diversify income sources, including, among others, mangrove nurseries, grass cultivation on the banks of rivers, creeks and ponds, and cage aquaculture and apiculture;
- *Safeguarding crop agriculture by changing traditional practices:* Modifying traditional practices in order to safeguard agriculture represented one of the most popular adopted options implemented in the project. These included changing crop varieties to enhance resilience, adjusting irrigation practices as a result of drought or flood, training in crop rotation techniques, promoting a more integrated approach in fertiliser application, and adopting innovation in practice (for example hanging vegetables and floating gardens in flooded areas);
- *Educating future generation on climate change:* When the project was being designed there was no curriculum for any level of students to understand climate change. As a result, it was decided to develop materials for secondary students. Some of the materials developed included teaching aids in Bengali using as many visual aids as possible, and a training manual for teachers. This was supported by capacity-building of teachers linking educational institutions and local governments in the region where the teaching aids were rolled out;
- *Raising awareness and empowering local communities:* The project increased the awareness of communities in all aspects of climate change through media campaigns using radio, television and print media; establishment of eco-clubs; establishment a school programmes to develop climate change curriculum; local theatre and drama; and through grassroots mobilisation and advocacy;
- *Addressing gender issues:* There was an understanding at the start of the project that women represented some of the poorest members of the community and were therefore more likely to be affected by climate change. This resulted in the inclusion of gender issues. While not all forms of gender-specific vulnerabilities were addressed with equal rigour, the design of responses aimed to address the top priorities of women, and increasing household income was one of the priorities;
- *Preparing grassroots institutions for adaptation:* Capacity-building of local institutions is critical for the long-term sustainability of the work undertaken by CARE and partners. As a result, training and workshops on climate change were conducted throughout the project.

This project was the first of its kind, and is credited with coining the term 'community-based adaptation'. It was also the forerunner to participatory vulnerability approaches to climate

change. Moreover, it constitutes one of the first well-documented projects in South Asia and provides a good practice example of ideal documentation.

4.1.3 Assistance to Local Communities on CCA and Disaster Risk⁷⁵

Organisation:	ActionAid
Location:	Sirajgani on the Jamuna River, Naogaon in the northwest, Patuakhali on the coast
Sector(s):	Agriculture, water, DRM, livelihoods
Climate impacts:	Droughts, floods, cyclones, sea level rise, saline intrusion
Strategies:	Action research, participatory methodologies, adaptive technologies, advocacy, training, livelihood support

This project took place during 2008–2010 in 12 villages that were experiencing a range of problems, including droughts, floods, cyclones, sea level rise, and saline intrusion. It looked at a range of issues, such as the importance of local knowledge, access to and control over resources, and the role of local institutions. The key goal of the project was to generate critical knowledge on the effectiveness of structural and non-structural community-based intervention, and the feasibility of expanding these to a national level.

Designed as an action research project, the major approach taken was to encourage participation. This was done by forming a ‘people’s research team’ in each village, that included women and those from the most vulnerable households. The main aim was to engage people in analysing their own problems and vulnerabilities to climate change, and to engage them in preparing community action plans (CAPs). These teams also engaged in advocacy work, targeting local government to incorporate options from the CAPs into local government annual development planning.

Through the project a wide variety of adaptation options were put on test including:

- Water and sanitation, using tube wells, ring wells, pond excavation, and climate-friendly latrines;
- DRR, involving plinth-raising of homesteads and early warning systems;
- Livelihood support: distribution of livestock, such as sheep, goats and ducks, vegetable seeds and fruit tree seedlings, and handloom mills;
- Training of para-vets on vegetable growing and climate change for local politicians, government officials, and journalists;
- Climate-resilient cluster villages and handloom factory

While there is not enough space in this report to look at this project in detail, it is possible to make a number of key points about the learning that took place throughout the action research process.⁷⁶ These are as follows:

1. The project demonstrated that community members themselves are very knowledgeable about their own local conditions and the changes they observe in weather. Consequently, while climate change might be a new term, and they might not know about the global causes of this phenomenon, they are quite adept at applying such knowledge to understand their own context once they do understand the phenomenon;
2. Climate change cannot be dealt with in isolation. Communities live in a world shaped by cultural, social, environmental, and economic factors, and climate change needs to be couched in these terms. Climate change is usually not the only explanation of local problems; environmental degradation, overpopulation, and poor governance are usually also present, and responses should be cognisant of this;

3. Adaptation to climate change is therefore a process that does not need an entirely new approach. Existing models of development that incorporate climate change hazards and risk and look to the future at longer-term trends can help communities reduce their overall vulnerability, as well as address specific climate change issues. Adaptation can only happen if it actually addresses the development gap;
4. The availability, control, and access to resources matters because of its influence on the different types of adaptation options available to people living in poverty, especially when they depend significantly on natural resources for their survival. Helping poor people to gain better access to the resources they need greatly increases their ability to adapt, and to choose from a wider range of adaptation options;
5. Local government has the responsibility to facilitate local adaptation. The project laid much emphasis on working with government and advocating better services to assist poor people adapt. These included agricultural, veterinary, health, water, and sanitation services. However, it found that the co-ordination of local departments of line ministries was lacking and this hampered action on climate change, as well as eroded trust between communities and local government.

4.1.4 Disappearing lands: supporting communities affected by river erosion⁷⁷

Organisation:	Practical Action
Location:	Gaibandha District, Bangladesh
Sector(s):	Agriculture, water, sustainable livelihoods, DRR
Climate impacts:	Changes in rainfall intensity and glacial melting increasing flooding, siltation, and river erosion
Strategies:	Capacity-building, alternative disaster risk reduction and management, building social networks, climate change awareness-raising, community participation, development of on- and off-farm livelihoods, infrastructure development, basic services, income generation, and flood proofing technologies

This project, involving 2000 households in Gaibandha, was undertaken in an area particularly vulnerable to climate change owing to its proximity to the confluence of two major rivers, the Teesta and Brahmaputra. The land in this area is prone to flooding and river erosion, which often results in the loss of cultivable land and even the destruction of homes. Most of the people living here are either landless or with insecure land tenure.

The overall goal of the project was to 'reduce the vulnerability of men, women, and children to the physical, social, economic, and political effects of river erosion, flooding, and other natural hazards in the Gaibandha district'. This was achieved in the following manner:

- Strengthening the capacity of communities, government, and NGOs to prepare and respond effectively to future climate-induced emergencies;
- Developing and promoting practical interventions to strengthen livelihoods and natural resource assets;
- Promoting the engagement of vulnerable communities in decision-making processes on climate-related adaptation strategies in order to influence policy change and increase self-sufficiency.

The project began with a series of discussions and surveys to provide a baseline understanding of the community's knowledge and awareness with regard to weather, climate, and climate change. This information provided an analysis of local livelihoods and identified the assets that were relied upon, owned, or accessed by the community. The baseline study also provided enough descriptive data to design the project and undertake participatory technology development and training.

In assessing knowledge about weather and climate, it was found that local people used both traditional and modern knowledge systems. This included climate observation, word of mouth to share and exchange weather and climate information, and the use of radio, television, and newspapers.

Social networks were a central pillar of the project, with 200 youth volunteers from the community recruited and trained on climate change issues. These volunteers were then given the task of raising awareness within the community and preparing community disaster preparedness plans. These volunteers also established two CBOs, known as 'early warning committees', which were tasked with building networks and relationships outside the community. These CBOs were successful in building relationships with key institutions to enable the community to work on adaptation activities in a political environment that was not previously conducive to this type of activity.

The project also initiated training to raise awareness on climate change within the community and with external stakeholders. This included training and refresher courses on climate change issues for community volunteers, youth volunteers, teachers, civil society, and locally elected bodies, as well as specific training on early warning systems and livestock rearing during disasters. In addition to formal training, a variety of media was used to raise awareness. This included the following:

- Cultural shows using songs to communicate climate change issues relating to flooding and disaster preparedness;
- Debates to create awareness among school students on climate change issues;
- Art and essay competitions to enhance knowledge and awareness of school students;
- Rickshaw adverts to create mass awareness in the community;
- Rallies and celebrations, such as the observance of World Environment Day and 'Fish Fortnight', which encouraged awareness in a range of environmental issues;
- Video footage that was recorded to capture examples of climate change impacts and demonstrate adaptation activities.

After the first year of the project, the community led initiative to identify and prioritise NRM options. Using participatory processes coupled with training on how to incorporate the likely impacts of climate change, particularly increased flooding, a number of technologies were identified and developed. These included:

- Floating vegetable gardens, constructed from water hyacinth and bamboo, provided a source of food during flooding and could be dismantled easily;
- Homestead vegetable gardening provided an additional income source for families when the flood levels receded;
- Caged-fish cultivation allowed community members without access to ponds to cultivate fish in cages in the rivers. The cages could also be kept closer to the house during floods;
- Duck rearing was more suitable in floods than other domestic fowl, such as chickens; and ducks as well as their eggs could be sold or eaten for household consumption, thereby providing necessary protein for family members;
- Raised flood-proof houses provided a safe place to live even in times of flooding;
- Elevated tube wells and latrines in some cluster villages and shelters were safe from flooding, thereby securing access to clean water.

A central theme of the project was building community capacity, social capital, and networks through the formation of voluntary community groups. This approach provided a foundation for CBA activities and was one of the reasons for its overall success. The project began by analysing the local context through participatory means and by taking time to make sure community members understood climate change and its impacts. This helped the project to design, develop, and implement context-specific technologies. These technologies were no-regrets options, which meant that communities could use them with short- and long-term benefits. Overall, while the project also experienced some difficulties, even information dissemination, it was able to catalyse the community into collective action and to work with government entities in order to ensure a longer-term response.

4.2 Adaptation in India

India is a vast country covering 3.28 million square kilometres with tremendous diversity. While India occupies only 2.4 per cent of the world's land surface area, it supports 16.2 per cent of the world's population, with more than one billion inhabitants.⁷⁸ India's diverse geography houses a spectrum of climates, yielding a wealth of biological and cultural diversity.⁷⁹ There is large variation in rainfall in different parts of the country. Average annual rainfall is less than 13cm in the Thar Desert, while at Cherrapunji in the northeast it is as high as 1080cm.⁸⁰ India is also a land of many rivers, with the 12 major ones covering 75 per cent of the country.⁸¹ Land use in the country is influenced by population density, urbanisation, industry, agriculture, animal husbandry, and irrigation demands, as well as by disasters, such as floods and droughts.⁸²

Given its large population and dependency on climate-sensitive sectors, such as agriculture and forestry, India has every reason to be concerned about climate change. It is also emerging as a significant contributor to greenhouse gas emissions and therefore is not only concerned with adapting to climate change, but also reducing its own emissions by transforming into a low carbon economy. A reduction in water availability, stemming from glacial melt and decrease in rainfall, is already threatening food security and natural ecosystems, including species that sustain rural households.⁸³ Sea level rise is another major concern, as is the increased frequency and intensity of extreme weather, all of which affect the development goals of the country, its ability to improve health and energy demands, water and coastal resources, and infrastructure, among others.⁸⁴

At a national level, India completed its Initial National Communication in 2004, and has since been actively involved in the UNFCCC negotiations. In 2008, the government released its first National Action Plan on Climate Change, which outlines existing and future policies and programmes aimed at addressing mitigation and adaptation issues. Identifying eight core 'national missions', including missions related to adaptation, it emphasises India's overall goal of maintaining high economic growth while also addressing climate change.⁸⁵

In terms of programming, while there are many documented project and programme examples in the country, it was extremely difficult to find examples that provided enough detail to be properly assessed. A lot of knowledge has been generated at the state level; however, it appears that there is a need to consolidate it at the national level. This should be a strategic priority for India's National Mission on Strategic Knowledge on Climate Change. Out of a total pool of 16 examples in the review, only two are therefore described in detail.

4.2.1 Sundarbans Programme⁸⁶

Organisation:	WWF-India
Location:	Indian Sundarbans
Sector(s):	NRM, water, livelihoods
Climate impacts:	Floods, sea level rise, cyclones and extreme weather events
Strategies:	Participatory processes, climate change awareness raising, mangrove regeneration, early warning systems, re-introduction of Indigenous crop varieties

The Sundarbans Programme was initiated in 2005 and works in three major, albeit non-exclusive thematic areas: biodiversity conservation, climate change and energy, and sustainable livelihoods. The programme has three main objectives: develop better understanding of current and future challenges; implement pilot projects to demonstrate what works and how; and raise awareness of issues in order to influence policy and incorporate pressing concerns into development planning. The Sundarbans is a unique eco-region located in both Bangladesh and India, where two major river systems – the Ganges and the Brahmaputra – converge. It is unique not only because it has one of the world's most extensive mangrove forests in the world (which can act as a natural buffer against coastal erosion and seawater intrusion), but it is also one of the most significant strongholds of the Royal Bengal Tiger, which is an endangered species. It is also unique because of the large population living on the fringes of the forest, and who depend on the forest for their lives and livelihoods.

Extreme weather in the Sundarbans is a reality and the fragile ecosystem now faces the challenges of climate change. The Sundarbans Programme has been working with communities through small-scale adaptation projects to enhance their risk preparedness and adaptive capacity. The goals of these projects are to: develop a better understanding of current and future climate challenges; develop and implement pilot adaptation strategies in selected sites; and raise awareness of climate change and incorporate concerns into development planning.

The programme has had a number of concrete achievements in the communities, some of which are listed below:

- *Establishment of a knowledge centre:* The Mousumi Climate Adaptation Centre acts as a central point for the exchange of information, data, and services. It has benefited local communities by increasing their capacity to deal with the impacts of climate change and promoting climate adaptive livelihood options. Managed by elected local representatives of the community, it also serves as an early warning station, a node for disaster response teams, and an adaptation knowledge/training centre;
- *Introduction of climate-resilient agricultural and piscicultural practices:* Indigenous salt-tolerant paddy and fish varieties were re-introduced at project sites, in order to provide communities with options to harvest crops despite saltwater intrusion. The types of harvests have been found to be comparable to conventional farming practices prior to saltwater intrusion;
- *Disaster relief shelter:* A high-school building was improved to include sanitation facilities and expanded to serve as a disaster relief centre able to cater for 1,200-1,500 individuals;
- *Early warning and disaster response teams:* More than 200 volunteers from five villages have been given additional training in disaster management and are now recognised by the local administration, receiving state support when disasters strike.

Overall, the success of adaptive strategies employed in the various projects has had a direct bearing on the health of the ecosystem. This has avoided displacement of people, losses of livelihoods, and the over-extraction of resources. While the jury is still out on the long-term viability of the Sundarbans, this project has for now bought some time for those dependent on the ecosystem.

