

Climate Learning for African Agriculture: Working Paper No.6

Climate Learning for African Agriculture: The Case of Mozambique

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Climate learning
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Foreword

The project “Climate Learning for African Agriculture”, funded by the Climate and Development Knowledge Network, and led by the Natural Resources Institute (NRI) of the University of Greenwich, the African Forum for Agricultural Advisory Services (AFAAS) and the Forum for Agricultural Research in Africa (FARA), is very pleased to present this Working Paper on Mozambique written by Verona Parkinson.

The paper presents a tour of the major policies and institutions, which form the context for agricultural adaptation to climate change in Mozambique. In Mozambique, even more than in other countries studied by CLAA, climate policy is dominated by a concern for the disasters – in Mozambique’s case floods as well as droughts – that have afflicted the country in the last few decades, and which many link to climate change, and attempts to examine in detail and region-by-region the projected impacts on Mozambican agriculture are only just beginning. Climate issues are addressed in agricultural policy and in some agricultural research, but extension services are underdeveloped and have done little work on climate adaptation.

The range of projects on agriculture and climate in Mozambique is influenced by, “on the one hand, a preoccupation amongst central government agencies to secure funding for institutional coordination and sector-led implementation of climate-related activities, and on the other a drive to mainstream climate resilience and compatibility effectively in more decentralised programmes able to respond to locally specific climate challenges”. The latter tend to combine delivery of information to farmers with a range of other interventions. Also of note is the interest within various projects and policies in other natural resource-based livelihoods such as fishing, and in livelihood diversification in general.

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Abbreviations used in the text

ALP	Adaptation Learning Programme
ACCRA	African Climate Change Resilience Alliance
AFAAS	African Agricultural Advisory Services
ASAP	Adaptation for Smallholder Agricultural Project
CAADP	Comprehensive Africa Agriculture Development Program
CEPAGRI	Centre for the promotion of Commercial Agriculture
CCD	Climate Compatible Development
CCGC	Coordinating Council for Disaster Management
CDKN	Climate and Development Knowledge Network
CIF	Climate Investment Fund
CIAT	International Potato Centre
CLAA	Climate Learning for African Agriculture
CONDES	National Sustainable Development Council
DfID	Department for International Development
DNEA	National Directorate of Agricultural Extension
DNSA	National Directorate of Agricultural Services
ENAMMC	National Strategy for Adaptation and Mitigation of Climate Change
EU	European Union
FARA	Forum for Agricultural Research in Africa
FEWS	The Famine Early Warning System Network
IDDP	National Institute for the Development of Small Scale Fishing
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IIAM	Institute of Agricultural Research of Mozambique

INAM	National Meteorology Institute
INGC	National Disaster Management Institute
IUCN	International Union for Conservation of Nature
MDGs	Millennium Development Goals
MICOA	Ministry for the Coordination of Environmental Affairs
MINAG	Ministry of Agriculture
MPD	Ministry of Plan and Development
NAPA	National Adaptation Program of Action
NRI	Natural Resources Institute
PARPA	Action Plan for the Reduction of Poverty
PEDSA	Strategic Plan for Development of the Agriculture Sector
PPCR	Pilot Program for Climate Resilience
REDD	Reducing Emissions from Degradation and Deforestation
SCF	Strategy Climate Fund
SCI	Save the Children International
SETSAN	Technical Secretariat for Food Security and Nutrition
SPCR	Strategic Program for Climate Resilience
UEM	Eduardo Mondlane University
UNAC	National Farmers' Union
UNFCCC	United Nations Framework Convention on Climate Change
UN-Habitat	United Nations Human Settlements Programme
UNIDO	United Nations Industrial Development Organisation
UNJP	United Nations Joint Program
WFP	World Food Program

1. Introduction

Responding to climate change and related uncertainty is a key development challenge. The Climate and Development Knowledge Network (CDKN) aims to help decision-makers in developing countries design and deliver climate compatible development. CDKN provides demand-led research and technical assistance, and channelling the best available knowledge on climate change and development to support policy processes at the country level. CDKN is also supporting initiatives that can help smallholders in developing countries to adapt successfully in the long term, and improve the understanding of climate change.

The Climate Learning for African Agriculture (CLAA) project is financed by CDKN and implemented in partnerships by the Natural Resources Institute of the University of Greenwich (NRI), the Forum for Agricultural Research in Africa (FARA) and the African Forum for Agricultural Advisory Services (AFAAS). The project involved four country studies in Benin, Mozambique, Sierra Leone and Uganda, which aim to assess the extent to which climate change and climate compatible development are addressed by agricultural research, extension and development activities and programmes. Related to this, the project has also supported efforts to facilitate stakeholder learning about climate change and climate compatible agricultural development.

In each of four countries, a national consultant was hired to undertake the country study and facilitate stakeholder learning activities, so as to stimulate awareness and reflection on the roles of agricultural research and advisory services in managing and disseminating relevant climate and agricultural knowledge in the context of increasingly uncertain climate.

1.1 Objectives of the CLAA Project

The objectives of the partnership are to:

- i. Explore with diverse actors in Africa how current climate change concepts (e.g. climate compatible development or CCD) are shaping responses in agriculture to develop a shared understanding of their usefulness
- ii. Assess the extent to which ideas and practices connected with integrated approaches to climate change and development are being used by African agricultural research and advisory services (across scales, sectors and actors), and what has influenced decisions regarding their use.
- iii. Facilitate stakeholders in the identification of the primary challenges and opportunities for enhancing integrated climate change and development approaches in agriculture and ways forward.

The project is centred on four case studies in selected African countries carried out in 2012-2013. The studies are seen as collective learning processes with the objective of stimulating

awareness and reflection in agricultural research and advisory services on how to manage agricultural knowledge in the face of climate change and increasing uncertainty.

1.2 Objectives and methodology of the country studies

The country studies had the following specific objectives:

- i. To assess through a shared learning process, for sub-Saharan Africa as a whole and for selected case-study countries in particular, the extent to which agricultural research and extension/ advisory services (public, NGO and commercial private sectors) have incorporated climate considerations in their policies and operations, and
- ii. To identify practical strategies for making agricultural knowledge management in Africa more climate compatible for smallholder agricultural development.

For each of the four countries local consultants were contracted as country facilitators to carry out a country study, which would improve access to information and understanding about climate change development and agriculture, and foster collective learning amongst the actors engaged on the sector. Each country study was required to:

- a) Assess the development and uptake of Climate-Compatible Development ideas and practices within agricultural research and advisory services in the country; and
- b) Identify:
 - Factors driving and limiting uptake, both internal to research and advisory institutions, and within broader national agricultural and other development strategies and policies;
 - Future pathways for climate compatible agricultural knowledge management;
 - Practical strategies for strengthening and re-orienting agricultural services;
 - Challenges and opportunities.
- c) Initiate and identify further opportunities for collective learning amongst the stakeholders.

1.3 The Mozambique country study report

The objective of the Mozambique study was 'to assess the extent to which agricultural research and advisory services (public, NGO and commercial private sectors) in Mozambique have incorporated climate considerations in their policies and operations, and to identify practical strategies for making agricultural knowledge management, and thus smallholder agricultural development, more climate-compatible'.

This report presents the findings from Mozambique. Section 2 provides background on existing knowledge of climate change and variability and their impacts in Mozambique. Section 3 surveys the strategies and programmes of government and non-government agencies intended to address climate change and variability and those relevant to agricultural development. Section 4 details the findings of case study projects visited that have sought to pilot approaches to strengthening resilience at local level.

Section 5 summarises the findings of a stakeholder workshop held in Maputo in February 2013. Section 6 discusses the scope for practical strategies for applying climate knowledge and learning to agricultural development and makes recommendations for practical ways forward.

2. Background on Climate Change and Variability in Mozambique

Mozambique is located on the south east coast of Africa and extends from the Rovuma river ($10^{\circ}.30'S$) to the border with South Africa ($26^{\circ} 49'S$). To the north is Tanzania, with Malawi, Zambia, Zimbabwe, South Africa and Swaziland to the west and to the east is the Indian Ocean. The total area of the country is about 799,380 km² of which 13,000 km² is water. Mozambique is composed of ten agro-ecological zones, each comprising several production systems (MINAG/INIA, 1994). Agriculture plays key roles in poverty reduction, as the major source of livelihood, employment and food security for rural households and communities.

Mozambique has a coastline of about 2,500 km that spans seven (7) of its 10 provinces, making the country vulnerable to the effect of ocean currents and air-sea interactions on marine ecology and resources, and on food production and security in the coastal zone. The coastal waters in Mozambique do not only contribute to the export market and much needed foreign trade but also to a large extent support coastal communities that depend on the coastal resources for their livelihood. About 70% of Mozambique's population live in coastal zones where marine fisheries provide an important source of food, income and employment. Thus In addition to agriculture, the fisheries sector is also important for food security, livelihoods and poverty reduction (Muchave, 2003).

The Initial National Communication of Mozambique indicates that impacts of climate change are particularly serious (MICOA, 2003). The effects of the doubling of pre-industrial

concentrations of CO₂ in the atmosphere are likely to increase the mean air temperature, reduce rainfall, increase solar radiation and increase evapo-transpiration (MICOA, 2003). Recent and past droughts are known to have had devastating environmental and socio-economic impacts on the poor and rural population who are dependent on climate - sensitive crop and livestock production, have little economic and technological resources and where there is a low level of preparedness and capacity to adapt to climate change.

Mozambique has now adopted a National Strategy for Adaptation and Mitigation of Climate Change (ENAMMC), an inter-sectoral programme led by MICOA, the Ministry for Environmental Coordination, and coordinated by an inter-ministerial body, CONDES, the National Council for Sustainable Development. The strategy was approved by the Council of Ministers in November 2012. It grew out of a National Action Plan for Adaptation to Climate Change (NAPA) that was agreed with UNFCCC, of which Mozambique is a signatory.