4.2.2 Vulnerability assessment and enhancing adaptive capacity to climate change⁸⁷

Organisation:	Swiss Agency for Development and Co-operation (SDC)
Location:	Rajasthan and Andhra Pradesh, India
Sector(s):	DRM, water, livelihoods, agriculture
Climate impacts:	Drought, erratic rainfall
Strategies:	Enhancing adaptive capacity, optimisation of delivery systems, policy dialogue and advocacy, linking local institutions with government

This programme focuses on the semi-arid regions of India that are vulnerable to droughts and increasingly erratic rainfall, with the overall goal of securing rural livelihoods among poor and vulnerable communities by promoting measures that enhance their adaptive capacity and disaster preparedness. A number of pilot interventions have been undertaken in key livelihood sectors, with a view to informing and catalysing policy dialogue at different levels using the emerging field experiences as an evidence base to link practice with policy and vice versa.

One of the programme's features is collaboration among various actors with complementary strengths. To assist in the process of generating synergy with other relevant programmes and the ongoing activities of the government, a national consortium was formed to take overall responsibility for managing the programme. Comprising three partners, the M.S. Swaminathan Research Foundation, Action for Food Production, and the National Institute of Agriculture Extension Management, the consortium has established, guided, and managed all field activities, including the provision of valuable scientific technical support to NGOs and communities.

The programme began with a comprehensive assessment of climate change vulnerability with communities selected through a multi-stakeholder process and a set of pre-defined criteria, including the following: 1. manifestation of climate hazards; 2. evidence of social organisation at the village level; and 3. presence of local partners and service providers. From this, a baseline study was established and interventions were developed in the programme's four thematic areas: energy, water, livestock, and land use. In order to distinguish between climate-smart development and classical development interventions, scientific hypotheses were developed for each of the four areas. A monitoring framework also accompanied the hypotheses.

The pilot activities undertaken within the framework of the programme have been diverse in approach and nature, in order to respond to the specifics of the different contexts of the programme. Generally, however, they have sought to build response capacity and improve management of climate risks; they have been based on no-regret options; and have included interventions that build on existing traditional knowledge, bringing in western science where it made sense.

Among the most successful interventions have been the following:

- *System of Rice Intensification (SRI)*: In areas with limited water availability, SRI offers communities multiple benefits for reducing the vulnerability of agricultural systems and livelihoods (for example, by cutting irrigation water requirements), and increases yields and profitability;
- *Water resource management*: Communities have used traditional irrigation systems to improve crop production even during periods of flooding and drought. The use of traditional water management strategies has also provided a valuable entry point for discussing climate change and how to make agriculture more resilient;
- *Pasture land development*: Through the protection of private and common land, in combination with soil and water conservation measures, the productivity of land has been increased even during erratic or below average rainfall;
- *Weather-based farming models for communities*: Through the establishment of village-level, agro-met observatories, collected data have helped the communities develop weather-based rules of thumb for taking appropriate farm decisions based on simple parameters;
- *Community-based institutions*: A number of community groups and institutions have been formed during the programme, including water-user groups, a village-level committee responsible for the management of protected and common pasture land, and smart farmers clubs. Local institutions were found to play a key role in building adaptive capacity in communities and their empowerment was found to contribute significantly to reducing the vulnerability of communities to climate risks, as well as a broad spectrum of other risks affecting them.

A key lesson from this work has been that building the capacity of communities and local institutions works best when there is a combination of existing traditional knowledge and practices, linked with other more scientific perspectives. New innovations can be developed by building on different knowledge bases with a focus on context and suitability for the communities who use them.

4.3 Adaptation in Nepal

Nepal is a landlocked country situated in the central part of the Himalayas, surrounded by India to the east, west and south, and Tibet to the north. It has a total land mass of 147,181 square kilometres, with a lateral span of less than 200 kilometres; five major climatic zones, from subtropical in the south to alpine in the north; and three main geographical regions, the High Mountains, the Mid Hills, and the Terai plain.⁸⁸ The climate is influenced by the Himalayan mountain range and the South Asian monsoon.⁸⁹ Nepal is considered one of the world's poorest nations, ranked at 193 out of 210 countries in terms of gross national income.⁹⁰ It has a population of close to 28 million, of which more than 70 per cent live on less than \$2 per day.⁹¹ Nepal's population is predominantly rural, with over 85 per cent of people engaged in farming, predominantly for domestic consumption.⁹² The agriculture sector is the second largest contributor to GDP, at 33 per cent.⁹³

Climate change is increasingly accepted as a major issue facing Nepal and its people.⁹⁴ Climate change scenarios indicate that warming at higher elevations will lead to a reduction in snow and ice coverage, which in turn will lead to an increase in the frequency of climate-related disasters, including floods and droughts, as well as cause changes in precipitation at a regional scale.⁹⁵ Nepal has already lost valuable arable land to flood and erosion; it has seen changes in the monsoon affecting agricultural production and has experienced water shortages and drought. There is also the growing and potentially deadly threat from GLOFs, outbreaks of diseases, and a sustained decline in food security.⁹⁶

At a national level, the political instability of the past decade has impacted on the capacity of the government to act on climate change. This has been exacerbated by a lack of available funding.⁹⁷ However, in 2010, the government finalised its NAPA, which set out the country's strategy and action plan to respond to the challenges and opportunities posed by climate change.⁹⁸ It has been credited as being developed in a consultative manner, with a focus on knowledge management, and planning and stakeholder consultation. Alongside the NAPA, the local adaptation plan of action (LAPA) has been developed with an aim to providing action at a more localised level (see the case example below).

In terms of programming in Nepal, the work is only just starting in earnest, with the bulk of activities to date focusing on impacts and vulnerability assessment, and sectoral studies. However, the consultative nature of the development of the NAPA has provided a solid basis for on-the-ground programming to take place, following the NAPA strategy and action plan, which provides a good foundation for understanding the different types of work that is needed, and how organisations can contribute to the overall strategic development of Nepal's response to climate change. Out of the nine projects and programmes included in the review, three have been selected to show different approaches to adaptation in various parts of the country.

4.3.1 Local Adaptation Programme of Action⁹⁹

Organisation:	Local Initiatives for Biodiversity, Research and Development
Location:	Rupa watershed near Pokhara, Nepal
Sector(s):	Agriculture, water, livelihoods, NRM
Climate impacts:	Landslides, floods, erratic rainfall, shifts in seasons, drought, seasonal flooding, soil erosion
Strategies:	Participatory decision-making, climate change awareness raising, building social capital, linking of upstream and downstream co-operatives, participatory technology development (vegetable production, soil management, herbal gardening, construction of check dams and barriers)

This project is one of seven pilot projects implemented under the LAPA programme. LAPA is not only a programme but an operational plan that identifies the adaptation priorities of climate vulnerable households and communities, as well as the preferred delivery agents (service and technology providers), and complements national scale planning initiatives, such as the NAPA.

The operational unit for LAPA is at the administrative scale of the District Development Committee and the Village Development Committee (VDC). This scale includes the geographic area covered by these administrative units and acknowledges the role of plural mechanisms operating within these scales in situations where the capacity of public sector administrative units is limited. This scale is likely to provide a better fit of national and local planning processes.

The LAPA is guided by a number of principles. These are that the LAPA should:

- Be owned by local communities, be demand-driven, aimed at the most vulnerable, and involve a diverse range of stakeholders;
- Be based upon and should promote local knowledge, resources, technologies, and practices;
- Be flexible in terms of design and implementation in order to respond to the changing and diverse climate adaptation needs of local people;

- Be sustainable, making efficient use of resources, particularly local people's time, and should represent value for the money invested in them;
- Be operated over the medium term and be comprised of various linked activities rather than short-term, 'project' type interventions;
- Be mainstreamed into local, VDC, and district-planning processes, thereby enabling bottom-up and top-down planning processes to engage with each other and be matched in terms of areas and scales.

Additionally, the LAPA should build upon existing institutional mechanisms in line with global, regional, and national policies and commitments. It should develop the resilience of vulnerable populations to climate variability and change, and the gateway systems local people depend upon to be able to adapt.

One of the seven pilot projects – a watershed management project – took place around Rupa Lake, a small watershed near Pokhara in the central area of Nepal, and involved 5,000 households across three villages. While the pilot itself was relatively short, the implementing NGO, Local Initiatives for Biodiversity, Research and Development (LI-BIRD), has been implementing NRM projects in the region for more than a decade. The pilot itself built on an existing NRM project that was implementing a number of activities intended to manage the natural environment, while at the same time providing sustainable livelihoods for the communities dependent on them.

Using existing local institutions (in this case, co-operatives established and run by the communities), the communities developed a reciprocal benefit sharing mechanism between upstream and downstream members of the co-operatives. Downstream communities used funds raised through the cultivation and sale of fish and other farming products to compensate upstream communities, so that they could carry out a number of activities, which helped prevent some of the problems facing both sets of communities. These included:

- Reforestation of degraded and eroded lands, which helped to reduce the amount of soil erosion on hillsides and increased soil content for planting;
- Construction of gabions and loose stone check dams, which helped to prevent sediment from entering the lake, thereby improving water quality;
- Minimum tillage practices, which helped to retain moisture and organic content in the soil;
- Water source protection, which helped to protect existing water sources from pollution.

The project enabled communities to work together to achieve sustainable development outcomes. The unit of operation was at the watershed level, which was important, as the problems facing communities – whether they are upstream or downstream – are linked at this level. While the findings of the pilot are not yet available to the public, early indications suggest that adaptation processes and activities using LAPA as a unit of scale are beneficial to communities in terms of both climate change issues and broader development objectives.

4.3.2 Adapting to changing seasons and flash flooding¹⁰⁰

Organisation:	Practical Action
Location:	Chitwan District, Nepal
Sector(s):	Agriculture, water, livelihoods, NRM
Climate impacts:	Landslides, floods, unusual rainfall patterns, seasonal storms, droughts
Strategies:	Participatory decision-making, climate change awareness-raising, building social capital, development and institutionalisation of a CBO, participatory technology development (vegetable production, improvement of irrigation channels, construction of check dams and barriers)

This project took place over a period of three years from 2004 to 2007 in one watershed in the south-western area of the lesser Himalayan foothills, and focused on 200 households. The majority of the population living in the area are dependent on natural resources and the monsoons for their livelihoods, which is mainly subsistence, although many families work outside the area (either in waged labour elsewhere in Nepal or overseas) to meet their needs. The project began with an *ad hoc* committee of communities, which was then developed and institutionalised in the second year of the project.

In order to gain a better understanding of climate change in the area, the project used a variety of secondary data coupled with local information gathered from interviews, group discussions, and observations. Through this process, landslides, flash floods, unusual rainfall patterns, seasonal storms, dry winds, hail, thunder, and droughts were identified as the major hazards that had increased in recent years. Also identified were longer-lasting winter fogs, higher temperatures in the daytime, and an increase in the frequency and magnitude of disasters.

Among the activities that were undertaken, three areas were prioritised:

- *Social networks*: The project helped already existing informal groups to become part of a broader based organisation that served the whole community. This included training on organisational management. A constitution was also prepared so that the CBO could be formally recognised by the local authorities. Once registration was completed, the CBO was able to play a major role in the community and, since the end of the project, has become self sustaining;
- *Awareness-raising*: As with other projects described in this review, raising awareness was considered one of the most important aspects of the project. This took place through the development of booklets, presentations, posters, and awareness activities. A total of 25 school teachers were also trained at the district level and beyond, and five workshops were organised to disseminate information about climate change;
- *Participatory technology development*: The development of a baseline survey and subsequent participatory discussions revealed the need to improve existing agricultural practices. As a result, training was provided on vegetable growing; livestock raising; and soil, forest, and watershed management. In terms of vegetable production, 25 farmers from each settlement were trained and subsequently supplied with vegetable seeds to establish demonstration plots, which proved successful not only in the production of vegetables, but in encouraging others farmers to become involved. Improvements to irrigation channels were also made to ensure water during the summer months for rice cultivation and during the winter for vegetable production. Check dams and flood barriers were constructed to reduce the incidence of landslides and floods. Although when the floods came some of the structures were damaged in the major streams, structures in the tributaries were able to stem the flood and provide stability.

As a result of the project, vegetable production overtook liquor as the largest source of income, and water resources were better used to support livelihoods. Land that had previously been left uncultivated in the winter was now able to support the cultivation of bananas and the use of simple irrigation technologies along with water conservation enabled farmers to plant other crops that were new to the area. Significantly, farmers now had greater confidence in their ability to make decisions about what they planted and when. By the end of the project, farmers of all levels were able to improve their food security and increase their resilience to the changes brought about by climate change. Forest conservation was also improved through management practices, such as restricting the illegal smuggling of timber and regulating firewood collection.

Another achievement was the establishment and institutionalisation of a CBO, the Climate Change Impacts and Disaster Management Group. This CBO has since been able to coordinate activities implemented by other agencies in the area and to build partnerships with the village-level government. Linkages have also been established with the local government and government service providers, which has seen the allocation of 10 per cent of the VDC budget allocated to watershed conservation.

In terms of lessons learned, two are worth noting:

- Building confidence in farmers is critical in order for them to make informed decisions and carry on the work once NGOs have left. This was achieved through the practical demonstrations, where farmers were able to learn from observation and share experiences, and could see the process and results first-hand in order to replicate on their own land. Rather than limiting the learning to a classroom, this approach helped them to feel more confident of the effectiveness of the initiative.
- Working together within a watershed is an effective unit for CBA. This helped communities living upstream and downstream to understand how being connected and working together economically, socially, and environmentally was critical for the sustainable management of local resources that could benefit the entire watershed.