ENAMMC is broadly aligned with the Strategic Program for Climate Resilience (SPCR), an international finance facility approved in 2010, and operated in Mozambique by the World Bank. The SPCR seeks to support the mainstreaming of climate resilience through piloting and demonstration investments in programmes designed within the context of sustainable development and poverty reduction. Most of the climate change adaptation and mitigation activities currently underway in Mozambique originated under the NAPA or in specific initiatives by other Ministries, sector bodies funded through the UN system or through the SPCR budget for pilot activities, or in some cases by NGOs.

2.1 Climate variability and climate change projections

Mozambique is accustomed to climate variability and extreme climate events. Convection during the wet season (October to April) brings higher rainfall to the northern and central regions than to the southern region. The lowest annual rainfall (300 mm) is recorded in the Pafuri District in Gaza Province. Temperature gradients are generally north-south (latitudinal influence) and east-west (coastal influence).

Flooding is often attributable to tropical cyclones especially along the central coastal regions but also extending inland, south and north of this area (INGC, 2009). The devastating flood of 2000/01 killed approximately 800 people and affected 4.5 million (EM-DAT, 2011).

The most recent GCM-based model projections of climate change for Mozambique (INGC, 2009) show that rainfall could increase moderately to strongly over most of Mozambique, although this remains uncertain. Coastal areas are likely to experience the strongest wetting in summer/autumn. Temperatures will continue to rise by 1.5 °C-3.0 °C by mid-century, and rates of warming, and associated increases in evapo-transpiration, are expected to be higher towards the interior. Heat stress events will be more frequent in future (Battisti and Naylor 2009), and it is likely that heat thresholds will be exceeded more regularly, particularly in spring (INGC, 2009).

This means that the implication for Mozambique's small scale and subsistence farmers, who rely almost entirely on rainfall for crop and livestock production, need to be thoughtfully assessed and used as a basis for supportive actions and strengthening of their adaptive capacity.

2.2 Smallholder agriculture and climate change

Mozambique's agriculture is characterised by small scale rainfed farming and pastoralist systems that are particularly vulnerable to climate change and food insecurity. As poverty and environmental degradation exacerbate food insecurity for many, poverty reduction is the core issue in mitigating climate related risks on agricultural production in Mozambique. Studies undertaken in Gaza province (Midgley, et al., 2012) aimed to assist Mozambique in adaptation to the long-term adverse effects of climate change. They showed that individual and community based risk reduction can help to build community resilience and food security in locations vulnerable to climate impact, and particularly if government can also make pro-poor precautionary risk reduction investments. According to IFAD (2012), the southern provinces, although characterised by less favorable agro-ecological conditions and higher climatic risks, have significant potential for the production of several agricultural products that are in great demand on domestic, regional and/or export markets. These include livestock products, horticulture in irrigated areas, fruits, cassava, cashew and forest resources. The region benefits from its proximity to major domestic (i.e. Maputo, the capital city) and regional markets (i.e. South Africa) as well as from easy access to export markets through the port of Maputo. Yet according to the most recent household survey (UNDP/GoM, 2010; Tvedten, 2011), the three southern provinces remain amongst the poorest in the country.

The extent to which the vulnerability of Mozambique will increase with increased exposure to climate change depends on its adaptive capacity. This in turn depends in large part on the socio-economic and technological development trajectory Mozambique will take, and on the adaptation strategies, policy planning, and institutional measures that can be put in place in the next ten to twenty years. Recent and past droughts are known to have had devastating environmental and socio-economic impacts on the poor and rural population who are dependent on climate sensitive crop and livestock production, and have little economic and technological resources to assist in adaptation capacity and preparedness for climate hazards.

One of the most important determinants of agricultural suitability is rainfall. Most of the country receives an average of between 600 and 1,200 mm of rainfall annually, which is generally sufficient for maize or cassava cultivation. Some areas such as mountainous regions in the north receive more than 1,200 mm, while the low-lying inland region in the south receives substantially less, and usually runs the risk of drought. The highest drought risk levels are where the average annual rainfall is also the lowest and hence the crop

production is very low. Floods (see below) are often the most visible hazard hitting the country.

The natural resource base remains very fragile, under threat from over-exploitation and unsustainable practices, existing climate-related risks such as recurring droughts and floods, overlaid with emerging and projected future climate change impacts and rising population pressures. However, increased food production and improvements in food security remain high on the list of priorities for Mozambique, whilst simultaneously ensuring sustainable management of natural resources led by both government policies and community-based approaches. More frequent high temperature stress on crops, more rapid loss of soil moisture through changing rainfall patterns and increased evapo-transpiration, and heightened risks of droughts and floods all call for urgent attention to adaptation.

Drought is also the critical climate factor affecting livestock production in Mozambique, as 90% of the cattle reared in the country is found in the arid and semi-arid zones of the provinces of Tete, Gaza, Inhambane and Maputo which have annual rainfall of less than 600mm. 94% of cattle are produced by small to medium farmers and the other 6% by large firms. Government has intervened to provide a boost to the livestock sector under the government's five-year development plan (2010-2014). The plan lists the following priorities for the sector:

- i. Increased production of cattle and poultry;
- ii. Promote use of animal traction;
- iii. Conduct research for genetic improvement of cattle;
- iv. Disseminate research results on supplementary feed for cattle in the dry season;
- v. Increase veterinary support for cattle producers;
- vi. Build/rehabilitate infrastructures for processing and marketing animal produce;
- vii. Increase agricultural advisory service coverage;
- viii. Construct/rehabilitate infrastructures for storage and water management.

Livestock production can be viewed as a mechanism for adapting to the negative impacts of climate change on crop yield since cattle are more resistant to climate change than crops. Cattle can graze on poor soils unfit for production of rain-fed crops in regions with low and unreliable rainfall. However, several components of livestock production are affected by climate change including the quantity and quality of pasture, biodiversity of the pasture, diseases, management and production system (Herrero *et al.*, 2009).

2.3 Notable recent cases of climate vulnerability and impact of climate change

The most notable recent example was in 2013. According to WFP, by 20 January 2013, moderate to intense rains had already affected 150,000 persons throughout the country. A total of 55 people lost their lives (WFP, 2013). The hardest hit was Gaza Province in the South, where 38 people died and 140,591 persons were displaced. The Limpopo River flooded and Gaza's Chokwe District was the worst affected (IRIN News, 2013, Reliefweb, 2013). Dwellings and infrastructures, including roads and bridges, were severely damaged. An estimated 680 houses were inundated. In other provinces, continuous rains affected around 20,000 people and damaged infrastructures and crops (Inhambane, Manica, Sofala, Zambezia). Further, the capital Maputo was seriously affected with 5,225 displaced people in 9 temporary sites (WFP, 2013).

In early February 2000, heavy rains started to fall across much of southern Africa, hitting southern Mozambique the hardest. On February 9, the capital city Maputo was flooded, burying slums in the peri-urban areas, and the road north to Beira was underwater. The rains continued and on February 11 the Limpopo River, north of Maputo, broke its banks, contaminating the water supply and bringing dysentery to the local population. The worst came on February 22, when Cyclone Eline hit the Mozambique coast near Beira, with winds of 260 km/h and torrential rains. Eline worked its way inland, dropping huge quantities of water on the Limpopo River catchment area. That water followed its way down the Limpopo River valley, and on February 27 flash floods occurred in the Gaza Province of Mozambique, arriving suddenly and burying the low-lying farmlands in the Chókwe and Xai-Xai Districts under four to eight meters of water. Residents climbed trees and rooftops, but with only a few boats and less than a dozen helicopters available to evacuate over 100,000 people, over 7,000 people were stranded in trees for several days. Eight hundred people died, hundreds of thousands were left homeless, and 2 million were affected. A significant part of the irrigation systems in Mozambique were lost. In the immediate aftermath of the floods, losses were estimated at \$273 million in direct costs, and \$428 million in optimal standard reconstruction costs. (Benessene, 2007; Zefanias, 2003).

It should be noted that as a country with a large low-lying coastal belt flooding has been a cyclical, recurrent problem in Mozambique due to periodic incidence of extremely heavy rains not only in Mozambique but in neighbouring countries. Localised flooding in the Limpopo valley for instance has been intensified by decisions to open the flood gates of upstream dams, for instance at Phalaborwa in South Africa, although the early warning system has improved in recent years. The problem is widely believed to have been exacerbated by the effects of climate change across the Southern African region and requires regional as well as national approaches to flood water management and to climate change adaptation.

In 2000, flooding was one of the causes for loss of life, crops, ecosystems, property, human and animal habitats, outbreak of pests and diseases, displacement of people, movement of land mines, destruction of infrastructure (communication networks, schools, hospitals, houses, etc.), land degradation and erosion.

Climatic conditions and changes in Maputo, Gaza and Inhambane provinces are affecting food security by reducing livelihood productivity and opportunities. The impacts are mostly negative in Chicualacuala and Funhalouro districts of Gaza and Inhambane provinces. Erratic weather undermines the rain-fed agricultural system; heat stress on crops reduces yields; increases in carbon dioxide concentrations decrease the protein content of vegetation (with implications for both human and livestock health and productivity); the rate of evapotranspiration is on the rise and pressure is increasing on water supplies, especially in areas where river run-off is reduced and shallow wells become unreliable.

2.4 Climate change and food security

Climate has important impacts on the agricultural sector, since the single most important source of risk for crop failure nation-wide is drought. According to a study done for maize, rice, sorghum and groundnut, drought constitutes between 48-73% of the risk of crop failure in Mozambique (Walker 2006).

The country has three easily recognisable geographical zones in terms of agricultural potential (see Figure 1). The north (Niassa, Cabo Delgado, and Nampula) is largely a sub-humid zone (1,000-1,200 mm rainfall annually). The centre (Zambézia, Tete, Manica and Sofala) is a mixture of sub-humid zones (1,000-1,200 mm annual rainfall) and humid highlands; and the south (Inhambane, Gaza, Maputo) with arid zones in some parts (400-1,000 mm annual rainfall) (World Bank, 2006).

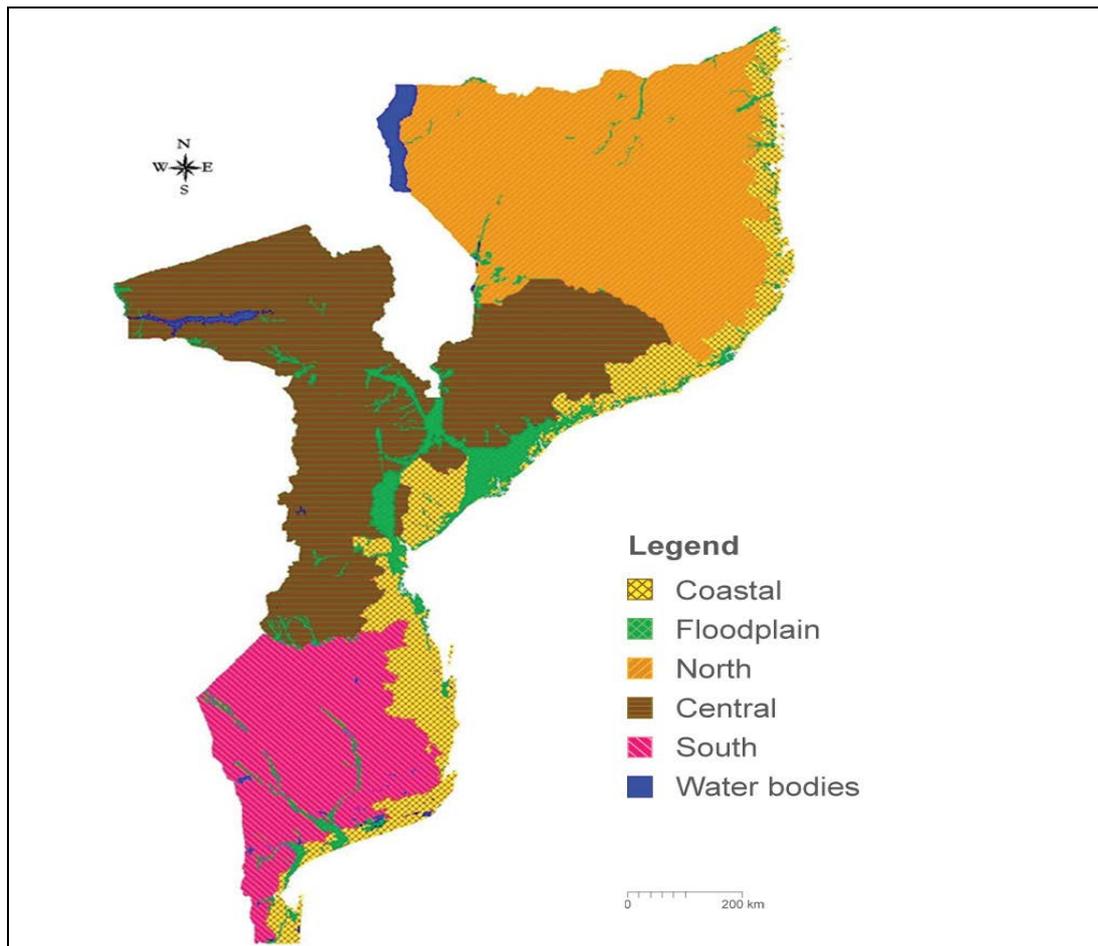


Figure 1: Mozambique Land Zoning (Source: IIAM 2008)

Food security and its dependency on the environment constitute a complex field, therefore precisely what might happen under projected and potential climate change scenarios is uncertain. Some of the range of climate-related risks to food security throughout Africa are set out in Table 1. Risks to staple food crop production in Mozambique, as in other economically poorer parts of the world, constitute the greatest climate-related risk to the food security of the country and of food producers themselves. The precise links between poverty and food security are also a function of a variety of environmental, social and economic influences. These tend to vary across space and time for individual regions.

Table 1: Climate-related risks to food security

Risk category	Process of change and resilience in relation to climate
Crop failure, loss of livestock, shortage of pasture, soil degradation; increased pathogens and insect pests	Temperature, drought, flood and bio-geo-chemical sensitivity
Water scarcity	Increased evapo-transpiration caused by drought, high temperature stress on crops, and loss of soil moisture through changing rainfall patterns.
People Increased workload for women Malnutrition and increased diseases (cholera, diarrhoea, malaria etc.)	Temperature and water, nutrition security, psycho-social well-being, displacement, exposure and susceptibility to hunger, infection etc, through drought and flood, socio-economic status and livelihood security, high health risks for women (as they traditionally often eat last and least), making them susceptible to illness.
Perceptions	Education, health, labour, fear, experience, conscience, coping with uncertainty, media representations.
Politics	Prioritisation of resources, politics of humanitarian aid, trade and environmental issues, including changing roles of international regimes, and conflict over natural resources (e.g. arable land for food crop or agro-fuels production)
Places	Environmental quality through drought- and flood-related changes to water, land, air, vegetation, hazard modification in natural (i.e. land and water stability) and built environments (energy and water infrastructures)

Source: Parkinson, 2011. Compiled from the findings of the African Forum for Agricultural Advisory Services, 3rd.symposium and general assembly, Accra Ghana, 2011

The single most important source of risk for crop failure nation-wide is drought, although agriculture in some provinces is also affected by coastal storms, severe flooding and saline inundation. The effects of climate change represent a threat to agriculture by deepening poverty in communities that themselves make little or no contributions to climate change through greenhouse gas emissions. The country is also prone to droughts of varying

severity, approximately every three to four years, and to floods caused by tropical cyclones. Survival and everyday life in the drought-affected areas depend to a large extent on rain-fed farming, exploration of local resources and fishing. The weakness of the road network, subject to severe disruption by heavy rain and flooding also imposes challenges for livelihoods.

Recurring droughts and floods are forcing farmers to adapt their farming systems to the differing conditions, often on a year-to-year basis. The effects of climate change undoubtedly have a greater impact on societies or individuals with scarce resources, where technologies are lacking, and where infrastructure and institutions are least able to adapt. These are the communities that have the least resources to adapt and cope with its effects.

It is understood that no detailed work has yet been done in Mozambique on the likely impacts of climate change on different types of crops or on agricultural production and food security by province or by region. There has been discussion amongst CIAT, the National Agricultural Research Institute (IIAM) and Eduardo Mondlane University about carrying out work on this, but at the time of preparing the current report, no further information was available.

Although perceptions are that unpredictable extremes of weather are increasingly a reality, specific risks and challenges have not been identified that are distinct from those inherent in climate variation, and vulnerability of specific regions to recurrent droughts, abnormally high temperatures, heavy rainfall, storm events and flooding in of the country. While there certainly are a number of climate-related risks to food security and it can reasonably be assumed that these are now greater than they have been historically, the implications for *additional* action to enable agriculture to adapt and become more climate-compatible are not clear.

As reviewed in the next sections of this report Mozambique continues to pursue rather general and centralised strategies to combat broad categories of climate risk, by strengthening infrastructure, increasing food production and improving natural resource management, combined with a small number of externally-funded pilot projects designed to better understand the practical and institutional challenges of strengthening resilience at local level. Although there is some scope for learning from the results and findings of these projects, there is no broad national agricultural research or extension programme underway that addresses climate change in Mozambique and its future and ongoing adaptation requirements explicitly. There is also little opportunity for decision-makers, agricultural practitioners, or for farmers themselves to *learn* about how best to apply specific areas of climate knowledge to strengthen the resilience of agriculture in different parts of the country.

3. Review and Consultations on Policies and Strategies on Climate Change

3.1 Policies

Government policies developed and approved in the 1990s did not mention climate change issues. However, Mozambique has a history of combat and prevention of natural disasters, resulting from drought, floods, and food insecurity. Government's development priorities and associated policies and strategies have in all cases placed emphasis on the reduction of food insecurity, alleviating poverty, combating environmental and natural resources degradation and the HIV/AIDS pandemic, in the context of the Millennium Development Goals, including reducing hunger by half by 2015 (MDG-1) and attaining environmental sustainability (MDG-7).

Mozambique has adopted strategies and policies, some of which are enshrined in law, which are in fact supportive of climate change- related actions. These include for example: the National Environment Policy; Forestry and Wildlife Policy; the Energy Policy; the new Water Policy; the Strategy for Meteorology; the Policy for Weather Disaster Management; the Gender Strategy, among others. More explicit incorporation of climate-related objectives into national development planning has resulted from development of a National Action Programme for Adaptation to Climate Change (NAPA) in 2007.

3.2 The National Adaptation Programme of Action (NAPA)

As a result of Mozambique's signature of the UNFCCC, and Government's commitment in planning for disaster risk, in December 2007, the Ministry for Coordination of Environmental Affairs (MICOA) prepared a National Action Programme of Adaptation to Climate Change (NAPA), which laid the foundation for a multi-stakeholder adaptation agenda. The NAPA was approved by the Council of Ministers in 2007, with the purpose of presenting the immediate and urgent needs of the country that have been identified during a participatory evaluation process for the purpose of strengthening the national capacity to cope with the adverse effects of climate change.

The specific NAPA objectives include:

1. Strengthening the early warning system in the country;
2. Strengthening the capacities of family farmers to deal with the adverse effects of climate change;
3. Improving the knowledge and strengthening the management of river waters;
4. Promoting actions to limit erosion and to develop sustainable fishery activities;
5. Promoting actions that will contribute to the mitigation of Greenhouse Gas emissions;

6. Promoting public education activities and information dissemination on climate change;
7. Improving the coordination between the various groups that work on issues related to the evaluation of climate change vulnerabilities and hazard/risk reduction;
8. Promoting the integration of climate change into decentralised district planning.

The management of the initiatives proposed under the NAPA requires well-elaborated and planned activities, and inter-institutional collaboration for the prevention and reduction of natural disasters. It is also essential that involved institutions have the required technical and fiscal capacities to implement environmental monitoring and research to better understand and interpret the phenomena that influence climate change impacts and vulnerabilities.