4.4 Adaptation in Pakistan

Pakistan is bordered by India in the east, China in the northeast, and Afghanistan in the west; it occupies more than 880,000 square kilometres of land and has over 990 kilometres of coastline along the Arabian Sea.¹⁰¹ The country is characterised by significant variations in altitude and topography across its territory. Pakistan's diversity in terms of climatic, socio-economic, and environmental characteristics, as well as the significant differences between regions, makes the assessment of climate change impacts complex and difficult.¹⁰² As a developing country, Pakistan relies heavily on agriculture, without adequate monitoring systems for predicting extreme events or for assessing possible changes in weather patterns.¹⁰³ Pakistan is particularly vulnerable to climate change because it is located in a region where temperature increases are expected to be higher than the global averages and where rivers are fed by melting glaciers, and because its economy is largely based on agriculture.¹⁰⁴

The effects of climate change have already been observed in a number of areas, with an increase in the incidence, frequency, and intensity of extreme climatic events; more intense and heavier rainfall in coastal areas; more intense cyclones; more intense flooding in flood-prone areas along the Indus; and more pronounced droughts in the arid areas of Khuzdar.¹⁰⁵ In most areas, rainfall patterns have also become more erratic, making it difficult for communities to predict local rainfall patterns. The duration of the cropping period has also shrunk perceptibly in southern Punjab and Balochistan, with a forward shift in sowing time and an earlier harvest.¹⁰⁶ It now appears that traditional mechanisms used to deal with water shortage, decline in fish catch, and reduced agricultural produce are no longer enough

to counter the immense impact of climate change, with seasonal migration increasing. This implies that incomes from traditional sources are no longer sufficient to support some families.¹⁰⁷

At a national level, Pakistan has been involved in UNFCCC processes since 1992. In April 2011, after two years of deliberations, the government approved the first draft national climate change policy. While it is not yet available publicly, it is hoped that the policy will provide a strategic framework and action plan aimed at addressing effectively the myriad challenges posed by climate change in the country. In terms of generating better research base from which to understand climate change, the government has established the Global Change Impact Studies Centre, which is focused on modelling-based research to assess impact, develop adaptation measures, and provide feedback to policy makers.¹⁰⁸ However, it still remains to be seen how effective this Centre will be, especially in terms of developing concrete adaptation programmes.

In terms of projects and programmes on the ground, it was difficult to find documented examples of initiatives during the literature review. Various interviews appeared to confirm that work on CCA was still very much in its infancy. As a result, only five projects were able to be reviewed and of these, three are explained in more detail below.

4.4.1 CBA and Advocacy¹⁰⁹

Organisation:	Oxfam GB
Location:	Badin, Pakistan
Sector(s):	Agriculture, water, livelihoods, coastal resources
Climate impacts:	Water-logging, sea level rise, and saline water intrusion
Strategies:	Participatory research, community decision making, development of local technologies, rehabilitation of natural resources

This project is currently taking place in the coastal areas of Badin, which is persistently affected by extreme weather events that often result in humanitarian disasters. People living in the coastal belt are among the poorest in Pakistan, with 70 per cent of households living below the poverty line, and their livelihoods under constantly threat. Mismanagement of natural resources, human activity (such as, the construction of barrages and the diversion of the river Indus), and inequalities in land and water distribution have all contributed to their plight, decreasing the flow of fresh water to the Indus delta, increasing water salinity, and preventing the draining off of storm water. Now the impacts of climate change have brought added problems to the delta regions, including salt water intrusion of croplands and increased risk of extreme weather events.

Most of the population in the local area survive on agriculture, labour, and small-scale businesses. The primary crops are wheat and rice, and households could once earn sufficient income from these crops. However, they are now experiencing a dramatic decline in agriculture due to land degradation, a lack of fresh water, and inadequate irrigation. They are also suffering from extreme shortages of drinking water, which has resulted in the migration of thousands of people away from the area. As the natural resource base has declined, there are fewer livelihood options available and the coastal communities are now almost entirely dependent on fishing. However, fishing remains unreliable, with changes in fishing regulations and decreases in fish yield over the past decade.

The overall objective of the project is to enhance the capacity of coastal and rural communities to adapt to climate change through:

1. Support for improved availability of fresh water for consumption and agriculture;
2. Support to small-scale farmers with appropriate practices for agriculture;
3. Investigation in options for reducing the impact of salinity on agricultural production;
4. Support to communities to reduce the impacts of floods and cyclones.

The project was initiated after Oxfam undertook community-based research in 2008 aimed at better understanding the implications of climate change for communities living in the Badin coastal region. The project area covers two disaster-prone villages, Mohammad Ali Chandio and Village Khamoon Mullah, in the Union Council of Bhugra Memon in Tehsil and District Badin. Project activities include the following:

- *Strengthening and enlarging existing water ponds, including installation of solar panels and pumps:* Two existing water ponds from each village were enlarged from 60 square metres to 100 square metres, and their linings were strengthened in order to increase water collection for crop irrigation and drinking purposes. Solar-powered pumps were installed at each pond to pump water into the crop fields. One community member from each village also received training for maintenance of the pumps;
- *Rehabilitating degraded land and using appropriate crop varieties:* A local agricultural expert was hired to work with the community to start the process of reclaiming 25 acres of previously productive land. Soil samples were taken from every acre and tested at Sindh Agriculture University, Tando Jam. Following analysis, the agricultural expert proposed organic processes and practices to improve the organic content of the soil, and proposed the cultivation of crops and plants that could be grown in saline water. The communities were involved in collecting animal waste that was then processed and subsequently spread across the fields as fertiliser. They then watered their prepared land through the water ponds, and after approximately 15-20 days the land was ploughed for cultivation. This organic process was less expensive for farmers and minimised harm to the environment and to already degraded land;
- *Setting up a nursery:* In addition to rehabilitating degraded land, the agricultural expert worked with the community to establish a nursery in Muhammad Ali Chandio village. Working from the soil sample analysis, species of trees and fruit plants were selected based on suitability for local conditions and the ability to tolerate increasing salinity. Guava, neem, lemon, coconut, and dates were among those selected. Members of the community established and maintained the nursery. The nursery also benefited from irrigation from the pond via two solar pumps. This nursery has become an important resource for the community as they can experiment with different varieties of crops by investigating the relative strengths and weaknesses of more flood-tolerant and more saline-tolerant varieties. They are also able to generate income by selling seedlings to nearby villages and in the city;
- *Setting up an emergency shelter:* Community-led consultation resulted in the formation of three committees for construction, purchasing, and monitoring and selecting the shelter's location. The constructed shelter was raised eight feet from the ground and had adequate space to seat the entire community, in addition to bathrooms and a safe water supply. People were also able to bring their livestock and food to the shelter. The communities have also used these shelters to conduct monthly village meetings in order to work on their village development plans;
- *Raising awareness:* Various awareness-raising activities were conducted, including: a one-day seminar on 'Climate change and its impact on the coastal belt'; community meetings with the Sindh Irrigation and Drainage Authority, during which members

of the community asked for the release of water in the main irrigation channels in order to halt the rate of salt water intrusion; a training session on 'Climate change and cyclone threat in Sindh Coast', which was organised by the National Disaster Management Authority of Pakistan; and a public seminar, during which members of the community shared their own accounts regarding the devastating floods and cyclones that they had experienced, and how the climate patterns were changing in their area.

- As a result of the project so far, communities are better prepared to deal with extreme and unpredictable weather-related events and are able to manage stresses that are set to increase over time. While community members lacked the technical knowledge and information at the start of the project, communities have been able to select appropriate solutions using their existing knowledge and experience of the natural environment, coupled with additional technical support. This has led to the following outcomes:
- *Communities are better prepared:* The villages were hit by cyclone Phet in June 2010, but were able to take refuge in the emergency shelter, thereby protecting lives and assets;
- *Food security:* After harvesting crops on the land, it was found that 50 households were more food secure than they had been before the start of the project through the use of water pond irrigation;
- *Access to water:* Approximately 43 households now have access to safe drinking water, which has reduced the workload for women who, prior to the project interventions, had been compelled to walk 15-18 kilometres each day to collect water for their families;
- *Improved co-ordination:* The communities now have a voice and are linked with local government departments through project and awareness-raising activities.

4.4.2 Desert and floodplain adaptation¹¹⁰

Organisation:	Practical Action and Rural Development Policy Institute (RDPI)
Location:	Sargodha, Jhang and Layyah Districts, Punjab, Pakistan
Sector(s):	Agriculture, water, livelihoods
Climate impacts:	Droughts, floods
Strategies:	Participatory vulnerability research, climate change awareness raising, building social capital, community mobilisation, livelihood interventions (alternative drought and flood tolerant crops, tree plantations, vegetable farming) to build resilience and provide alternative sources of income

This three-year project was undertaken with 300 poor and vulnerable households in two ecological zones in the Punjab region, the former rangelands of the Thal desert region and the floodplains of the Chenab River. The project began with an extensive process of identifying vulnerable households within the areas, understanding their circumstances, and building up relationships between different stakeholders. During this time, climate change and research training sessions were organised to increase understanding of climate change so that it could be integrated into programme design.

Gathering local knowledge on how people perceive and experience climate change formed the first step in involving communities in the adaptation process. This information was then used alongside scientific observations of changes. Community mobilisation formed another integral part of the project, with the development of CBOs leading the identification, design,

and management of project activities. While some CBOs were more active than others, the majority were successful in undertaking project activities and mobilising members. The project also devised and experimented with a number of awareness-raising tools that were successful, despite the challenges of low literacy, civil society indifference to climate change at the start of the project, a lack of understanding of climate change by local government, and a lack of resources for awareness-raising activities. These tools included the following:

- Using the baseline survey as a tool for raising awareness and increasing knowledge;
- Conducting a 'people's parliament' for use as an open platform to promote public accountability;
- Initiating 'story nights', which revived a traditional practice of storytelling for raising awareness and educating community members about the project;
- Holding discussions and community meetings;
- Organising cultural events to revive environmental practices;
- Using local language banners and publications to generate a wider audience for local climate change issues;
- Producing a video documentary detailing project activities;
- Highlighting two popular campaigns on the protection of local grazing lands, biodiversity, livelihoods and crafts;
- Establishing farmer resource centres to promote climatically and environmentally responsive cropping, forestry, and livestock practices.

In addition to significant work on raising awareness in target communities with a diverse set of stakeholders, the project also engaged in context-specific technology development using the baseline survey, aimed at providing a better understanding of existing livelihood patterns and at identifying opportunities for diversification, which in turn informed the choice of technologies that were used and promoted during the project. As the project focused on rural communities, the technologies predominantly consisted of alternative agricultural practices. These included the following:

- Identifying alternative crops in partnership with local experts, government, academic and civil society stakeholders. Each variety was selected for its ability to tolerate drought and flood conditions and its positive impact on soil stability;
- Establishing tree plantations from local species. In total, 60,000 tree saplings were planted by participating households;
- Focusing on female farmers by helping them to diversify their incomes from the traditional cash crops of wheat, rice, and sugarcane through the introduction of good quality vegetable seeds that were planted in each of the project sites and over the duration of the project. However, this strategy was not without its problems in the Thal project site, with damage to crops from lizards and termites, a lack of experience in growing vegetables, and poorer weather and soil conditions affecting the success of some of the interventions;
- Training women on alternative livelihood options, such as veterinary services;
- Setting up a demonstration site to raise community awareness of livestock management techniques, organic vegetable farming, and the importance of NRM. However, this site was not maintained during the whole project owing to a lack of interest from the community.

There were many lessons and challenges gathered from the project over the three-year period in which it was operational, including the following:

- Gathering local knowledge was an excellent starting point for the project as it helped to provide understanding of: the communities' perceptions of weather, and weather patterns and changes; the role of the seasons in local culture and how they determine livelihoods; vulnerability to climate hazards; and local or traditional early warning systems and methods of prediction. However, local knowledge has its limitations: it can be highly subjective and inconsistent. It is therefore best to combine findings from local knowledge with information from other outside sources. The project also found that women were often useful holders of information, with a more refined and culturally rich vocabulary than men;
- Community mobilisation and organisation was a continuous activity that required strategic thinking, commitment, and a readiness to work with the community throughout the project. In using tools for mobilisation, traditional methods were by far the most effective;
- Awareness raising needed to be understood as a two-way process in which the implementing organisation, communities, government, and other stakeholders learned from each other. Mass media tools, such as television and radio, could help with this process and needed to be considered as part of the strategy of any adaptation project;
- Before designing livelihood-centred adaptation interventions, there was a need to map a comprehensive picture of existing livelihood patterns onto current and future climate trends. All livelihood interventions required consistent support over time in order to assess how they responded to ongoing climate variability and change.
- All adaptation projects needed to have a strategy to link communities with government and non-government institutions. This could assist with ongoing monitoring and learning and the longer-term sustainability of interventions.

Overall, this project highlighted the need for a holistic approach to CCA, using a range of strategies and interventions that were tested, monitored, and adjusted in order to provide communities with a suite of options to adapt to climate change. This range of strategies includes baseline research, mapping livelihoods against climate hazards to identify opportunities to build resilience, social capital and building relationships with multiple stakeholders, community organisation, awareness raising, an appreciation of culture and tradition, and linking traditional livelihoods with options for diversification. While this project had a number of issues, it was successful on a small scale and offers lessons for scale-up and replication.

4.4.3 Building capacity for CCA in coastal areas¹¹¹

Organisation:	WWF
Location:	Indus Delta, Balochistan District; and Dasht Delta, Sindh District, Pakistan
Sector(s):	Agriculture, water, livelihoods
Climate impacts:	Droughts, floods
Strategies:	Participatory vulnerability research, climate change awareness raising, building social capital, community mobilisation, livelihood interventions (alternative drought and flood tolerant crops, tree plantations, vegetable farming) to build resilience and provide alternative sources of income

While this project is not mature enough to offer learning as yet, its location – the coastal areas of Pakistan – makes it a worthwhile project to include in this review. Designed as a long-term programme, over a period of 60 months, this project aims to work with 20,000 community members and benefit more than 1.25 million people in Sindh and Balochistan Districts. Its goal is to increase community and government CCA capacity and water governance, and to improve the climate resilience of delta ecosystems on which coastal communities rely.

In order to achieve these overall goals, the programme plans to:

1. *Conduct a delta-wide vulnerability assessment and three local-level assessments in the target sites:* The delta-wide vulnerability assessment will provide a contextual and policy analysis of the threats faced by the region, including proposed mechanisms of addressing these existing threats and emerging vulnerabilities. The site specific assessments will form a subset of the delta-wide assessment. The local assessments will provide first-hand primary information on threats and vulnerabilities, and the ability and capacity of people to cope with these changes in natural cycles, in addition to other emerging threats;
2. *Develop two local adaptation plans and implement pilot projects:* While overarching strategies are proposed by provincial and federal governments, implementation at the community level will be undertaken by local authorities. To facilitate this, the capacity of local and district authorities will be built up to help them develop adaptation plans. Focusing on ecosystem-based solutions, the two local CBA plans and adaptation pilot projects will provide a blueprint for how to implement broad adaptation strategies in practice;
3. *Integrate adaptation into sectoral policies and development plans, and address water allocation and sustainable flow requirements:* While the project will be implemented through local-level plans, the impact of the project would be short lived without provincial and federal strategies for the medium and long term that consider water use, cropping patterns, and relocation of vulnerable communities, particularly given the current absence of any government adaptation action plans in Pakistan;
4. *Build regional collaboration and international support:* Adaptation to climate change is a relatively new consideration, relying on the integration of design, management, and monitoring to test assumptions systematically, in order to adapt and learn. Building a regional network for adaptation in deltas between Iran, Pakistan, India, and Bangladesh will provide a tremendous source of experience. For climate adaptation and improved water governance to become a long-term reality, however, engaging such organisations as the World Bank, Asian Development Bank (ADB), and DfID, which influence and finance development and water management, is important for sustainable water management and improved governance beyond the life of this project;
5. *Strengthen awareness and capacity in Pakistan:* Scaling out awareness and promoting local level adaptation planning to communities and authorities along the coastal belt will form one component of the expected result. The second area will be to develop an adaptation ‘campaign’ to create widespread sensitisation and engagement in the issues among parliamentarians, the wider public of Pakistan, and the media.

4.5 Adaptation in Sri Lanka

Sri Lanka is a tropical island situated just off the southern tip of India. A relatively small island, its maximum length is about 435km and its maximum width is approximately 240km.¹¹² The coastline, which is about 1585km, is irregular and comprises sandy beaches, extensive lagoons and estuaries, mangroves, coastal marshes, and dunes.¹¹³ The island consists of a mountainous area in the south-central parts and a vast coastal plain, which surrounds it. The central mountainous region rises to an elevation of over 2000m and is the source of the major rivers of the country, which number more than 100 and flow across the

lowlands into the Indian Ocean.¹¹⁴ The topography of the southwest is characterised by long parallel ridges that are cut by these rivers, their height increasing gradually from the coast. The northern and north-central parts of the island form one great plain, and the maritime districts consist of similar level or undulating stretches.¹¹⁵

Climate change in Sri Lanka is expected to lead to a rise in sea level, higher temperatures, more frequent and prolonged droughts, high intensity rainfalls and increased thunder activity. Climate change impacts could include: inundations, flooding, storm damage, and coastal erosion the affecting human settlements and wetlands; decreases in agricultural crop yields; pollution of waterways and wells, leading to increases in waterborne diseases; and increased soil erosion from heavy rainfall events.¹¹⁶ These anticipated changes represent a significant threat to the coastal areas, as well as to different sectors of the national economy and human health.¹¹⁷

At the national level, the government has recently developed a National Climate Change Adaptation Strategy for 2011–2016. This is built around a strategic framework with five main components:

1. Mainstreaming CCA into national planning and development;
2. Enabling climate-resilient and healthy human settlements;
3. Minimising the impact of climate change on food security;
4. Improving the climate resilience of key economic drivers, including tourism, transport, and power;
5. Safeguarding natural resources and biodiversity from climate change impacts.¹¹⁸

In terms of projects and programmes on the ground, it was difficult to find documented examples of initiatives during the literature review. A number of interviews appeared to confirm that work on CCA was still very much in its infancy, and that the focus so far had been on policy development. As a result, while nine projects were reviewed, only two of these are presented below.

4.5.1 Adapting agriculture to increasing salinity¹¹⁹

Organisation:	Practical Action
Location:	Hambantota District, Sri Lanka
Sector(s):	Coastal resources, agriculture, water
Climate impacts:	Sea level rise, salt water inundation, coastal erosion, flooding from heavy rainfall events, saline contamination of irrigation systems, temperature increases
Strategies:	Participatory research, climate change awareness, use of modern and traditional weather forecasting, farmer-to-farmer learning and social networks, reintroduction of traditional rice varieties

This project took place over a period of three years, working with 500 households to help them to identify traditional rice varieties suitable for cultivation in degraded paddies through a participatory research process. The project also worked to extend community and institutional knowledge of climate change. The community were able to reach a consensus over the main challenges posed by climate change to community livelihoods, through a process of participatory research combined with focus group discussions, community resource mapping, risk mapping, field observations, transect walks, the assessment of climate knowledge and awareness, and by using existing social networks (capital). The main challenges were identified as floods (which caused crop losses) and salinity (which caused low yields and crop damage).

As a result, the project sought to reduce the risks of crop failure and unprofitable yields through developing a strategy aimed at building capacity on resource use and management by seeking to establish and replicate best practices in crop cultivation. This was done mainly by training paddy farmer groups, which were mobilised to adopt and develop sustainable practices.

During the project, farmer groups agreed to trial traditional rice varieties alongside research station varieties, supported by technical research partners. This encouraged the formation of links between communities, farmer organisations, and the Government Rice Research Institute, thereby yielding advice and soil testing. These links developed a two-way communication channel between farmers and the government (including local government), as well as increasing farmer-to-farmer learning. The results of the trials clearly showed improved yields from the indigenous varieties. The traditional rice varieties also carried a premium market price of up to 50 per cent per kg compared to hybrid varieties. After seeing that some varieties performed well in saline soils, the farmers developed confidence in researching and selecting varieties. By the end of the project, a traditional paddy cultivator group was established with formal connections with the technical research partners, resulting in a more sustainable intervention once Practical Action withdrew.

There were various lessons learned from the project, including the following:

- Stakeholder participation needs to be as broad as possible, incorporating a diverse range of community members, government departments (local and provincial), NGOs, and technical partners. While farmers have sufficient coping mechanisms to survive in the short term, it was apparent that collective action among all stakeholders was critical for the community to successfully adopt new strategies for longer-term sustainability;
- Participatory tools, such as risk mapping, helped to encourage collaboration between different stakeholders;
- Co-ordination among stakeholders was essential in identifying solutions. While individual stakeholders were able to identify solutions to the issues identified by the farmers, they were only able to achieve results by working together;
- Climate change awareness-raising was critical in helping farmers to understand the threats to their farming and to identify possible solutions, including, among others, the reintroduction of forgotten varieties of indigenous rice that are able to tolerate increases in soil salinity.

Overall, the participatory research approach taken during the project highlighted the need for experimentation in adaptation in order to uncover innovative ways of solving complex problems. This approach allowed those involved to feel supported in their decision-making processes and able to use the necessary resources to experiment with. Social networks played a significant role through the projects. The relationships built to achieve the participatory research were a particular success and capitalised on the pre-existing farmer groups within the community.

4.5.2 Participatory post-disaster reconstruction¹²⁰

Organisation:	Practical Action
Location:	Manmunipattu Division, Batticaloa, Sri Lanka
Sector(s):	Housing infrastructure, disaster risk management
Climate impacts:	Extreme weather events
Strategies:	Integrated development approach: strengthening peoples' coping and livelihood protection strategies, DRR, climate change awareness raising, capacity building of institutions, beneficiary participation, building alliances and networks, demonstration of disability access in housing design, and improved mobility

This project took place in areas of the Manmunipattu Division, which had been affected by the Asian Tsunami. The project worked alongside people with disabilities and those most vulnerable in order to build 16 sustainable houses. While the project was part of a larger programme, its specific aim was to build house that demonstrated beneficiary participation, disability access, cost effectiveness, and the use of sustainable housing technologies.

The integrated development approach included the following activities:

- Raising awareness within the community, local government, and NGOs of the rights of people with disabilities;
- Improving the participation of people with disabilities in social networks;
- Creating employment opportunities through training and skills development for people with disabilities to reinforce that persons with disabilities are active contributors to the local economy;
- Enhancing access for disabled persons to local service providers;
- Reducing the vulnerability of people with disabilities to disasters by demonstrating participatory housing and sustainable building practices in post-disaster reconstruction.

Practical Action's integrated approach was built on their vulnerability framework, which advocates the use of the Sustainable Livelihoods Approach (SLA) to reduce vulnerability to disasters. It demonstrated a participatory approach to post-disaster reconstruction that included beneficiaries in the design and construction process through participatory rural appraisal techniques. As a result of this approach, several incorporated design features take into consideration climate change, included:

- Raised of plinth levels on sites prone to flooding;
- Modified design of clay tiles and roof pitch to withstand higher wind speeds and reduce the risk of roofs becoming loose or blowing away;
- Use of improved masonry technology; a technique called 'Rat-Trap Bond' was used to keep houses cooler in the hot drought months and to withstand floods.

A focus on learning and cross-linkages was also an innovation in the project. In particular, learning on sustainable housing design was shared not only with beneficiaries but also with other stakeholders outside the project. In addition to helping to share learning on building techniques, this inspired others to develop more sustainable housing practices in their programmes. This learning has also been incorporated into Practical Action's vulnerability framework, which has benefited from learning on how to reduce vulnerability in post-disaster contexts. Cross-linkages have enabled networks to be set up to link disabled people with a range of services, including advocacy.

5 Lessons about good practice from South Asia

Section 4 detailed 14 projects and programmes out of a pool of 64 in South Asia. These were presented as examples of good practice in adaptation, but what is it about them that makes them replicable? The seven following points summarise different aspects that constitute good practice, gathered from the examples reviewed along with explanation as to why they are good practices. Many of these follow the principles and approaches of Oxfam outlined in Section 2, but also include some principles set out in the LAPA process.

1. *Participatory assessment and analysis of vulnerability and capacity:* Good practice is based on a solid assessment of the vulnerability, need, and capacity of the actors.

Initiatives that begin by understanding the vulnerability of communities to existing development challenges, while integrating climate change issues, help build a solid foundation to work ahead. Climate change cannot be dealt with in isolation and using existing issues around sustainable livelihoods, disasters, water, and/or natural resources can help frame adaptation in ways that communities can understand. This in turn helps them think about and start to plan their work in ways that are climate-smart, rather than seeing climate change as one more issue to deal with. Using community experiences of the recent past and current experiences of climate variability can also help communities think about what climate may be like in future and how they can plan ahead to adapt to this changed reality.

A majority of the examples reviewed were based on participatory processes, such as PCVA, and participatory action research, which provided organisations with a better understanding of community realities and the different contexts in which they were working. One example is CARE's RVCC programme in Bangladesh, which used PCVA to identify and prioritise different vulnerabilities perceived by the community, and address them throughout the programme by awareness-raising, education, creation of alternative income opportunities, and safeguarding crop agriculture. Another is Oxfam's CBA project in Pakistan, which used participatory research to understand how best to work with communities across a range of issues. This helped the community to design and implement strategies in order to safeguard crops and regenerate agricultural land.

2. *Focus on poor, vulnerable, and marginalised beneficiaries:* Good practice means targeting and working with the most vulnerable groups, including women and the socially marginalised.

Focusing on the poorest and most vulnerable and marginalised communities is important because of their high dependency on climate-sensitive resources, and their lack of access to material, social, political, and economic resources that would enable them to adapt to climate change.¹²¹ For women, climate change can amplify existing inequalities, reinforcing the disparity between women and men in their vulnerability to climate change and their capacity to cope with it.¹²² Including them throughout the process represents a central concern of any intervention.

A large proportion of cases reviewed worked explicitly with vulnerable and marginalised populations (including some that targeted women, children, people with disabilities, and ethnic minorities). This is no surprise given that this is the traditional beneficiary base of many NGOs working in developing countries. Practical Action's post-disaster project in Sri Lanka is an example where targeted beneficiaries were identified as vulnerable and marginalised. Using SLA, the programme actively improved the participation of people with disabilities in social networks and created

employment opportunities through training and skills development. Unfortunately, detailed documentation of work that explicitly addressed the gendered dimensions of climate change was difficult to find. This is not unique to CCA; it is frequently an issue across other areas of development where gender is sometimes mainstreamed to the point that it disappears or is not documented owing to a lack of time and/or the skills of those collecting information.

3. *Local ownership*: Good practice requires that the process and actions are owned and driven by local communities.

Long-term sustainability, justice, and equity demand that interventions are owned and driven by local communities and by actors involved in the process. This is true of all development planning, and adaptation is no different. Interventions that work long after the NGO has finished its project, succeed because communities are empowered with the knowledge, skills, resources, and power to take it further.

Although not universally recognised across all the examples, local ownership in decision-making was a central component in a number of examples. In Nepal, the LAPA pilot in the Rupa watershed was driven by three villages and two co-operatives already present in the watershed. Using local institutions, they were able to plan together and make decisions that benefited the whole watershed, not just individuals. The role of LI-BIRD, as an NGO, was to facilitate and provide technical support, rather than drive forward the work or decide on the priorities. In Bangladesh, local communities in the Hari River Basin own the TRM technology. Working together with Uttaran and technical partners, they implemented a traditional technology that has long-term benefits and is owned by the community.

4. *Diversity of stakeholders*: Good practice involves a diversity of stakeholders with different knowledge practices.

What all the cases have in common is that they are good at including a wide variety of stakeholders. This is important because climate change is a complex problem with no set answer or single set of people possessing the solutions. It requires a synergy of local and traditional knowledge with 'scientific' knowledge and a broad discussion of technologies and practices suitable to the particular context. In some cases, it requires a different point of view to innovate innovative and build on existing traditional practices.

Many of the examples demonstrated a commitment to including a diverse range of stakeholders. Of these, one is the SDC programme aimed at securing rural livelihoods among poor and vulnerable communities in India. One of its main features was a commitment to extensive collaboration among different actors in order to generate synergy between programme stakeholders and the ongoing activities of the government. Through the establishment of a national consortium and multi-stakeholder decision-making processes, the programme was able to undertake interventions across different key sectors – energy, water, livestock, and land use. By bring together and building on different knowledge practices, the programme was able to develop new innovations based on existing traditional practices that worked for local communities and the broader sectors on which the community depended.

5. *Flexible and responsive design and implementation*: Good practice requires flexibility in design and implementation, and responsiveness to changing needs.

Given that the exact impacts of climate change are uncertain, particularly at the local level, communities can best adapt to climate change through programmes that empower them to work together: making decisions and building their collective capacity, in order to manage current risks and hazards, and to promote flexibility in terms of adapting to future uncertainty. A social learning process that includes vulnerable and marginalised groups can also help identify the best practices that will benefit those most at risk.

Of the case examples reviewed, CARE's RVCC programme in Bangladesh was more explicit than others in recognising the need to be flexible and responsive in the way the project was designed, implemented, and monitored. From the beginning of the programme, those involved were careful to ensure that the approach allowed experimentation and trial of interventions across a range of intended outcomes. The monitoring system aided this objective by allowing the programme to review progress against goals over time and to adapt them where necessary. Of the other examples reviewed, it was more difficult to assess whether or not this was a central concern.

6. *Future-looking*: Good practice not only helps communities address immediate concerns, but also helps them prepare for the long-term future.