The NAPA document outlines four courses of action, which aim to reduce the negative impacts of extreme hydro-meteorological events through adaptation initiatives. All proposals utilise locally available resources and cost-effective, environmentally-friendly, sustainable technologies as a way to combat poverty. The priority areas/programmes outlined by the NAPA are:

1. Strengthening of the early-warning system
2. Strengthening the capacity of agricultural producers to cope with climate change
3. Reduction of climate-change impacts in coastal zones, and
4. Management of water resources under climate change.

Following the NAPA, Mozambique incorporated broad objectives to address climate risks into its poverty reduction strategy, the Action Plan for the Reduction of Absolute Poverty 2006-2010 (PARPA II). Its third anti-poverty strategy PARP III (2011 -15), which the Ministry of Agriculture (MINAG) is responsible for leading, has a strategic objective to support the adoption of measures to 'prevent and adapt to climate change'.

Despite Mozambique's history of dealing with climate-related problems, and incorporation of relevant goals and objectives into its centralised strategies, relatively little progress has been made across government in strengthening understanding of how to make development more climate-compatible in practice. A stakeholder consultation conducted by the National Disaster Management Institute (INGC) (INGC, 2009a), revealed that, at the level of heads of ministerial departments and at the technical level, there is lack of understanding of climate change, lack of understanding of the parent Ministry's role, and hence limited consideration of adaptation measures that could be taken by their ministries.

3.3 Key organisations working on climate change

The institutional mainstreaming of climate change issues has been recommended for all Mozambican government agencies, and some projects are already being implemented. While most of the Ministries do not have specific units for climate change issues, they have Directorates and subordinate institutions dealing with climate change policy formulation, adaptation measures and mitigation of climate change effects.

A study by IFPRI to assess work to address climate change related issues in Mozambique (IFPRI, 2011), identified the following eight Government institutions as the main players:

- Ministry for the Coordination of Environmental Affairs (MICOA)
- National Institute for Disaster Management (INGC)
- Ministry of Planning and Development (MPD)
- Ministry of Science and Technology (MCT)
- Ministry of Agriculture (MINAG) (the DNSA, National Early Warning System, CENACARTA and IIAM)
- Ministry of Tourism
- Ministry of Public Work and Habitation (MOPH)
- Eduardo Mondlane University (UEM).

The IFPRI 2011 study reviewed the set of national laws and legal regulations considered relevant to climate change, and the roles played by different government agencies, and those of international agencies and NGOs. The findings of the study on these points are summarised in Tables A 2.1, A 2.2 and A 2.3 in Annex 2 of this report.

While MICOA has the overall lead in cross sector strategy and planning to address climate change, INGC, the National Institute for Disaster Management, has been one of the most proactive government agencies on climate. In its disaster- risk management plan, INGC identified the need to move towards a more integrated climate-risk management approach, alongside implementation of corrective disaster risk management activities to address ongoing natural hazard risks that are already well- understood. The climate related planning activities recommended by INGC range from preparedness and disaster mitigation to broader adaptive activities, and the need for government as a whole to take into account the changing pattern of natural hazards.

Government is now implementing a number of sustainable development projects which address the link between development and adaptation. These include projects by MICOA to combat erosion, efforts by MINAG to improve seed quality, production, and climatological studies led by INAM. In addition to a number of locally based pilot projects that aim to strengthen climate adaption at community level, which have cross-sectoral engagement and a strong agriculture component. Two of these projects, in Chicualacuala and Guija districts

of Gaza province were visited during research to prepare this report, and their progress, findings, and associated learning points are detailed in Section 4.

3.4 Strategic Program for Climate Resilience (SPCR)

The NAPA and INGC Phase I study (INGC 2009) provided a base for climate adaptation planning including disaster risk reduction strategies. This led to investments in adaptation to reduce the scale of future impacts on the country's economy through the Strategic Program for Climate Resilience (SPCR), which was approved in 2010. The SPCR seeks to support the mainstreaming of climate resilience through piloting and demonstration investments in programmes designed within the context of sustainable development and poverty reduction.

The SPCR has combined financing of US\$100m from AfDB, the World Bank and IFC. The support covers four key sectors: (i) agriculture, (ii) transport (rural roads), (iii) urban (coastal cities), and (iv) natural resources (watershed management and forestry). The programme encourages private investment in climate resilience in agriculture and forestry through the provision of credit from Mozambican banks. IFC's interest is in the private sector especially for sustainable forest management through REDD+.

The SPCR recognises the importance of institutional strengthening and, to support efforts to put in place an effective institutional framework for climate change, a Development Policy Operation (DPO) fund was paid into the state budget. The first phase is to promote mainstreaming climate change to support policy reforms that will transform provincial and municipal policies.

The INGC Phase II study on the Impact of Climate Change on Disaster Risk in Mozambique assessed and quantified current vulnerability to extreme- climate events (flooding, cyclones, and rise in sea-level). These were evaluated against seven potential future climate scenarios in an attempt to capture the full variability of potential impacts and risks associated with climate change. It is hoped that this study will contribute to legislation directed at addressing climate change. INGC will soon set up a portal to facilitate networking and provide a forum to exchange perspectives and experiences.

INGC planned to hold a consultation in October 2012 to present the Phase II study and future strategy development, but unfortunately this did not go ahead. This consultation was to address sector policies and propose revisions to the legal framework to adjust fiscal policies and measures to engage the private sector.

3.5 Agriculture sector policies and strategies in support of climate change

Mozambique's current agriculture strategy, the *Strategic Plan for Development of the Agriculture Sector* known by its Portuguese acronym, PEDSA, is intended to orient agricultural development over the current decade until 2020. PEDSA (MINAG 2011) is closely aligned with investment pillars on land and water management (Pillar 1) and

increasing food supply and reducing hunger (Pillar 3) of the Comprehensive Africa Agriculture Development Programme, (CAADP) of the New Partnership for Africa's Development (NEPAD). In this context, the government, NGOs and international donors have launched a range of programmes in an effort to better understand the immediate and long-term underlying causes of poverty and food insecurity, so that they can be addressed effectively.

PEDSA envisages Mozambique adopting measures for mitigation of and adaptation to climate change. Although the PEDSA document does not specify what these measures would be, it recognises implicitly the connections between climate change, natural disasters and natural resource management, and also envisages:

- Promotion of reforestation and reduction of carbon emissions due to deforestation and forest degradation;
- Reduction of vulnerability to natural disasters and improved community participation in sustainable natural resource management;
- Operationalising Natural Resource Management Committees, and strengthening soil and water management for efficient agricultural use.

All of these strands of activity have their own operational strategies and plans under development. Whereas the Ministry of Agriculture plays a role, these activities are primarily implemented through partnership with other public sector bodies, provincial and district government, donor- financed programmes, and the private sector. Under programmes implemented by MINAG itself, including agricultural research and extension, there is only limited focus on climate change or on reduced vulnerability, and improved natural resource management.

Since the 1990's the development of the agriculture sector itself has been guided by a series of different strategies also aiming to increase farm production and strengthen food security. The relevant strategy documents were reviewed recently by the Mozambique Strategic Analysis and Knowledge Support System (Chilonda *et al.*, 2011), and are summarised in Annex 3. Some specific strategies such as those concerned with irrigation and agricultural extension, remain effectively in force as supplements to the PEDSA itself.

Preparation of the National Strategy for REDD+, the international finance programme for Reduced Emissions from Deforestation and Forest Degradation is a key activity under Mozambique's national climate strategy. The national forest service falls under MINAG and accordingly MINAG has been engaged alongside MICOA, with specialist consultancy assistance, in the planning process. No REDD+ projects as such are yet operational, although a number of forestry, agroforestry and forest conservation activities led by the private sector are underway, linked to the voluntary carbon market. Some of the possible models

for REDD+ activities have good potential to combine climate mitigation and adaptation with community engagement in agricultural and natural resource based development, although no related research and extension activities are yet underway. Closer investigation of the development of REDD+ in Mozambique and its implications for agricultural strategy was beyond the scope of this report.

3.6 International agencies and assistance programmes on climate

A wide variety of international funding and development agencies have been concerned to introduce activities to promote climate change adaptation and/or mitigation into their activities in Mozambique. These include DFID through a programme entitled '*Mainstreaming Climate Change into Development*', which has provided funds to Government to assist in development of the National Climate Change Strategy recently presented to the Council of Ministers for review and approval. DFID also supported NGO led local activities in Mozambique through the Africa Climate Change Resilience Alliance (ACCRA). The two principal international funding programmes intended to strengthen climate resilience of relevance to the agricultural sector are described below.

3.6.1 World Bank

The Pilot Program for Climate Resilience (PPCR) managed by the World Bank and funded by them and other donors within the framework of the Climate Investment Funds (CIF) funds technical assistance and investments in 18 developing countries including Mozambique, supporting their efforts to integrate climate risk and resilience into core development planning and implementation. It provides grants and highly concessional financing (near-zero interest credits with a grant element of 75%) for investments supporting a wide range of activities, such as:

- Improving agricultural practices and food security;
- Building climate-resilient water supply and sanitation infrastructure;
- Monitoring and analysing weather data;
- Conducting feasibility studies for climate-resilient housing in coastal areas.

Under its Strategic Program for Climate Resilience (SPCR), Mozambique has now applied for \$50 million grant from the PPCR to support six projects one of which is "*Enhancing Climate Resilience Agricultural Production and Food Security*".

3.6.2 IFAD

IFAD has a global climate change strategy which seeks to maximise its impact as an agricultural development fund on rural poverty in a changing climate. The strategy's objectives are: (i) to support innovative approaches to helping smallholder farmers build their resilience to climate change; (ii) to help smallholder farmers take advantage of available mitigation incentives and funding; and (iii) to inform more coherent dialogue on climate change, rural development and food security.