While the impacts of climate change are set to increase over time, it is also important that development interventions are able to address current hazards and increased variability, given that these issues are at the forefront of every community's collective psyche. For communities already experiencing poverty across a range of development issues, this is important because they have pressing needs, both in the present as well as into the future. This means that the outcomes set for projects and programmes should have short-, medium-, and long-term outcomes.

The nature of work undertaken in projects/programmes included in this review has meant that helping communities cope with existing development issues, along with emerging trends in climate change, is common. RDPI's project working with drought and flood-affected communities in Pakistan, for example, was able to improve people's livelihoods, while also preparing them for future uncertainty. This included crop diversification, help communities increase subsistence and cash income, and at the same time as tree planting, which, rather than offering immediate benefits for the community, typically yields results after 5-10 years. CARE's RVCC programme in Bangladesh is another example, where time and effort was given to educating future generations on climate change, at the same time as safeguarding crop agriculture and the creation of alternative income opportunities for women and men of working age.

7. *Builds adaptive capacity at multiple levels and within existing institutions*: Good practice involves working with local government (such as municipal or district) to build adaptive capacity.

While working at the community level is necessary, it is not a sufficient response to support effective CCA on its own. Working with local government is critical because it is at this level that many government policies are implemented. To some extent, it is at this level that some of those policies are influenced in light of the local context. It is also the level at which the impact of climate change are most clearly manifested. Building adaptive capacity for the most vulnerable therefore requires a two-tiered approach. First, a 'bottom-up', locally-inclusive approach to adaptation planning, which is sensitive to the disaggregated nature of climate change vulnerability and the fault lines of social exclusion at the local level; and second, this local level adaptation must be supported by meso- and higher-level institutions that enable the access of poor and excluded groups to the assets and institutional systems they require help from to build their adaptive capacity and that act as the means of delivery for external resources to facilitate adaptation, thereby governing access to such resources.¹²³

As demonstrated in the LAPA pilot in Nepal, it is not enough simply to work with local communities; local and district government is an essential component, both for financial and technical support. In strengthening these institutions, it is possible to strengthen community responses and provide greater support in the longer-term efforts, long after the NGOs have left the community.

6 Gaps in current knowledge and what is needed¹²⁴

By examining the literature and assessing case examples of adaptation in the region, it becomes apparent that there are a number of gaps in knowledge, capacity, and experience. These include a lack of information on climate impacts in some of the region's most vulnerable areas, which are hotspots of climate change; and a lack of research and knowledge across a range of interconnected issues. Capacity-building within and among different stakeholders, better ways to monitor and evaluate CCA work, and improved knowledge management, including the documentation of good adaptation practices, are all that is needed.

6.1 Overall gaps

Among the many gaps identified, the following provide a general overview:

- General lack of research;
- Inadequate tools, knowledge, and financial resources;
- Lack of infrastructure;
- Issues related to communicating what climate change actually is to different groups;
- Insufficient long-term perspective, aggravated by short-term funding cycles;
- Lack of integration among adaptation strategies in food security and development strategies;
- Insufficient integration between institutions, including intergovernmental co-operation.¹²⁵

6.2 Research on various issues

6.2.1 The region's hotspots

There are two major 'hotspots' in the region where large populations live in vulnerable areas.¹²⁶ These areas require research to better understand how they are likely to be affected and how they can adapt.

- *The Eastern Ganges Basin:* This basin contains one of the world's largest concentrations of people vulnerable to climate change, owing to their settlement and livelihood characteristics. These vulnerabilities include: floods, droughts and extreme storms, compounded by a long history of development activities that have altered drainage and other natural systems in the east; changes in snow and increasing glacial melt in the upper zone; floods, sea level rise, and the impacts of storms in the lower zone; and a heavy dependence on monsoons, which may also be destabilised by climate change.¹²⁷
- *Other major river deltas:* In addition to the Ganges Basin, the Ganges-Brahmaputra Delta and other major deltas, such as the Indus, Kaveri, and other large rivers draining the Deccan plateau, are also vulnerable for the following reasons: they have low gradients, thereby making them particularly vulnerable to flooding from upstream areas; sea level rise and extreme coastal storms are likely to intensify; they are heavily dependent on sediment loads that are likely to be affected both directly by climate change and by any river management activities implemented upstream; and wetland and brackish water ecosystems, which often play a major role in regional livelihoods, are highly vulnerable to changes in temperature, salinity, and sediment.¹²⁸

6.2.2 Climate and hydro-geological changes

There is currently a lack of information and statistical analysis related to climate and hydro-geological changes in the region. This is compounded by poor connection between decision makers and the scientific community, inadequate climate risk assessment methods, a scarcity and inadequacy of technical instruments, a scarcity of experience and financial capacity of governments in managing climate change studies, and insufficient real-time information on rainfall and water levels for operational schemes.¹²⁹

6.2.3 River basin management

Across the region there is currently no river basin management system or any long-term strategy for water management.¹³⁰ This is compounded by insufficient co-ordination between agencies, a low investment, lack of clear regulation for rational land use, and inefficient use of water, especially for agricultural purposes. An example of this is the lack of co-ordination between national and international institutions for river basins that transcend national boundaries. This has led to fragmented scientific research and consequently, to lost opportunity in terms of creating a common strategy to solve trans-boundary environmental issues.¹³¹

Those responsible for managing river basins, including local governments, need to co-operate with a range of stakeholders in order to:

- Advance monitoring and statistical analysis of their particular basin;
- Disseminate information to communities and other institutions;
- Operationalise flood and river overflows forecasting and alert systems;
- Improve understanding of the different types of interventions needed to regulate river flow during wet and dry seasons;
- Manage natural resources more effectively, including through efficient water use and land-use planning.

6.2.4 Social and institutional mechanisms to support migrants

Research on climate-induced migration is urgently required, particularly given that migration is already putting a strain on resource-poor local municipalities, peri-urban centres, and crowded cities. Such research should include the following:

- Research to understand how climate variability has affected migration patterns and the extent to which remittance is used for productive investment either in climate-proofing infrastructure or for setting up new businesses;
- Research or documentation of learning from initiatives designed to support communication, insurance, and social security requirements of migrants.¹³²

6.2.5 Managing rangeland and enhancing livestock productivity

Given the declining availability and quality of pastures in drought prone areas, there is a need to rethink how community-based management of common resources may work in a context where social relations between sedentary populations (farmers) and pastoral groups are exacerbated by conflict. This could include research to better understand the following:

- The interface between cropping and fodder needs, in order to maximise returns for marginal and poor populations;
- The reciprocal sharing arrangement between local farmers and pastoralists, and implications for adaptive strategies;
- The implication of chemical fertilisers (and the resultant reduction in livestock manure use) on the nutrient cycle;

- How market access to poor farmers can improve and strengthen livelihoods and resilience.¹³³

6.2.6 Factors enabling and constraining autonomous adaptation

While autonomous adaptation is likely to become more common and widespread than planned adaptation, most research and policy dialogue have so far focused on the latter.¹³⁴ In order to better understand the drivers of autonomous adaptation, research across a number of related areas would benefit the region, including as follows:

- Research on economic diversification at household level and how this reduces the impacts of climate change;
- Research to test the links between access to basic services, such as energy, water, transport, finance, health, and education; and how these affect a community's ability to adapt;
- Research to identify opportunities for encouraging the spread of low-carbon technologies to support diversification and mobility in areas undergoing rapid economic development.¹³⁵

6.2.7 Role of financial mechanisms in spreading risks

As pressure increases on traditional risk-sharing strategies (borrowing from family, friends, and social networks) so too does the exploitative nature of moneylenders, particularly during disasters. How people access financial institutions for micro-credit, insurance, and financial services requires further research and documentation.¹³⁶ This could include:

- Micro-finance research to better understand how micro-finance can be linked to larger social support systems that strengthen livelihoods and increase disaster risk resilience rather than increase the risk and debt burden for the poor;
- Financial incentives research to identify how risk sharing and risk transfers can be promoted through existing institutional mechanisms in terms of CCA.¹³⁷

6.3 Capacity-building and who should be involved

Capacity, knowledge, and experience gaps are common across South Asia, particularly the spread of concept and experience regarding effective strategies for adaptation.¹³⁸ Moreover, while the issue of knowledge varies from country to country, a common challenge is the way that knowledge and learning are structured, which may require new approaches to sharing learning and expertise.¹³⁹ These approaches should value diversity, rather than uniformity, in local and regional response strategies in order to foster resilience.¹⁴⁰ Most of all, new approaches will need to build practical local strategies for experimentation, local and scientific risk assessment, and systematic sharing of research results.¹⁴¹ Some strategies to achieve greater knowledge in the region could include the following:

- Building relationships and developing a common understanding and shared knowledge among various groups of people, including groups of politicians and researchers;
- Strengthening the structures of organisations responsible for disseminating information;
- Working in collaboration to embrace innovations and to create synergies among communities, the private sector, and government to work across levels from the local to the global, rather than focusing on strategies that emerge from one mindset;
- Documenting management initiatives, particularly those involving the participation of local populations and organisations as well as the government;

- Building the basis for informed dialogue through broad-based communication strategies that reach key audiences, forums for debate, social networks, and partnerships;
- Building research capacity at various levels of governance and among public, private, and community organisations;
- Providing access to funding and ensuring that research institutions are guaranteed intellectual independence.¹⁴²

In terms of engaging key stakeholders, while they may vary from country to country, the following actors should be involved:

- *Policy makers operating across sectors nationally:* Given that many of the research issues focus on topics that have major cross-sector policy implications, policy makers and their agencies should be involved. This includes such key agencies as planning and finance.¹⁴³
- *Sector-specific organisations:* Given that adaptation is enabled or restricted by access to communication, transport, finance, energy, water resources, and ecosystem services, government and non-government organisations involved in these sectors should be included.¹⁴⁴
- *Research and policy networks:* Given the wide variety of issues involved, partnerships that incorporate diverse coalitions of NGOs, academics, private sector, and government actors are likely to be of particular importance in supporting adaptation. This could include regional or sub-regional partnerships for fostering cross-regional learning, technical support, and capacity-building, in addition to highly prioritised national level networks to influence policy;
- *Local and regional governments:* In all areas, the factors that inhibit and promote adaptation are heavily influenced by local contexts and specific conditions. As a consequence, action is needed to improve connections between sophisticated high-level research and local governments so that the knowledge generated through research enables improved practice and vice versa.¹⁴⁵
- *National and international NGOs:* Organisations, such as Oxfam, play an important role in bringing together communities with different levels of government, and a diverse set of actors.¹⁴⁶ They also play important roles in advocacy and in putting to testing practical adaptation.

6.4 Monitoring and evaluation frameworks for adaptation

Given the innovation needed within aid and development work in order to tackle the unavoidable impacts of climate change, an integral part of this work includes monitoring, evaluation, and learning to demonstrate the difference and impact of adaptation processes and actions.¹⁴⁷ This will not only provide improvements in programme design and implementation for future activities within programmes, but will also provide opportunities for organisational development and motivate staff.

Monitoring, evaluating, and learning are doubly important within CCA because climate change is taking communities, local and national governments, and other stakeholders into uncharted territories. This means that all stakeholders will need to learn what does and does not work, and build upon successful strategies.

Wherever possible any adaptation practice should aim to:

- Facilitate a 'safe space' for communities and other stakeholders to experiment with different ideas and solutions without putting themselves at greater risk;

- Ensure that stakeholders (communities, government authorities, and other organisations) are actively involved in monitoring and evaluating the outcomes of the actions they implement, and that frameworks recognise and maintain local relevance;
- Build on what works and what does not in order to improve CCA programming for the future.¹⁴⁸

At present, there is a lack of information on how to monitor and evaluate CCA, including benchmarks or framework that is participatory, practical, and replicable at the community level. A number of organisations, however, are in the process of developing such frameworks, including CARE which, along with other development organisations, is developing a participatory and open-source methodology that can be used by communities, planners, practitioners, and researchers to monitor, evaluation, reflect and learn from adaptation processes and activities. It is hoped that this tool will provide a new platform for encouraging downward accountability of institutions and service providers to vulnerable groups, and present an opportunity for building local adaptive capacity that can inform the monitoring and reporting needs of stakeholders across scales.

CARE's existing CVCA methodology has a 'Framework of Milestones and Indicators for Community-Based Adaptation', which covers four areas it considers essential for effective adaptation: addressing underlying drivers of vulnerability; capacity development; climate-resilient livelihoods; and DRR.¹⁴⁹ These four areas are consistent with those identified throughout the report, providing a useful reference for understanding how to measure adaptation progress in South Asia and other regions. The United Nations Development Programme (UNDP) has also been active in developing a monitoring and evaluation framework, which aims to incorporate both quantitative and qualitative indicators; ground projects in tangible changes that can be objectively evaluated; and capture lessons and case studies for global dissemination.¹⁵⁰ It uses three main tools: the Vulnerability Reduction Assessment, which is a question-based approach whereby local meetings with community members are the vehicle for measuring progress; the Impact Assessment System, which monitors progress primarily in biodiversity and land management in its Global Environment Facility (GEF) focal areas using quantitative indicators to track biophysical ecosystem indicators, as well as policy impact, capacity development, and awareness-building; and the UNDP Climate Change Indicator Framework, which focuses on NRM.

Despite these initial steps, much more is needed to develop practical and effective ways of monitoring, evaluating, and learning about CCA that work not only for organisations and donor organisations, but also for communities themselves.

6.5 Documenting good practice

One of the major challenges and constraints this review faced was a lack of useful documentation on adaptation practice. Without exception, the majority of countries and cases did not provide adequate information on their work in order to accurately assess their effectiveness. While we are all still learning about adaptation, and its practice is in the early stages, documentation and shared learning becomes especially important. This includes not only documentation of the 'what' but more importantly documentation that goes into details about the 'how' in order to explain the process of working with communities and other stakeholders; the approaches, methodologies, and tools taken; and why these were important. This also includes details on the early success and challenges of particular project and programmes, given the need to learn both from what works and, just as vitally, from what does not. In order for this to happen, there is a need to increase investment in the skills of staff and partners, thereby enabling them to draft their work in a manner that promotes learning outside of the project. This will require additional training and support, as well as funding so that documentation and sharing becomes an integral part of programming, rather than merely an afterthought or a means to fulfil funding requirements.

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Appendix 2 Projects and programmes reviewed

Regional			
Project	Sector	Description	Organisation & online source
Nepal, India (and China): Adapting to Glacial Melting in the Himalayas.	Water, DRM	Monitoring of glacial melt, predicting glacial lake outburst floods, and educating communities about associated risks and preparedness actions.	WWF http://www.panda.org/about_wwf/where_we_work/asia_pacific/where/nepal/our_solutions/projects/index.cfm?uProjectID=NP0898
Bangladesh			
Project	Sector	Description	Organisation & online source
Bangladesh: Post-Flood Rehabilitation.	DRM, agriculture, water	Autonomous adaptation where communities recover from floods by draining fields. Planting late-transplant rice or switching to other, faster-growing crops.	Government of Bangladesh and local NGOs http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=160
Bangladesh: Enhancing Adaptive Capacity to Prolonged Flood and Water-Logging in a South Central Floodplain.	DRM, agriculture, water	Implementation of several measures (e.g., crop diversification, disaster preparedness) targeting the threat of sea level rise and storms.	SouthSouthNorth and the Society for Wetland Eco-Research http://www.southsouthnorth.org/country_home.asp?country_id=11#112
Bangladesh: Livelihood Adaptation to Climate Variability and Change in Drought-Prone Areas: Developing Institutions and Options.	DRM, agriculture, water	Development of a 'good practice' adaptation option menu, evaluating and field testing locally selected options with farmers.	FAO and the Asian Disaster Preparedness Centre http://www.fao.org/docrep/009/a0820e/a0820e00.htm

Bangladesh: Community Adaptation to Salinity and Cyclones in the Southwest Coastal Region.	DRM, agriculture, coastal resources, water	Implementation of a suite of adaptation measures (e.g., agricultural diversification, aquaculture promotion, disaster risk reduction) in coastal areas to deal with sea level rise and storms.	SouthSouthNorth and partners. http://www.southsouthnorth.org/country_home.asp?country_id=11#113
Bangladesh: Disappearing Lands: Supporting communities affected by river erosion	DRM, NRM, agriculture, water	Conceived as a DRR project, there are lessons for CCA as the project worked effectively with communities to reduce their vulnerability to river erosion, flooding and weather-related disasters.	Practical Action See: Practical Action (2010) Coping with Disasters.
Bangladesh: Catastrophic flood meso insurance	DRM,	<i>This project is still in the early stages.</i> Index-based flood insurance for people living in flood prone areas for agriculture, livestock, homestead and infrastructure. Payouts are made based on a pre-agreed index.	Oxfam. See Oxfam (n.d). 'Catastrophe Flood Meso Insurance in Bangladesh Feasibility Report'.
Bangladesh: Assistance to local communities on climate change adaptation and disaster risk reduction	DRM	This project examined DRR approaches in three areas (one prone to cyclones and salinity, one prone to regular flooding, one prone to drought) to assess whether the interventions were effective in supporting communities adapt to climate-driven disasters	Action Aid See: ActionAid (n.d.). 'Sustainable success in uncertainty'.
Bangladesh: Comprehensive Disaster Management Programme.	DRM	Bangladesh's Comprehensive Disaster Management Programme is incorporating risk-assessment-and-reduction into its scope of activities to better deal with floods, droughts, and storms.	CDMP http://www.cdmp.org.bd/
Bangladesh: Scaling up community-based adaptation with local government	Agriculture, water, livelihoods	<i>This project has not yet started.</i> To be implemented in four climate hot spots in three physiographic zones that are prone to flood, drought, cyclones and salinity.	ActionAid See: ActionAid (2010): 85-86.

Bangladesh: Flood-Resilient Aquaculture in Faridpur.	Coastal resources, water	Flood-friendly fisheries technologies.	Practical Action http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=36
Bangladesh: Flood-Resistant Housing in Faridpur.	DRM	Development of low-cost housing model based on PCVA process.	(http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=35)
Bangladesh: Flood-Resistant Housing through Micro-Loans.	DRM	Provision of loans for two house designs that are specially adapted to heavy rains and floods, and can even be dismantled and reassembled in severe flood events.	Grameen Bank http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=38
Bangladesh: Coping with Climate Change.	DRM, agriculture, sustainable livelihoods	Oxfam is helping poor communities prepare for various climate change impacts, by forming committees and training people, promoting appropriate crops, and assessing water supply and storage.	Oxfam http://www.oxfamnovib.nl/id.html?lang=EN&id=PROJ_DETAIL&pid=BAN-501114-0006018
Bangladesh: Preparing for Floods.	DRM, water	Construction of raised villages in flood-prone areas, distributed rescue boats and lifesaving equipment, and trained disaster preparedness committees.	Oxfam http://www.oxfam.org.uk/what_we_do/issues/climate_change/story_facingheat.htm
Bangladesh: Participatory Climate Risk Assessment and Development of Local Adaptation Action Plans.	DRM, sustainable livelihoods	Development of risk communication strategies and testing adaptation options to foster adaptation policy at the local level.	North South University http://www.acccaproject.org/evolution/modules/knowledgebox/external2/view.php?id=304&kbid=5
Bangladesh: Social Forestry (Roadside Plantation) Project.	NRM, DRM	Reforestation programme that educates erosion and guarantees a standing stock of biomass that can be used in emergencies.	Caritas http://www.cckn.net/pdf/seeing_the_light_dre.pdf

Bangladesh: Enhancement of Adaptive Capacity of Drought Vulnerable Community in North West Region of Bangladesh.	Agriculture, water	Use of a variety of means (e.g., integrated farming methods, rain-water gathering) to promote adaptive capacity in agriculture and water conservation.	SouthSouthNorth and partners http://projects.wri.org/adaptation-database/bangladesh-enhance-ment-adaptive-capacity-drought-vulnerable-communities
Bangladesh: Improved Adaptive Capacity to Climate Change for Sustainable Livelihoods in the Agriculture Sector	Sustainable livelihoods	CBA project to promote livelihood adaptation and reduce vulnerability to climate change. Based on findings of assessments, the project promotes institutional and technical capacity building within key agencies and among farmers' associations/groups for demand-responsive services. Developed, and is constantly updating, a menu of diversified good practice, locally prioritized adaptation practices. Key role for participatory extension work.	FAO in partnership with Department for Agricultural Extension ftp://ext-ftp.fao.org/SD/Reserved/Agromet/FAO&ClimateChangeCROM/docs/Natural per cent20resources per cent20and per cent20environment/i0481e.pdf
Bangladesh: SHOUHARDO-II- Strengthening Household Abilities for Responding to Development Opportunities	Sustainable livelihoods	CBA project, focused on duck rearing as a livelihood strategy for women.	CARE Bangladesh http://www.care.org/careswork/projects/BGD094.asp http://pdf.usaid.gov/pdf_docs/PDACP746.pdf
Bangladesh: Clustered villages	DRM, water	Project with Livelihoods approach to DRR (aim of increasing resilience to flooding). Linked to wider national and institutional initiatives. Project involved training and capacity development; also building low-cost raised dwellings (cluster houses).	Practical Action http://www.bdresearch.org.bd/home/protifolon_3.pdf http://practicalaction.org/docs/ia1/good-practices-community-resilience-052009.pdf
Bangladesh: Enhancing Coping and Adaptation Capacity of the Community to Reduce	DRM, water	Project to introduce and encourage uptake of adaptation activities to reduce climate change related flood and water logging.	Caritas Bangladesh with support from Bangladesh Centre for Advanced Studies (BCAS).

Vulnerability to Climate Change.		Capacity building of community to improve coping mechanisms during high flood and water logging.	Not available online.
Bangladesh: Reducing Vulnerability to Climate Change (RVCC) Project	Agriculture, water, DRM, sustainable livelihoods	<p>Project piloting an integrated Community-Based Adaptation approach to vulnerability reduction to climate change.</p> <p>First in depth documented study of CCA process.</p> <p>Focused on raising awareness of climate change and associated vulnerability areas, promoting concrete actions by households and communities to reduce their vulnerability.</p> <p>Equally advocated with the government at multiple levels for appropriate action to reduce vulnerability to climate change.</p> <p>One resulting action was a campaign for the government to provide safe water to vulnerable populations, and to address the problem of saline intrusion in the south-western part of the country.</p>	<p>CARE Bangladesh</p> <p>http://www.careevaluations.org/Evaluations/BGD_per_cent20-per_cent20RVCC_per_cent20-per_cent20Progress_per_cent20Report_per_cent20-per_cent20Feb_per_cent202005.pdf</p> <p>http://www.docstoc.com/docs/68415702/LESSONS-LEARNED-FROM-THE-Reducing-Vulnerability-to-Climate-Change</p> <p>http://www.carebangladesh.org/publication/Publication_6555355.pdf</p> <p>Book:</p> <p>Ahmed, A. U. (Ed.) (2011) <i>Reducing Vulnerability to Climate Change: The Pioneering Example of Community-Based Adaptation in Bangladesh</i>. Dhaka, Bangladesh, Centre for Global Change.</p>
Bangladesh: Community-based Adaptation to Climate Change through Coastal Afforestation	Forestry, livelihood diversification	This project works with coastal communities to establish over 6,100ha of mangrove plantations and 935ha of non-mangrove plantations, planted and managed by local administrations and communities.	<p>UNDP Bangladesh</p> <p>See: UNDP Bangladesh (n.d) 'Community-based Adaptation to Climate Change through Coastal Afforestation'. Project Factsheet.</p>
Bangladesh: Action Research for Community Adaptation in Bangladesh (ARCAB)	Various sectors	<p><i>This programme has not yet started.</i></p> <p>ARCAB is a long terms programme of actions focused on CBA in five major agro-ecological zones. An initiative of nine international NGOs and one national NGO (BCAS) it</p>	<p>BCAS and IIED</p> <p>See: BCAS (n.d.); ARCAB (n.d.)</p>

		aims to collect community-based knowledges on adaptation, and generate empirical knowledge on CBA through action research.	
Bangladesh: Local Capacity Building for Advancing Community Adaptation to Climate Change in Bangladesh.	Agriculture, water, DRM, sustainable livelihoods	Suite of interventions (soft and hard) to reduce climate risks and vulnerability of local people in nine villages. Interventions included: awareness raising, PCVA, village committee formation, exchange visits, rainwater harvesting, flood and cyclone resistant housing, trialling of saline tolerant crops, floating gardens, etc.	Bangladesh Centre for Advanced Studies (BCAS). Not available online.
India			
Project	Sector	Description	Organisation & online source
India: Community Disaster Resilience Fund	DRM	Mechanism to direct resources for disaster risk reduction (DRR) to vulnerable communities. Used for projects which improve community capacity to identify own vulnerabilities and demonstrate pro-poor approach to DRR.	The National Alliance for Adaptation and Disaster Risk Reduction, (network of 170 organisations working with local communities). In partnership with ProVention Consortium, GROOTS International National Management Authority of India (NDMA). http://www.bdresearch.org.bd/home/protifolon_3.pdf http://www.preventionweb.net/files/8947_8947CDRFRreport091.pdf http://www.preventionweb.net/files/11787_CDRFReportOct2009.pdf
India: Community based food and livelihood security mechanism on the flood plains of river basins.	Sustainable livelihoods, water	Development of a seed/grain bank to improve community food and livelihood security.	Rural Volunteers Centre, Assam (in connection with National Alliance for Disaster Risk Reduction, India). Not available online.

<p>India: Community based institutions.</p>	<p>Agriculture, water</p>	<p>Component of the 'Vulnerability assessment and adaptive capacity to climate change in semi-arid regions in India' (V&A) pilot programme.</p> <p>Focus on strengthening community institutions to improve adaptive capacity. Includes water user committees, pasture management committee and smart farmers clubs.</p>	<p>Managed by a national consortium: MSSDF; Action for Food Production; National Institute of Agriculture Extension management. Supported by international consortium: INFRAS and Intercooperation. Funded by SDC.</p> <p>http://www.intercooperation.org.in/images/Climate_per_cent20Change_per_cent20- per_cent20Introduction_per_cent20to per_cent20V&A per_cent20Case per_cent20studies.pdf</p> <p>http://www.intercooperation.org.in/images/Climate_per_cent20Change_per_cent20- per_cent20Case per_cent20study per_cent20on per_cent20Community per_cent20based per_cent20Institutions.pdf</p>
<p>India: Institutionalisation of emergency service delivery mechanism in flood plains of Brahmaputra River basin</p>	<p>DRM</p>	<p>Community owned and managed resource centre intended for immediate local emergency response.</p>	<p>Rural Volunteers Centre, Assam (in connection with National Alliance for Disaster Risk Reduction, India).</p> <p>http://www.nadrrindia.org/resources/RVC-standard/Best_per_cent20Practice_per_cent20for per_cent20Adaptation-and-DRR_Case1_Duryug per_cent20Pratirodh per_cent20Samiti_RVCAssam2009.pdf</p>
<p><i>India: Integrated Land and Ecosystem Management to Combat Land Degradation and Deforestation in Madhya Pradesh</i></p>	<p>NRM, sustainable livelihoods, water</p>	<p>Project aiming to promote community-driven sustainable land and ecosystem management at the landscape level through integration of watershed management, joint forest management, and sustainable livelihoods development so as to balance ecological and livelihood needs.</p>	<p>UNDP, in partnership with Ministry of Environment and Forests, State Government of Madhya Pradesh. Funded by GEF Trust Fund.</p> <p>http://www.adaptationlearning.net/project/integrated-land-and-ecosystem-management-combat-land-degradation-and-deforestation-madhya-pr</p> <p>http://gefonline.org/projectDetailsSQL.cfm?projID=3472</p>

India: Pastureland development (Rajasthan)	Agriculture, water	<p>Component of the 'Vulnerability assessment and adaptive capacity to climate change in semi-arid regions in India' (V&A) pilot programme.</p> <p>Focus on community centred efforts to protect pasture lands and develop them through the adoption of soil and water conservation measures.</p> <p>Central element was increasing the capacity of the community to manage and maintain pastures and set up buffer stocks of fodder.</p>	<p>Managed by a national consortium: MSSDF; Action for Food Production; National Institute of Agriculture Extension management. Supported by international consortium: INFRAS and Interco-operation. Funded by SDC.</p> <p>http://www.intercooperation.org.in/images/Climate_per cent20Change_per cent20- per cent20Case per cent20study per cent20on per cent20Pasture per cent20Land per cent20Development.pdf</p>
India: Preparing future generations to understand, plan and reduce risks of disaster in flood plains of Brahmaputra river basin.	DRM	Development of a village/school based institution aiming to help children understand disaster, plan to address disaster and in turn plan to reduce risks of disaster in their own initiatives.	<p>Rural Volunteers Centre, Assam (in connection with National Alliance for Disaster Risk Reduction, India).</p> <p>http://www.nadrrindia.org/resources/RVC-standard/BestPractice-for-Adaptation-and-DRR_Case2_Sishu-Duryug-Pratirodh-Samiti_RVCAssam2009.pdf</p>
India: System of rice intensification (SRI) (Andhra Pradesh).	Agriculture, water	<p>Component of the 'Vulnerability assessment and adaptive capacity to climate change in semi-arid regions in India' (V&A) pilot programme.</p> <p>Focus on promoting adoption of SRI – package of practices which reduce water requirements of rice cultivation while increasing yields and reducing need for other inputs.</p>	<p>Managed by a national consortium: MSSDF; Action for Food Production; National Institute of Agriculture Extension management. Supported by international consortium: INFRAS and Intercooperation. Funded by SDC.</p> <p>http://www.intercooperation.org.in/images/Climate_per cent20Change_per cent20- per cent20Case per cent20study per cent20on per cent20The per cent20System per cent20of per cent20Rice per cent20Intensification.pdf</p>