IFAD is currently designing a “Pro-Poor Value Chain Project in the Southern Region” of Mozambique, known as PROSUL (IFAD 2012). The project objective would be *to sustainably increase the competitiveness of small farmers and their integration into selected value chains* within the Southern Region.

IFAD is also developing an Adaptation for Smallholder Agricultural Project (ASAP) which it plans to be fully embedded within the PROSUL project, and will be directed at reducing the vulnerability of agricultural value chains to the impacts of climate change. In particular, the aim is to create adaptation capacity within agricultural value chains to enhance their sustainability. The project will be divided into three components. Component 1 will be directed to *“Mainstream climate change adaptation in policy support for selected value chains”* in order to design and implement policies and strategies for increasing the resilience of value chains; to support the Centre for the Promotion of Commercial Agriculture (CEPAGRI) on moving towards a climate-proof commercial agriculture, and to establish mechanisms for climate change adaptation knowledge.

The second and third components of ASAP will be focused on *“Climate resilient crop-related value chains”* and *“Climate resilient livestock value chains”* correspondingly. Both components will design and implement adaptation strategies within the specific investments plans for the selected crop-related and livestock value-chains. Adaptation technologies will be adopted within the different value chains; risk management strategies will be explored and disseminated; access to modern inputs, improved technologies, on-farm equipment and relevant technical advice will be provide; and integrated crop-livestock adaptive strategies will be analyzed and promoted among farmers.

PROSUL will also have a Component on Policy Support, Institutional Development and Project Coordination that would support the development of a policy agenda related to the selected value-chains, the strengthening of the institutional capacity of CEPAGRI, including for the coordination of the project, the strengthening of key institutions along the chain (e.g. producers’ organisations) and the setting-up of the necessary coordination mechanisms at the level of each value chain, such as multi-stakeholder platforms and fora. These activities will be complemented by those under Component 1 of the ASAP project (i.e. *“Mainstream climate change adaptation in policy support for selected value chains”*) and Component 4 on *Project Management*.

In 2011 IFAD and IFPRI undertook a joint study in Mozambique as part of a partnership programme which aims to advance innovative policies designed to help the poor benefit from climate change adaptation and mitigation activities and improved market access (IFPRI 2011). Specifically, the study aimed at: identifying constraints impeding organisations in formulating and implementing policies/programmes on climate change and high-value commodity market access; understanding the bottlenecks and best practices in these organisations with regard to formulation and implementation of policies and programmes

on the two aforementioned thematic areas, and understanding how government organisations are linked to institutions/structures that have the potential to effectively promote access to carbon markets for small-holders.

The study reviewed: institutional, organisational and strategic leadership; organisational structure; human resources related to climate change; financial resources available and allocated to climate change-related activities; programmes/services on climate change; infrastructures and equipment-supporting activities related to climate change; and technology and inter-organisational linkages to support and strengthen the organisational capacity to formulate and implement policies, strategies and programmes related to climate change. Some of the findings relating to relevant legislation and organisations in Mozambique are detailed in the tables in Annex 2 of this report.

3.7 Research

The Mozambique Institute for Agrarian Research (IIAM) and Eduardo Mondlane University (UEM) are the principal institutions engaged in agricultural research in Mozambique.

3.7.1 Mozambique Institute for Agricultural Research (IIAM)

Mozambique's Institute for Agricultural Research (IIAM, *Instituto Investigação Agrária de Moçambique*) was formed in 2005 following the integration/amalgamation of three former research institutes, one experimental centre and one agricultural training centre into one institute. IIAM is mandated to conduct agricultural research, development and dissemination. It has four technical directorates: the Directorate of Agriculture and Natural Resources (DARN), the Directorate of Animal Sciences (DCA), the Directorate of Training, Documentation, and Technology Transfer (DFD TT), and the Directorate of Planning, Administration, and Finance (DPAF). The institute also has four Agricultural Research Zonal Centres: South (based in Chokwé), Central (in Chimoio), Northwest (in Nampula), and Northeast (in Lichinga). Until the formation of IIAM in 2005, the directorates were separate entities previously known as the National Institute of Agronomic Research (INIA), the National Institute of Veterinary Research (INIV), the Institute of Animal Production (IPA), and the Centre of Forestry (CEF) (Flaherty, *et al.*, 2010).

IIAM has been investigating soil fertility, soil conservation and erosion control for improved farm productivity for some years now, but not specifically in the context of climate changes. Staff from the Institute's soils and crops department work on climate related projects but they are not designed to be entirely climate specific. For several years IIAM has been screening and developing short cycle and drought-tolerant varieties of cereal, leguminous and root and tuber crops in collaboration with international institutes like ICRISAT and IITA. IIAM is also involved in addressing dry-land agriculture and water conservation in the Limpopo Basin.

Climate-related work that is underway by IIAM includes:

- A three year project, funded by the EU and entitled Agro-ecology Based Aggradation-Conservation Agriculture (ABACO). The project investigates the application of conservation tillage and conservation agriculture techniques in semi-arid locations subject to moisture and climate stress in a number of countries including Mozambique, in order to combat soil degradation and food insecurity in semi-arid Africa. The first year of the project aims to demonstrate soil- conservation practices: zero tillage; intercropping maize and legumes and green manure using crotalaria species. Plot level research by the Soils Department of IIAM coordinated by the University of Zimbabwe is underway in three districts of Manica and Gaza provinces. In some countries, not including Mozambique, ABACO is promoting conservation tillage innovation platforms linking farmers, extension workers and researchers.
- Implementation in partnership with IUCN of a programme entitled Managing Climate-related Risks to Improve Livelihood Resilience and Adaptive Capacity In Agricultural Ecosystems In Southern Mozambique. This is a multidisciplinary project on soils, forestry, livestock, and agro-processing. It is funded through the CGIAR Climate Change Agriculture and Food Security (CCAFS) programme managed by CIAT, to conduct studies on crops in Chicualacuala and on livestock in Xai Xai in Gaza province.
- The national agricultural research institute (IIAM) collaborated on a climate-adaptation project in Chicualacuala (one of the projects visited and discussed below in Section 4 of this report) by conducting field-based adaptive research. Together with FAO and SDAE, IIAM set up trails to introduce conservation agriculture in four communities in Chicualacuala District. They also set up agro-forestry trials on fruit trees (mango and cashew), alley- cropped with vegetables, cereals and/or legumes as a potential agro- forestry system.

3.7.2 Universities

The higher education sector accounted for 15 percent of total agricultural research capacity in Mozambique in 2008. The main university is Eduardo Mondlane University (UEM), which has two faculties conducting agricultural research: the Faculty of Agronomy and Forestry Engineering and the Faculty of Veterinary Science. Each of these two faculties employed 17 researchers (full-time equivalent) in 2008.

IIAM and UEM have had a long partnership and a variety of collaborative projects are implemented jointly with centres of the Consultative Group on International Agricultural Research (CGIAR). UEM also collaborates with several European universities on climate-related research. Most of these projects use climate models to understand climate change and predict future trends of several climate scenarios, land use, production systems and crop yield predictions. UEM works closely with INGC and the Famine Early Warning System (FEWS) on disaster forecasting and preparedness and with INAM in collecting, processing and disseminating climate data.

While UEM is still the main research provider in the higher education sector, several new public and private universities are beginning to conduct some agricultural research and are likely to grow in size over the next decade. These include the School of Marine and Coastal Sciences (ESCMC), the Faculty of Agriculture of the Catholic University (a private university in Cuamba, Niassa Province), and the Higher School of Rural Development (ESUDER), operated jointly with UEM and recently opened in Inhambane Province. Collaboration among national agencies and with regional and international agencies continues to be a significant aspect of agricultural research and development in Mozambique.

Another privately owned university that conducts agricultural research is the Mussa Bin Bique University, which is located in Nampula Province, and employed seven full time agricultural researchers in 2008 (Flaherty, et al., 2010). Collaboration among national agencies and with regional and international agencies continues to be a significant aspect of agricultural R&D in Mozambique.

3.8 Extension

Public extension services were introduced in 1987 and were organised and provided through the National Directorate of Rural Development (DNDR, *Direcção Nacional de Desenvolvimento Rural*). The DNDR was reformed and renamed the National Directorate of Rural Extension (DNER, *Direcção Nacional de Extensão Rural*) in 1997), with its role focusing more on agriculture than on general inter-sectoral activities associated with integrated rural development. In 2006, the DNER was re-formed to become the current National Directorate of Agrarian Extension (DNEA, *Direcção Nacional de Extensão Agrária*), the main national public institution responsible for extension. DNEA has low levels of funding and operational capability and coverage, and does not have any climate-specific programme.

In practice a very wide range of public, private and civil society organisations are now involved in delivery of agricultural and rural extension and advisory services of one sort or another. Nevertheless, under the new agriculture strategy (PEDSA) and the current national poverty reduction programme, DNEA has identified some climate-compatible interventions including promotion of sustainable soil fertility and water-management systems, improved seed varieties, better management and prevention of wildfires, and sustainable natural resource based income generating activities such as bee-keeping.

MINAG maintains a separate National Directorate of Agricultural Services (DNSA) and the two directorates work independently and organise separate annual meetings. Support for agriculture under the Strategic Program for Climate Resilience which targets investment in the key productive regions of the Limpopo and Zambezi valleys is being organised under DNSA.

Links between research and extension are also weak at present. Although IIAM and DNA were moving closer together and held a joint planning meeting in 2007 (at which time climate change was not on the agenda), this was not followed up.

This study also found that relevant extension information on climate, climate hazards and weather forecasting in public communications media is rather limited. There are two national radio programmes “*Verde Campos*” and “*A voz de extensionista*” which sometimes discuss conservation agriculture but this is never linked to considerations of climate.

The Institute for the Development of Small Scale Fisheries (IDPPE) is one government agency with an active extension programme seeking to tackle climate issues. IDPPE is actively working on climate change adaptive solutions for both coastal and inland fishing communities, and uses information gathered from local communities in devising project proposals and intervention strategies.

3.9 NGO led activities

Agricultural advisory service is also provided by several international NGOs active in rural development and addressing climate concerns. In particular, CARE and Save the Children International (SCI) have integrated climate-change adaptation and resilience into their activities in Mozambique.

3.9.1 The Africa Climate Change Resilience Alliance (ACCRA)

The Africa Climate Change Resilience Alliance (ACCRA) is a consortium of NGOs led by Oxfam GB, Save the Children International (SCF-I), and World Vision, and also including the Overseas Development Institute (ODI). ACCRA was funded by DFID to promote integrated, community based adaptation to variable and changing climatic conditions in Ethiopia, Mozambique and Uganda. Activities in Mozambique were managed by CARE and Save the Children International (SCI) and implemented in conjunction with local NGOs in Angoche and Chibuto districts of Nampula and Gaza provinces, respectively. SCI also supported activities in Sofala province.

ACCRA was established in 2009 with the aim of understanding how development interventions can contribute to adaptive capacity at the community and household level, and to inform the design and implementation of development planning by governments and non-governmental development partners to support adaptive capacity for climate change and other development pressures (Levine, *et al.*, 2011). The first phase of the programme ran from 2009 to 2011 and used a local adaptive capacity framework to assess perceptions of climate change, the broad range of coping at local level, and how best to assist the poor and vulnerable adapt to emerging realities of climate-change. The second phase started in December 2011 and focused on decision- making and planning at the local level. SCF works with the Ministry of Planning and Development (MPD) on capacity building, advocating for

government to take action in the decentralisation process to make it possible for decisions that affect people's lives to be taken at provincial and local levels.

One of the key findings of research undertaken by ACCRA in Mozambique is that autonomous local adaptations are important but not well understood by development agencies which tend to assume that the means for community adaptation come from outside. Accordingly more emphasis needs to be placed on building the capability of local communities to develop their own adaptive capacity (Arnall 2012).

3.9.2 Local NGOs and community based organisations

The national NGO, Women, Gender and Development (MUGEDE), which currently coordinates the forum of rural women in Mozambique, is also the focal point nationwide for gender, environment and management of natural resources. MUGEDE works with community-based women's organisations on gender and climate change and has conducted training in climate change and natural resource management and dissemination through its own network of weather forecasting and climate information provided by the Technical Secretariat for Food Security and Nutrition (SETSAN).

Two community based network organisations engaged in climate change adaptation and natural resources management activities with women's groups were visited in Niassa province during preparation of this report: ROSA (*Rede de Organizações para a Soberania Alimentar*) and PROAGRA based in Lichinga, operating in the districts of Lichinga, Majune, Maua, Marrupa, Nipepe and Sanga. Activities include: mitigation and control of forest fire, prevention of irresponsible tree logging, and conservation agriculture and water conservation. PROAGRA also provides training on sustainable environmental management, and projects in this area include sustainable charcoal production, and introduction of solar-powered stoves with funding from UNDP. The women's group in Majune has accessed loans from the government's \$250,000.00 district development fund (*Fundo do Desenvolvimento Distrital*) to set up small businesses. According to PROAGRA, loan repayment records are very good and this makes them eligible for increased loans in subsequent years.

4. Case Studies

This section of the report details the findings of case study visits undertaken to three local climate change adaptation projects with significant focus on small scale agriculture.

4.1 Case study 1 - Chicualacuala District

The United Nations Joint Programme on Environmental Mainstreaming and Adaptation to Climate Change

Lead organisation: UNDP

Funding source: The Spanish Government through the MDG Achievement Fund.

Implementing national partner: MICOA

Start date: 2008

End date: 2012

This project was implemented in 10 villages in the district of Chicualacuala in Gaza Province and included approximately 1,000 direct beneficiaries. The participating UN agencies in the Joint Programme were FAO, UNEP, UNDP, UN-HABITAT, UNIDO and WFP. Implementing agencies included several government ministries, institutions and NGOs, as listed below.

- i. Ministry for the Coordination of Environmental Affairs (MICOA)
- ii. Ministry of Agriculture (MINAG)
- iii. Institute for Disaster Relief Management (INGC)
- iv. Institute of Meteorology (INAM)
- v. Ministry of Energy (ME)
- vi. Mozambique Institute for Agricultural Research (IIAM)
- vii. Government of Gaza Province
- viii. Government of Chicualacuala District
- ix. International Union for Conservation of Nature (IUCN)
- x. Union of Small Scale Farmers (UNAC)
- xi. Save the Children Fund (SCF)

The Joint Programme was designed to align with government policy, planning and strategies, notably the NAPA and PARPA (Plan for the Reduction of Absolute Poverty), for a harmonised approach that creates synergies and avoid duplication. The aim of the project was to help Mozambique integrate climate change into a national policy. Additionally, the project set up pilot activities to support farmers in adapting to the effects of climate change.

Chicualacuala district lies in the Limpopo Basin of inland Gaza. It is typically flat and characterised by low elevations of generally less than 100 metres above sea level. The area experiences regular droughts, and occasional destructive floods brought by excessive rainfall. These climatic hazards have significant impacts on the population, almost all of whom are subsistence farmers with few other sources of food and income. They rely heavily

on the natural forests when crops fail and income from livestock is reduced. The risks of crop failure and variability of production are high owing to erratic rainfall patterns.

The various activities conducted by the UNJP have contributed directly to the realisation of actions 1, 2 and 4 of the NAPA.

For example, to strengthen early-warning systems the UNJP has assisted the government by rehabilitating and re-equipping a weather station, expanding the reach of the Chicualacuala community radio station and conducting risk-mapping exercises in Chicualacuala and 8 other vulnerable districts. To strengthen the coping capacity of agricultural producers in Chicualacuala District specifically, the UNJP has made numerous interventions (described below) in the areas of water development, agriculture, horticulture, irrigation, livestock health and production, agro-processing, fish- farming, bee-keeping and forestry.

To improve the management of water resources, the UNJP has assisted rural communities by: (i) expanding irrigated agricultural production, (ii) installing household and community rainwater harvesting systems, (iii) drilling boreholes equipped with solar pumps and storage tanks, and (iv) building livestock drinking troughs. Community water-management committees have been created and trained to manage these installations.

4.1.1 Contribution of local/national partners

MICOA is the leading government partner. The following have been achieved through the partnership:

- i. The INGC produced a risk map for Chicualacuala District, which was used by The Secretariat for Food Security and Nutrition (SETSAN) to produce district development profiles.
- ii. The National Meteorological Institute (INAM) was involved in the procurement and installation of meteorological equipment in Chicualacuala. They also provided training to district- level government and community leaders' staff in the use and care of the equipment as well as in methods to analyse and interpret climate data.
- iii. The Ministry of Agriculture (MINAG) staff at the provincial level facilitated training in most activities and, at the district level, were the main government counterpart ministry.
- iv. The Ministry of Energy (ME) provided training to Chicualacuala communities and government staff on the benefits and use of renewable energies, notably solar and bio-gas. The ME took the lead in installing 2 solar water- pumping systems in Chicualacuala.

- v. IIAM has partnered with the UNJP to carry out field-based demonstrations and training (in Chicualacuala) in conservation agriculture, livestock nutrition, dairy hygiene, cheese- making and forest- nursery management.
- vi. IUNC has partnered with the UNJP to implement water- development activities in Chicualacuala.
- vii. Save the Children Fund collaborated with the District Government and the UNJP in conducting Newcastle disease -vaccination campaigns in village- chicken flocks.
- viii. UNAC partnered with the UNJP and the District Government in Chicualacuala to train, equip and monitor 12 community-based animal-health workers from 6 different communities.

At the community level, the activities designed for the beneficiaries included: water harvesting, agriculture, irrigation, livestock- production, bee-keeping, integrated fish-farming, pig management, forestry management and the management of the solar systems for water pumping. Women were fully involved in these activities.

4.1.2 Results of the programme in selected areas

1) Enhanced community- coping mechanisms for climate change

An inventory was taken of strategies and coping mechanisms that were used by communities in particular in the Limpopo River Basin. This was a helpful guide in the implementation of programmed field activities designed to reinforce coping strategies. The activities were carried out in a total of 18 communities with special emphasis on the three communities of Ndombe, Mapuvule and Chissapa situated close to the Limpopo River.

The activities conducted in these three villages included: (i) promotion of irrigated agriculture/horticulture, (ii) integrated fish- farming, (iii) pig management, (iv) bee-keeping, (v) training and equipping of community animal health workers in animal disease control, (vi) training of a community natural- resource management committee in forest management, (vii) training in agro-processing, (viii) facilitating marketing of products and (ix) the supply of tractors and agricultural implements to increase the cultivated area.

In the other 15 villages, only a few of these activities were conducted.

In all villages, water- harvesting systems were established and renewable- energy systems installed for water pumping and electricity supply.

2) Agro forestry practices introduced and applied at the community level

Agro-forestry demonstrations were set up at sites in 5 communities using fruit or fodder trees, many of which were produced in the community forestry nurseries. The respective communities are still using these sites and, as such, the experience gave positive results.

The re-forestation component of the programme in Chicualacuala had little success because community interest in tree nurseries waned and many trees died because of lack of watering. Efforts to establish small cashew nut orchards using the slower-growing native species were not encouraging.

3) Multipurpose integrated water resource management systems

- One hundred household rainwater systems were installed; 50 systems in Chicualacuala town and 50 systems in Mapai town.
- Two community rainwater-harvesting systems were built in schools in Chicualacuala town.
- Four boreholes were drilled equipped with solar water pumping systems.