<p><i>India: Sustainable Land and Ecosystem Management (SLEM) Partnership Program.</i></p>	<p>NRM, agriculture</p>	<p>Focus on the prevention and control of land degradation; enhancement of local capacity and institution building to strengthen land and ecosystem management; Facilitation of knowledge dissemination and application of national and international good practices in SLEM; replication and scaling-up of successful land and ecosystem management practices and technologies.</p>	<p>The World Bank in partnership with Indian Ministry of Environment & Forest, Ministry of Rural Development and Ministry of Agriculture. Funded by GEF Trust Fund.</p> <p>http://www.adaptationlearning.net/project/sustainable-land-and-ecosystem-management-slem-partnership-program-0</p> <p>http://www.adaptationlearning.net/project/sustainable-land-and-ecosystem-management-slem-partnership-program</p>
<p><i>India: Sustainable Rural Livelihood Security through Innovations in Land and Ecosystem Management.</i></p>	<p>NRM, agriculture</p>	<p>Project focused on strengthening institutional and community capacity for sustainable land and ecosystem management through approaches and techniques that combine innovative and indigenous techniques for restoring and sustaining the natural resource base, including its biodiversity, while taking account of climate variability and change.</p>	<p>The World Bank in partnership with Department of Agriculture, Union Ministry of Agriculture and Union Ministry of Environment and Forests</p> <p>http://www.adaptationlearning.net/project/sustainable-rural-livelihood-security-through-innovations-land-and-ecosystem-management</p> <p>http://gefonline.org/projectDetailsSQL.cfm?projID=3470</p> <p>http://www.reliefweb.int/rw/RWFiles2009.nsf/FilesByR_WDocUnidFilename/MWAI-7RE8R8-full_report.pdf/\$File/full_report.pdf</p>

India: water resource management (Rajasthan).	Agriculture, water	<p>Component of the 'Vulnerability assessment and adaptive capacity to climate change in semi-arid regions in India (V&A) pilot programme.</p> <p>Focused on addressing water related challenges and make community agricultural systems more resilient to emerging climate risks. Included measures to increase the amount of ground and surface water available to livestock activities; improve water management; reduce water demand in the production system.</p>	<p>Managed by a national consortium: MSSDF; Action for Food Production; National Institute of Agriculture Extension management. Supported by international consortium: INFRAS and Intercooperation. Funded by SDC.</p> <p>http://www.intercooperation.org.in/images/Climate_per cent20Change_per cent20- per cent20Case_per cent20study_per cent20on_per cent20Water_per cent20Resource_per cent20Management.pdf</p>
India: Weather based farming model (Andhra Pradesh and Rajasthan).	Agriculture	<p>Component of the 'Vulnerability assessment and adaptive capacity to climate change in semi-arid regions in India (V&A) pilot programme</p> <p>Focus on establishing village level mini agro-observatories to help community develop weather based thumb rules.</p>	<p>Managed by a national consortium: MSSDF; Action for Food Production; National Institute of Agriculture Extension management. Supported by international consortium: INFRAS and Intercooperation. Funded by SDC.</p> <p>http://www.intercooperation.org.in/images/Climate_per cent20Change_per cent20- per cent20Case_per cent20study_per cent20on_per cent20WFMC.pdf</p>
India: Building Community Resilience through Watershed Restoration.	Agriculture, water	Helps poor communities in Maharashtra state reclaim drought-degraded lands through watershed management.	<p>The Watershed Organisation Trust</p> <p>http://www.iisd.org/pdf/2003/envsec_livelihoods_3.pdf</p>
India: Promoting Integration of Adaptation Strategies into Developmental Policies by Effectively Communicating Climate Risks and Adaptation Measures in the Bundelkhand Region.	Agriculture, water	Several organisations collaborated to develop communication materials about agriculture and water risk, and conduct a pilot adaptation project.	<p>ACCCA</p> <p>http://www.acccaproject.org/evolution/modules/knowledgebox/external2/view.php?id=302&kbid=5</p>

India: Johads (Earthen Check Dams) in Rajasthan.	Agriculture, water	Construction of earthen check dams to retain monsoon water for times of drought.	Tarun Bharat Sangh http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=41
India: Pilot Project on Climate Change Adaptation for Sustainable Rural Development.	Forestry, water	Testing of technical solutions for watershed and forestry management programmes and financial instruments such as micro insurance.	Government of India. and GTZ http://www.gtz.de/de/dokumente/en-climate-results-asia.pdf
Nepal			
Project	Sector	Description	Organisation & online source
Nepal: Langtang Park and Buffer Zone Project	NRM, livelihoods	Programme to conserve biodiversity, enhance livelihood opportunities and sustain diverse cultures and traditions through integrated land, forest and water management.	WWF http://wwfnepal.org
Nepal: <i>No project name given.</i>	DRM	Project to raise awareness of causes and effects of natural disasters. Involved participative vulnerability and capacity analysis and formulating and acting on CAPs.	Practical Action Nepal in partnership with SAHAMATI (local NGO) http://www.proventionconsortium.org/themes/default/pdfs//local_voices-case-studies.pdf
Nepal: Climate Change Adaptation and Advocacy	Agriculture, livelihoods, water	<i>This project has just started.</i> Project aimed at increasing climate change resilience among target groups through creation of livelihood options and incorporation of climate change adaptation practices in district and national level plans and programmes.	Oxfam. Not available online.

Nepal: Flood Preparedness Project	DRM	Project focusing on preparation for flooding: includes installing early warning system; physical infrastructure; strengthening communities' capacity to manage floods through capacity building and awareness raising, in turn strengthening coping strategies.	Practical Action http://practicalaction.org/climate-change/nepalfloods http://practicalaction.org/docs/region_nepal/sewin-project-summary.pdf
Nepal: SAMADHAN – Building disaster resilience of vulnerable communities in Nepal.	DRM	Awareness raising and capacity building project – ongoing.	CARE Nepal http://expert.care.at/?id=1135 http://expert.care.at/uploads/media/NPL075_final_evaluation.pdf http://expert.care.at/uploads/media/NPL075_final_report.pdf
Nepal: Application of Community-Based Adaptation Measures to Weather Related Disasters.	DRM	A collective disaster insurance scheme in Western Nepal.	Himalayan Climate Centre http://www.acccproject.org/evolution/modules/knowledgebox/external2/view.php?id=300&kbid=5
Nepal: Mitigating the Risk of Glacier Lake Outburst Floods.	DRM, water	Reduction of water level in Tsho Rolpa Lake to prevent glacial lake outburst floods, and development of an early warning system for downstream villages.	Government of Nepal http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=72
Nepal: Strive For Climate Change Awareness and Action	Awareness raising	Project to increase understanding of climate change among students, youths; civil society, development workers and government officials of Nepal.	Clean Energy Nepal Not available online.
Nepal: Livelihoods and Forest Programme (LFP)	Forestry, water	LFP supports community groups to manage over 396,000 hectares of forest, resulting in improved forest condition, biodiversity and ability to capture and store carbon. The community forests also help local users to increase their ability to prepare for and adapt to effects of climate change. Although not originally designed	DfID and the Government of Nepal http://www.lfp.org.np

		with climate change in mind the programme has responded and a range of activities are taking place based on the LFP climate change strategy.	
Pakistan			
Project	Sector	Description	Organisation & online source
<i>Pakistan: Community-based adaptation and advocacy in coastal Pakistan.</i>	Agriculture, DRM, water	Pilot project in response to community-based research project in coastal Pakistan. Project involved an adaptation component Strengthening and expansion of existing water ponds including installation of solar panels and pumps; construction of embankments using pressed earthwork; Rehabilitation of degraded land and use of appropriate crop varieties) advocacy component, and DRR component.	Oxfam http://img.mtnforum.org/en/node/20294 http://img.mtnforum.org/sites/mtnforum.org/files/pub/6370.pdf
<i>Pakistan: Building capacity on climate change adaptation in the coastal areas of Pakistan</i>		<i>This project has just started.</i> This project aims to increase community and government capacity to adapt to climate change, increase water governance and improve the resilience of delta ecosystems.	WWF Pakistan Not available online.
<i>Pakistan: Desert and Floodplain Adaptation</i>	Agriculture, water, livelihoods	Project focusing a range of soft and hard interventions in two ecological zones in Pakistan – desert and floodplain – to increase community resilience and adaptive capacity through participatory research, baseline study, social capital, community mobilisation, alternative cropping and livelihoods and tree plantation.	Practical Action and Rural Development Policy Institute (RDPI) See book: Ensor & Berger (2009).

<i>Pakistan: Spate Irrigation as an Adaptation Strategy</i>	Agriculture, water	A number of areas use spate irrigation whereby farmers construct fields by making embankments to store the flood water. Crops are then cultivated on spate and natural vegetation for survival of livestock also depends on this water.	http://maindb.unfccc.int/public/adaptation/adaptation_ca_sestudy.pl?id_project=69
<i>Pakistan: Rural Livelihoods Climate Change Adaptation Support Programme.</i>	Agriculture	<i>This project has not yet started.</i> This project aims to address and reduce the additional stresses and associated costs posed by climate change to the Pakistani agricultural production system.	IFAD. Funded by SCCF. http://www.adaptationlearning.net/project/rural-livelihoods-climate-change-adaptation-support-programme
Sri Lanka			
Project	Sector	Description	Organisation & online source
<i>Sri Lanka: Participatory Coastal Zone Restoration and Sustainable Management in the Eastern Province of Post-Tsunami Sri Lanka.</i>	DRM, NRM, sustainable livelihoods, water	Project focusing on rehabilitating tsunami affected ecosystems to provide full ecosystem services including adaptation against extreme climatic events. Objective is to restore and manage ecosystems and mainstream effectively into the reconstruction process to support sustainable livelihoods and reduce vulnerability to climate change along the East Coast of Sri Lanka.	International Fund for Agriculture in partnership with the World Conservation Union http://www.adaptationlearning.net/project/participatory-coastal-zone-restoration-and-sustainable-management-eastern-province-post-tsun http://www.gefonline.org/projectDetails.cfm?projID=2753
Sri Lanka: Pangu Work-Distribution Practice.	Agriculture, water	Pangu – a traditional system of co-operative irrigation reservoir maintenance helps ensure water availability in times of drought	International Water Management Institute http://maindb.unfccc.int/public/adaptation/adaptation_ca_sestudy.pl?id_project=152 http://www.unesco.org/most/bpik22.htm http://doc.utwente.nl/38681/

Sri Lanka: Seed trials of Indigenous rice.	Agriculture, water	Project involving trials of indigenous rice (saline tolerant), which were then marketed through farmers groups.	National Federation of Traditional Seeds and Agri-Resources with support from Practical Action http://www.bdresearch.org.bd/home/protifolon_3.pdf www.practicalaction.org/southasia http://pubs.iied.org/G02816.html http://pubs.iied.org/pdfs/G02816.pdf
Sri Lanka: Post-disaster reconstruction housing	DRM, infrastructure	Provision of housing to people with disabilities and those most vulnerable using an integrated development approach where the benefits of the project were felt by the wider community.	Practical Action See: Ibrahim (2010)
Sri Lanka: Increasing paddy salinity in coastal Sri Lanka	Coastal resources, agriculture, water	Project involving participatory research as an approach to multi-stakeholder involvement in the reintroduction of indigenous saline tolerant rice varieties.	Practical Action See book: Ensor & Berger (2009).
Sri Lanka: Nawa Kekulama Farming System	Agriculture	A refined system of ecological paddy cultivation practiced by roughly 100 farmers in the North-Central Province of Sri Lanka.	http://maindb.unfccc.int/public/adaptation/adaptation_ca_sestudy.pl?id_project=27
Sri Lanka: Rainwater harvesting	Water	Project to construct ferro-cement rain water tanks in communities suffering water shortages.	Practical Action See: ITDG (2005: 25-27).
Sri Lanka: Agroforestry using coconut plantations	Agriculture	Use of land within coconut plantations to grow a variety of different crops including food crops (such as tubers, cereals, legumes and fruits), spices and condiments (such as arecanut, betel leaves, chillies, ginger and turmeric), and cash crops (like black pepper, cacao, cinnamon, cloves, coffee and nutmeg).	http://maindb.unfccc.int/public/adaptation/adaptation_ca_sestudy.pl?id_project=29

Sri Lanka: Indigenous forecasting	Agriculture, weather information	Use of Indigenous knowledge to predict weather.	Sri Lanka Resource Centre for Indigenous Knowledge http://maindb.unfccc.int/public/adaptation/adaptation_casestudy.pl?id_project=31
Sri Lanka: Women's Indigenous Knowledge of Water Management	Water	Water management strategies and management practices of women to manage water more sustainably in arid areas.	Sri Lanka Resource Centre for Indigenous Knowledge http://web.archive.org/web/20041218040330/www.nuffic.nl/ciran/ikdm/2-3/articles/ulluwishewa.html

Appendix 3 Most commonly used approaches, methodologies, and tools

Name	Sponsor	Purpose	Focus	Online source
Mainstreaming Adaptation to Climate Change in Agriculture and Natural Resources Management Projects	The World Bank	Guidance notes for lessons learned, best practices, recommendations, and useful resources for integrating climate risk management and adaptation to climate change in development projects	Programme planners	http://beta.worldbank.org/climatechange/content/mainstreaming-adaptation-climate-change-agriculture-and-natural-resources-management-project
Adaptation Policy Frameworks for Climate Change	UNDP	Roadmap for planners and policy makers on CCA	Programme planners, policy makers	http://www.undp.org/climatechange/adapt/apf.html
Adaptation Toolkit- Integrating Adaptation to Climate Change into Secure Livelihoods	Christian Aid	Toolkit for adapting livelihoods	Community	http://unfccc.int/files/adaptation/application/pdf/christianaid_ap_update_sep_09_toolkit_6_sp.pdf
CEDRA – Climate Change and Environmental Degradation Risk and Adaptation Assessment	Tearfund	Project assessment and decision support tool	Community	http://tilz.tearfund.org/Topics/Environmental+Sustainability/CEDRA.htm
Climate Analysis Indicators Tool	World Resource Institute (WRI)	Indicators and analysis tools designed to inform policy discussions concerning vulnerability and adaptive capacity	Policy	http://cait.wri.org
Climate Guide	International	Guidance on integrating climate change into	Multiple levels	http://www.climatecentre.org/site/p