4) Sustainable conservation agriculture practices introduced and efficiency in small-scale irrigation systems improved

Conservation agriculture to mitigate against climate change was implemented in several fields in 6 communities. The main techniques promoted were:

- a) Minimum Tillage
- b) Maintenance of soil surface cover
- c) Intercropping

Other observations are:

- Adoption of minimum tillage was less successful in an area where animal traction is widely used for ploughing, and renting out the animals is income for the owners. Also, farmers were reluctant because the claim was that this technique increased pests and disease incidences.
- Maintenance of soil surface covered with grass or other materials to retain moisture was successful in plots protected by fencing. Where there were no fences, as was the case with the majority of fields, impact was less visible because the animals ate or trampled on all materials left over after harvest.
- Intercropping cereals and legumes (maize/cowpeas or sorghum/cowpeas) was more widely adopted with reasonable success.
- A total of 4 small scale irrigation systems were set up for horticultural production. Most of the produce was sold locally by the 200 + farmers involved. All farmers received on-going training and support in efficient water use.
- Renewable energy (solar power) has been installed in Ndombe and in Madulo and the water pumped by the systems is used to produce irrigated vegetables.

5) Prospects of biogas generation and composting using waste manure as coping mechanisms to climate variability

The programme ventured into biogas generation and composting using waste manure as coping mechanisms to climate variability in four communities. Farmers were given assistance to set up irrigated production units. The use of mulching and animal manure in agriculture was demonstrated and was adopted by the majority of the more than 200 farmers involved. Farmers also learned how to compost animal manure and other organic materials.

The bio-digester was built on a selected site with community labour under the supervision of a bio-gas specialist from Ghana. A borehole was drilled to provide water for the bio-digester (and for the community) and a solar pumping system was installed. A generator to turn gas into electricity was purchased and installed on site.

4.1.3 Concluding remarks

The study area where small scale irrigation has been practiced has shown considerable increases in crop production. This has also resulted in the piloting of some of the conservation agriculture (CA) principles such as crop rotation, intercropping and maintaining soil cover through mulching using manure. CA is likely to be more widely accepted if the basic principles are broadened to include crop-livestock inter-actions that would encourage multipurpose trees and grass species that can be used for both human and livestock needs.

Crop-livestock integration was not envisaged as an intervention by the project, and was not developed, but it will remain a very important area for scaling-up. It has significant potential for building resilience and developing crop-livestock synergies in a smallholder system operating under rainfed conditions, and where livestock are crucial resources in adaptation. The development of animal traction rather than the conventional mechanised ploughing could also be a more affordable and environmentally sustainable solution to the problem of climate change.

Urgent attention to managing and regulating the harvesting of forest resources, combined with the strengthening of alternative income generation from sources other than charcoal, is vital to climate change adaptation. The development of community forest management plans and the introduction of by-laws serve as a strong basis to maintain the ecological stability of the forests. This could be an example for up-scaling in other areas.

Diversification of the livelihood basis using livestock and forest resources will play an important part in adapting to climate change in this district and other similar areas. Bee-keeping and integrated fish- and small- animal farming were activities not envisioned in the project document but have been initiated based on local requests. Such flexibility will be important in incorporating changes in the climate-change adaptation programme, which will help build resilience. Furthermore, the development of value chains, particularly when these

incorporate small scale enterprises, and are based on locally available resources will be an important means of adapting to climate change.

The use of renewable energy from the sun and organic waste, and its use for increasing production and added value should be supported at all times as a climate change response. The technical considerations and barriers must be assessed before deciding on feasibility, particularly relating to biogas. The by-products of biogas can also be used for improving soil fertility, which is a serious constraint in the project area.

Other lessons learned from the project include:

- Beneficiary involvement: To ensure beneficiary ownership of the project and sustainability beyond the life of the project, beneficiaries should be involved in all stages from project design to phasing-out. This is to avoid the project collapsing when funding ends.
- Improving access to water resources: Water is central and critical to climate change adaptation in Chicualacuala. The current and future water resource, from all sources, must be scientifically assessed and used sustainably in order to adapt to climate change and support long-term development. Future project formulation and site selection should also assess the water availability potential, as it will significantly influence adaptive capacity to climate change.

4.2 Case study 2- Guija District

Coping with Drought and Climate Change

Lead organisation: UNDP

Funding source: GEF

Implementing national partner: MICOA

Start date: 2009

End date: 2012

In 1999, Mozambique participated in a farmer-focused survey on accessibility and use of contemporary and indigenous climate information commissioned by UNDP. Following the survey, Mozambique expressed interest in a UNDP-supported project to assist adaptation to climate change and potential interventions were identified in the most vulnerable regions including the Lower Limpopo, the semi-arid interior of Gaza and Inhambane provinces, and the Upper Limpopo zone. The combination of vulnerability to climate change and the need to create synergies with existing/on-going efforts on drought management, led to the selection of two communities in the district of Guija district for the pilot project.

The project was intended to contribute to the Mozambique Government's goal of enhancing food security and the capacity to adapt to climate change in agricultural and pastoral

systems. The project's objective was: *To develop and pilot a range of coping mechanisms for reducing the vulnerability of farmers and pastoralists to future climate shocks.* The project worked to improve the livelihood strategies and resilience of farmers to drought through guaranteeing water supply, enhanced farming practices and improvement of community-based natural resource management. The project also established the use of early- warning systems to bolster resilience in the agricultural sector.

The project sought to undertake measures identified by Mozambique in its Initial National Communication to the UNFCCC to address the vulnerability of different economic sectors, including agriculture, to future changes in climate. For agriculture, these included: (1) adjustment of land management practices, such as changes in crop types, season and location of farming, development of intensified and mechanised farming; (2) promotion of drought- tolerant crop varieties and livestock in drought vulnerable areas; (3) alternation of grazing systems; (4) change of stocking rates; (5) change in the timing of the grazing period. Furthermore, the National Adaptation Programme of Action (NAPA) confirmed that sustainable land management, drought and agriculture are priority adaptation issues.

The project on Coping with Drought and Climate Change was to develop and pilot a range of coping mechanisms for reducing the vulnerability of small-holder farmers and pastoralists in rural Mozambique to future climate shocks. It was structured around four outcomes:

- Promoting sustainable livelihoods so that farmers and livestock-keepers are able to cope with drought;
- Enhancing use of early- warning systems to provide timely and relevant information to farmers/pastoralists to assist them in coping with drought;
- Integrating climate- risk management across sectors, institutions and society; and
- Up-scaling adaptation lessons learned outwards to other geographic areas and upwards to national policy level.

In line with the reasoning of the UNDP-GEF Adaptation Policy Framework (UNDP, 2013), the approach recognises that adaptation occurs through public policy-making and decisions made by stakeholders, including individuals, groups, organisations (government entities, non-governmental organisations and private companies) and their networks. Since the project addressed the future impacts of long-term climate change by increasing the adaptive capacity of local and national stakeholders to cope with increased frequency and intensity of drought, local project stakeholders needed to build their own capacity to adapt to changing climatic conditions. The project strategy therefore sought to build capacity for continuous review of the sustainability of land-management systems, and to adapt them as climate changes alter underlying drivers of productivity.

4.2.1 Location

Gaza province, located in Mozambique is particularly susceptible to climate variability and drought. It is threatened increasingly by desertification and scarcity of water resources and the loss of biological diversity. In this environment, rain-fed farming is a high-risk enterprise but also a way of life. Agricultural productivity is low and the production environments are normally characterised by stress due to low soil moisture. There are large yield gaps between the average farmer and the best farmer, and returns to land, labor and capital are low. Droughts tend to reduce production below the already marginal levels, so that subsistence farming itself is threatened. These conditions occur where the local economy is least diversified and where virtually everyone depends either directly or indirectly on agriculture (adapted from FAO, 2004).

Guijá is situated in the central part of Gaza province and four districts surround it: Chigubo in the north, Chókwe in the south, Mabalane in the west and Chibuto in the east (Figure 2). The drought risk (in terms of rainfall distribution) increases from east to west and from south to north. This is also the direction for the aridity level, which places Guijá in a transitory position between highly vulnerable and less vulnerable districts. The total area of Guija district is 4,200 Km² and occupies 5.6% of the total area of Gaza province. There are four Administrative Posts: Nalazi, Mubangoene, Chivongoene and Caniçado. Caniçado is the district capital. The upper Limpopo, the Semi- Arid Interior and the Lower Limpopo (Fig 3) are the three livelihood zones in Guijá District.

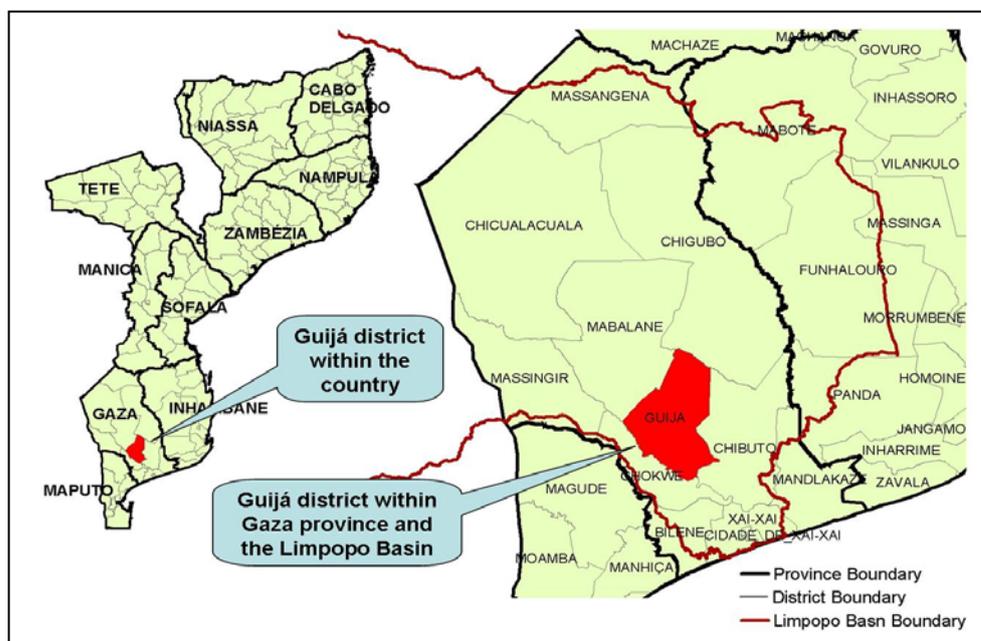


Figure 2: Location of Guijá district relative to the country and the Limpopo Basin

In Guijá District, all rural farmers face the same dilemma of adapting to water scarcity and drought, management decisions on how to allocate limited resources among crop production, livestock production, and off-farm employment. One of the main considerations in adapting to climate change is how to use climate risk information for agricultural planning. A range of approaches for adaptation to climate change were presented including gender-sensitive post-harvest income-generating activities such as preservation of natural fruits for marketing.