	Federation of Red Cross/ Red Crescent (IFRC)	organisational work		ublications/85
CRiSTAL – Community-based Risk Screening Tool- Adaptation and Livelihoods	International Institute for Sustainable Development (IISD)	Project assessment and decision support tool	Community	http://www.cristaltool.org/
Climate Smart Disaster Risk Management (CSDRM)	Consortia of Plan International, Christian Aid and International Development Institute (IDI)	A framework to guide strategic planning, programme development and policy making. Additionally, a framework to assess the efficacy of existing DRM policies, projects and programmes in the context of climate change	Multiple levels	http://community.eldis.org/.59e0d267/SCR per cent20DRM.pdf
Climate Vulnerability and Capacity Assessment (CVCA)	CARE	Vulnerability and adaptation assessment tool.	Community	http://www.careclimatechange.org/publications/adaptation
Gender, Climate Change and Community-Based Adaptation: A Guidebook	UNDP	Guidance on integrating gender into CBA programming	Community	http://www.undp-adaptation.org/projects/websites/docs/Gender Climate Change and Community Based Adaptation (2).pdf
Local Adaptive Capacity Framework	ACCRA - Consortia of Oxfam, World Vision, Save the Children, CARE and Overseas Development Institute (ODI).	Framework for assessing local adaptive capacity	Community, up to national level	http://www.odi.org.uk/resources/details.asp?id=5177&title=adaptive-capacity-framework-local-level-climate
ORCHID – Opportunities and Risks from Climate Change and Disasters	Institute for Development Studies (IDS)	Climate screening and framework	Community	http://www.ids.ac.uk/climatechange/orchid

PCVA – Participatory Capacity and Vulnerability Assessment	Oxfam GB	Capacity and vulnerability assessment	Community	Not yet published Contact Edward Turvill (OGB) for information eturvill@oxfam.org.uk
SERVIR	SERVIR (supported by USAID & NASA)	Climate Change Monitoring System	Multiple levels	http://www.servir.net
Shared Learning Dialogues (SLDs)	Institute for Social and Environmental Transition (ISET)	Process for creating understanding between diverse stakeholders	Multiple levels	http://www.i-s-e-t.org/images/pdfs/WP per cent208_highres.pdf
Toolkit for Integrating CCA into Development Projects	CARE	Comprehensive set of tools for CCA integration	Multiple levels	http://www.careclimatechange.org
V2R – From Vulnerability to Resilience	Practical Action	Framework for analysis and action to build community resilience	Community (although other levels discussed)	Not yet available online

4 Examples of adaptation technologies in South Asia

Name	Purpose	Description
Pond sand filter (PSF)	<ul style="list-style-type: none"> To ensure clean water supply for domestic use in times of drought; To provide easy access to water source, saving time. 	<p>Water collected from a pond is stored in a tank (approximately 13ft x 10ft x 5ft). The water is purified through a five tier purification process. A tube well is also place on the tank for pumping out the water.</p> <p>The PSF reduces the amount of time needed to walk to collect water during times of drought.</p>
Rainwater harvesting	<ul style="list-style-type: none"> To meet basic needs for clean drinking water; To stores clean water for use during times of drought. 	<p>PVC pipe is attached to the edge of the roof to collect water, which is then funnelled into downpipes into an enclosed water tank, through a four-stage purification process. A tube well is linked to the tank to pump out water.</p>
Pond water harvesting using solar PV pump	<ul style="list-style-type: none"> To pump water to crop lands from ponds during times of drought; To reduce use of fossil fuel dependant pumps. 	<p>Using a 100ft x 100ft x 10ft pond, water is collected from rainfall to use for irrigation, fish culture and domestic purposes. A hydraulic pump is used and solar energy is drawn to activate the ump. It takes five solar panels plus a switchboard to pump water.</p> <p>The solar pump and pond are used to irrigate community owned land for growing vegetables. The water is also used for fish rearing and ducks.</p>
Information and technology exchange centre	<ul style="list-style-type: none"> To share, transfer and spread innovative ideas and technology related to climate change adaptation; To demonstrate and train farmers on improved seed varieties; To raise awareness on climate change issues within the broader community. 	<p>A permanent structure of varying size (depending on community size), equipped with chairs, benches and tables, books, posters, leaflets, newspapers etc. A committee looks after the general running of the centre. Set up as a space for regular meetings, trainings, linking and learning.</p>
Snakes and Ladders board game	<ul style="list-style-type: none"> To educate children about climate change and disasters. 	<p>Action Aid has developed a board game for children and communities to use to learn about climate change and raise awareness of hazards within the community.</p>

Floating gardens	<ul style="list-style-type: none"> To assist farmers grown crops in times of flood and inundation. 	Water hyacinth or deep water rice straw, along with bamboo are used to construct a floating garden bed. Farmers begin by laying a bamboo pole on dense water hyacinth to stand on and then pile more water hyacinth on top to make it compact. This makes a floating garden. After 10-15 days farmers can transplant seedlings. A wide range of vegetables can be grown on floating garden beds providing food and income in times that other activities are impossible due to flooding and inundation.
Crab cultivation	<ul style="list-style-type: none"> To move communities away from shrimp farming to crab cultivation and fattening. 	Crabs grow quickly and can provide poor communities with cash income. Crab cultivation requires little land, less time and less money than shrimp farming and has less environmental impacts.
Cluster housing	<ul style="list-style-type: none"> To raise the level of a group of houses to reduce risk of flooding; To encourage communities to engage in a range of different productive economic activities to increase their resilience to disasters. 	Cluster housing is an initiative which establishes a group of house in a particular location which is above the level of predicted floods. This reduces the physical exposure to floods, increases families' sense of security, but also increases families ability to engage in other activities to increase their resilience.
Flood proof tube wells	<ul style="list-style-type: none"> To ensure year-round access to safe drinking water. 	Before installation, information on the expected level of the water table is required and sites tested for arsenic contamination. The tube well base is generally 5ft x 5ft and its level higher than the highest recorded levels of past flood event, taking into account possible floods as a result of climate change.
Mobile library	<ul style="list-style-type: none"> To raise awareness and educate hard-to-reach communities through fun activities. 	A mobile library is equipped with materials and trainers/speakers and travels to hard-to-reach places to educate communities about climate change. The types of activities can vary but the mobile library is a focal point in the community from where activities can be arranged to suit the context.
Flood proof sanitary latrines	<ul style="list-style-type: none"> To ensure sewerage is contained within the latrine during times of flood. 	A flood proof latrine is a pit type latrine in which the earthen pit is protected by five concrete rings with a water trap pan at the top. The latrine bases are constructed with brick, sand and cement with the finished slab place high above flood levels (taking into account climate change projections).

Construction of embankments for flood protection	<ul style="list-style-type: none"> • - To protect agricultural lands from inundation. 	An embankment constructed of soil and other local material is built to protect land from flooding. The size of the embankment varies and can be temporary in nature to allow water to access the land once flooding has subsided.
Community based flood shelter	<ul style="list-style-type: none"> • To provide temporary shelter from floods for community members and their livestock. 	Sites suitable for construction of shelter chosen based on their resilience to flood events. Structures vary but most a two story to maximise space. Along with the construction of shelter is the development of a flood shelter management plan within the community.
Plantations to control river erosion	<ul style="list-style-type: none"> • To reduce flood damage and provide livelihood support for communities during flooding season. 	The practice involves planting flood resistant tree species along embankments, roads and other sites to increase vegetation cover, which also decreases soil erosion, conserves flora and fauna, can contribute to bio-fuels and overall socio-economic development. Before planning on site, tree species are grown in a community nursery.
Community based seed conservation	<ul style="list-style-type: none"> • To keep seeds safe from flood water; • To build capacity among farming communities in terms of appropriate seed conservation management. 	In order to develop a seed bank, research must be first conducted into the types of seed used in the community and their suitability in changing climatic conditions. Training and workshops can then take place to raise awareness of the farmers regarding techniques to save and store seeds. This is then followed by the construction of a suitable seed conservation site, and the formation of farmers groups to develop and manage the seed network among farmers.
Tidal River Management (TRM)	<ul style="list-style-type: none"> • To raise waterlogged areas using sediments brought in by tidal flows for agriculture. 	TRM is a concept derived from a traditional practice of sediment management, deeply embedded in Indigenous ecological knowledge, blended with Western science. It works in conjunction with natural tidal flows to deposit sediments into flooded lands, raising land in 1-2 years that is suitable for cultivation.
Portable and more efficient cooking stoves	<ul style="list-style-type: none"> • To facilitate cooking during times of flooding; • To reduce the incidence of smoke which has negative health implications for women; • To reduce the amount of fuel required, lessening the impact on the environment. 	Made from clay and mud, stoves are designed in a way to make them portable and more fuel efficient.

Duck rearing	<ul style="list-style-type: none"> To provide sources of protein and income during times of flood. 	Ducks are more adapted to flood conditions than chickens and eggs to be sold or eaten for household consumption providing necessary protein for family members.
Caged fish cultivation	<ul style="list-style-type: none"> To provide a source of protein and income for farmers without access to ponds, and during times of flood. 	This technology is particularly useful for community members without access to ponds as they are able to cultivate fish in cages in the rivers. The cages can also be kept closer to the house during times of flood. Each cage is made from a steel frame and net and usually two to three cages are required for a typical family.
Minimum tillage and crop residue management	<ul style="list-style-type: none"> To increase soil organic content. 	This practice reduces exposure of the soil through application of crop residue (mulch). This helps prevent soil erosion, builds soil biodiversity, improves water filtrations for future crop use, and requires less energy for cultivation. This also increases soil organic matter and ultimately helps increase production.
Sloping Agricultural Land Technology (SALT)	<ul style="list-style-type: none"> To maintain soil health and control insect pest populations. 	SALT is a method of growing field crops and permanent crops in 3-5 metre bands between contour hedgerows of nitrogen fixing trees. This helps add nitrogen to the soil and cut leaves and trees help reduce soil erosion.
GLOF early warning system	<ul style="list-style-type: none"> To warn people living in downstream areas of GLOF events. 	The GLOF early warning system consists of two main components: a GLOF sensing system and a GLOF warning system. The sensing systems detects the occurrence of a GLOF and transmits relevant information to the transmitter stations to initiate the warning process. Six water level sensors are installed in the river channel to detect the onset of a breach. These are connected to a transmitter station which relays the information downstream. The warning systems and relay stations are installed in villages in the valley. They are based on extended line of site VHF radio technology.
Eco-clubs and weather stations	<ul style="list-style-type: none"> To increase the level of understanding of the hydro-meteorological sector and to disseminate information on climate change in the local community. 	Weather stations, managed by local secondary school clubs are established to record hydro-meteorological data and to help educate the community about climate change.
Farmer field schools	<ul style="list-style-type: none"> To provide a forum for learning, sharing and training in local communities. 	Farmers are taught about climate change and ways in which they can adapt their farming practices. This can include: integrated pest management, production of healthy crops, the use of organics, liquid manure, etc.

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5 Online databases and knowledge platforms

Online location	Description
ALM www.adaptationlearning.net	ALM represents a collaborative, global learning process, with leadership, facilitation and strong participation by Southern institutions. It seeks to provide stakeholders with a common platform for sharing and learning, the bridging knowledge gaps by bringing relevant knowledge and stakeholders together to exchange information, experiences, and expertise.
Asia Pacific Adaptation Network www.asiapacificadapt.net	The Asia Pacific Adaptation Network aims to provide a one-stop shop for knowledge on climate change adaptation in Asia and the Pacific.
Climate and Development Knowledge Network www.cdkn.org	The Climate and Development Knowledge Network aims to support decision makers in designing and delivering climate compatible development by combining research, advisory services, and knowledge management in support of locally owned and managed policy processes.
Asia-Pacific Network on Climate Change http://www.climateanddevelopment.org/ap-net/index.html	The Asia-Pacific Network is a knowledge-based online clearing house for climate change issues in the region. It aims to provide a platform for policy dialogues and consultation within the region; provide access to latest information and data on climate change issues and developments, focusing on the Asia-Pacific; and to support capacity-building for developing countries in the region.
ELDIS www.eldis.org/go/topics/resource-guides/climate-change	ELDIS aims to provide a summary of current thinking on climate adaptation issues with access to relevant and up to-date resources and publications for researchers, practitioners and policy formers, including a 1000-member email-based network and over 1,000 summarised documents.
Local Coping Strategies Database http://maindb.unfccc.int/public/adaptation/	The UNFCCC's online database for 'local coping capacities' is intended to facilitate the transfer of knowledge on long-standing coping strategies/mechanisms, between communities and practitioners so that they may learn how to adapt to specific hazards or climatic conditions, as a result of climate change.
weADAPT www.weadapt.org	weADAPT is an online knowledge platform that aims to work collaboratively with others on CCA, pooling expertise from a wide range of organisations, developing and distributing new and innovative tools, methods and datasets, and sharing experience on practical planning and building capacity.

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Notes

- ¹ Oxfam GB (2009a); Oxfam GB (2009b)
- ² *Ibid.*
- ³ Oxfam GB (2009a)
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- ⁹ ISET (2008a)
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- ¹⁵ *Ibid.*
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- ³¹ Parry, M.L. et al. (2007)
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- ⁵⁶ Mitchell et al. (2010)
- ⁵⁷ Wisner et al. (2004), in Mitchell et al. (2010)
- ⁵⁸ Twigg (2009)
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- ⁹⁹ Ayers (personal communication), together with notes collected during a field visit to the LI-BIRD site in March 2011.
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- ¹⁰¹ Government of Islamic Republic of Pakistan (2003)
- ¹⁰² *Ibid.*
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- ¹²³ Jessica Ayers, IIED (2011), personal communication.
- ¹²⁴ This section relies heavily on the work undertaken by ISET (2008a and 2008b) on identifying gaps and research needs in the region.
- ¹²⁵ Regional Climate Change Adaptation Knowledge Platform for Asia (2010)
- ¹²⁶ ISET (2008a)
- ¹²⁷ *Ibid.*
- ¹²⁸ *Ibid.*
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