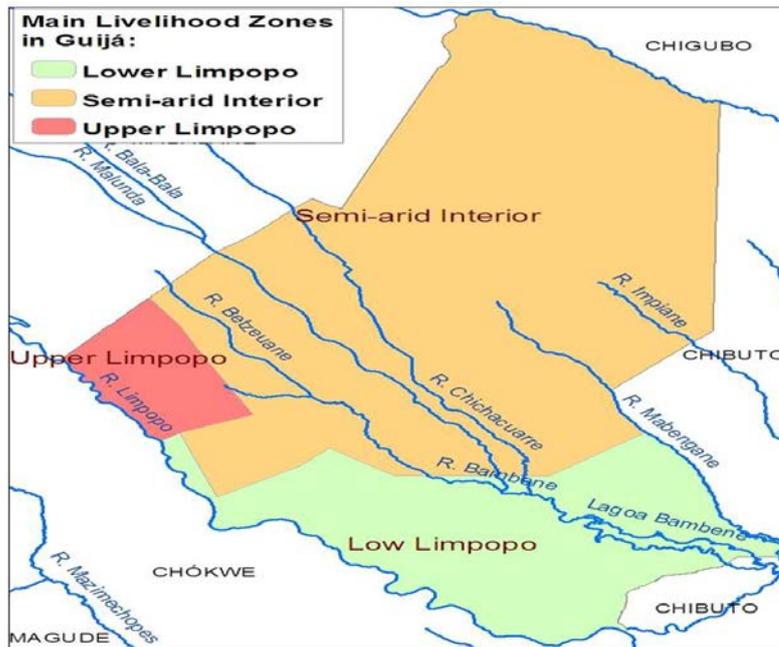


Figure 3: Main Livelihood Zones in Guijá district

4.2.2 Water Availability in the Project Area

The problems with water supply in Guija are availability and quality. The programme in Guijá planned to undertake activities like the construction of small dams, basin dams, subterranean bridges, wells and boreholes in the field. However, prior to doing so it was decided to undertake hydro-geological survey studies in the district to make sure that there would be quality water in sufficient quantity in the subsoil in target communities.

Socio-economic studies were also conducted in the district, and extension activities were reviewed to provide insight into the role of extension in drought management. The hydro-geological and socio- economic studies were intended to enable the project and the local government to establish a basis for decisions on what kind of water-supply infrastructures should be built where and how better to plan for the future.

In carrying out these studies, an assessment was first made of the current situation regarding quality and quantity of potable water points in the district and their functionality in the communities taking into consideration the use of natural resources, existent availability of water resources for agriculture and livestock farming as well as overall understanding and attitude of local communities with regard to early- warning systems and climate change. Also the people's perceptions, levels of awareness, knowledge, attitudes and practices related to climate- change adaptation were assessed.

4.2.3 Findings

1) Quality and Quantity of Potable Water Points and hydro-geological Survey Results

It was found that the communities were concerned about:

- i. The frequency of droughts experienced,
- ii. The significant reduction of water resources available for domestic use, livestock watering and cropping. This had resulted in very low crop yields, shortage of pasture and poor condition of livestock.
- iii. Communal boreholes and wells linked to animal dip tanks had low water tables and were no longer functional. This had created poor sanitation and hygiene conditions and impacted badly on animal health.

The geo-hydrological survey showed that:

- i. Even though water was available in sustainable quantity in many locations the quality was poor.
- ii. Salinity was high especially in Nalazi administrative post where good water was found in only one location visited.
- iii. Road access was a big constraint in this administrative post and it was decided that the survey team should return when road conditions improved to investigate other locations.



Figure 4: *Dried up lake that served for cattle watering and Water pump rusted from salty water*

2) Agriculture, livelihoods, and socio-economic impacts of climate

The main livelihood activities of the population in the study area are crop and livestock production which are both climate-dependent. Livelihoods have been challenged in recent years in coping with drought, unreliable rainfall, high temperatures and other related climate hazards such as pests and diseases, soil erosion and desertification. The socio-economic study looked at the impacts of climate change on key livelihood resources in the communities, people's adaptive capacity and coping mechanisms. The communities identified drought as the most important climate hazard that threatens their livelihood followed by high temperatures.

Maize is the only cereal crop produced, alongside *Phaseolus* beans, groundnut and cassava, even though in some years the annual rainfall is insufficient for good crop production. The more drought-tolerant cereal crops like millet and sorghum are not grown. The communities know that if the trend of reduced rainfall continues, maize could become a crop of the past unless drought-tolerant varieties are introduced.

Rural communities largely depend on the natural environment to provide most of the livelihood resources they need. The eminent degradation of the ecosystems resulting from climate change hazards is having serious impacts on the livelihoods of communities as the hazards are already resulting in reduced availability of goods and services to local communities and reduced economic opportunities especially for women.

The main financial resources on which the communities depend are; limited sale of crops, sale of livestock (cattle, pigs, goats and chickens) and sale of forest products such as wild fruits, firewood and charcoal. All these financial resources are strongly impacted by drought and desertification, as most of them are directly dependent on climate-sensitive natural resources. Because of limited income from livestock and crop sales, the district has experienced increased poverty, food insecurity, and migration of young people in search of employment in near-by towns.

4.2.4 Lessons Learned

The project had established implementation partnerships with government institutions. Project and programme outcomes on climate-risk management have been taken up and pursued by a number of NGOs and government agencies operating in the region. The focus has been on livelihoods diversification, small scale irrigation development and conservation agriculture.

- 1) *Piloting*: The optimised crop pilots through this initiative have the potential to benefit about 4,267 households in Guijá district, and many thousands more households at the national level.
- 2) *Early-warning systems*: Enhanced use of early-warning systems for agricultural purposes at the selected pilot sites resulted in 3,952 farmers/households integrating

early-warning information into their agricultural practices' decision-making processes. This was also done by many households in other districts.

- 3) *Water scarcity*: Drought mitigation (water scarcity) was reduced with access to quality water for communities in the pilot district resulting from construction of concrete water- harvesting and storing systems.

4.3 Case Study 3 - District of Angoche

CARE Climate Change Project

Lead organisation: CARE

Implementing national partner: AENA

Start date: 2012; on-going

The project's focus is on adaptation and seeks to follow up activities supported by CARE in Angoche District linked to the ACCRA initiatives work in Mozambique, working in partnership with a local NGO, the Nampula Association of Extensionists (AENA). The project aims to develop agricultural climate adaptations so as to improve the livelihoods of coastal and inland communities and address immediate needs. It does this by adopting production practices such as conservation agriculture, based on reduced tillage, maintenance of soil cover and crop rotation, and promoting other adaptation technologies including improved seeds tolerant to drought and flood, conservation agriculture using mulching and control of forest fires. CARE also introduced an *Adaptable Programme Lending* (APL) component, to support climate compatible productive activities.

The programme collaborates with IIAM on seed improvement and with UEM on communication and extension. CARE's initiatives have also sought to manage climate change impacts at field level by encouraging farmers to leave trees in their fields and uptake of sustainable agricultural practices to reduce the effects of irregular rains on crop production, control evapotranspiration and soil erosion, improve water conservation (using mulches and cover crops) and to reduce forest degradation and assist carbon sequestration by improved fallowing technique to reduce the opening of new fields from secondary forest.

Owing to its location this region of coastal Nampula is extremely vulnerable to the impact of coastal storms and agriculture is also hampered by sandy soils with poor water retention and in some locations high salinity levels. Only a limited assessment of the project was possible because of the severe impact of heavy rains and localised flooding on access roads and communications in the area, which prevented planned visits taking place. Poor communications also prevented representatives of the implementing agency AENA from gathering and forwarding information to the consultant and from participating in the workshop.

The project is implemented in several communities and the plan to share knowledge is through field days and exchange visits. Discussion with farmers from one participating community targeted by AENA, Sawa Sawa, revealed that they had little understanding of the holistic, conservation-oriented production practices promoted by the project. However the scope of the project may need to be broadened according to local conditions in order to respond to the immediate and eminent threat smallholders face from climate change and variability. In a coastal ecosystem like Angoche, an integration of crop production, agro-forestry and fishing would enhance the resilience of the smallholder in the face of climate change.

Key points which emerged from the assessment done in Sawa Sawa were:

- The group of farmers met explained that inadequate information and insufficient water were the most important challenges to their livelihood.
- The majority of people in the project area obtain water from wells, which are insufficient in number and in some cases too distant imposing additional labour burdens on women.
- Information on extreme climate events, especially floods and hot winds, to enable them to put in place risk-aversion strategies. Currently, the radio and government extension service are the sources for early warning on climate hazards.

4.4 Lessons learned from the case studies

The projects visited, and other interactions with stakeholders, suggest a number of relevant lessons on practical approaches to climate adaptations in semi-arid areas. Most significantly:

- The scope of climate adaptation support projects and the technical approaches recommended, such as conservation agriculture techniques, may need to be broadened to address the immediate climate related risks experienced by local people, and the specific local conditions in any one place.
- Sustainable agricultural intensification and improved integration of small scale farmers into markets are both critical in reducing pressure on the natural resource base, and in achieving more climate compatible agriculture
- Simple, available technologies to improve water supply and management and develop small scale irrigation have a central role to play in adaptation.
- Diversification of the livelihood basis using livestock and forest resources will play an important part in adapting to climate change.
- Training farmers and community members in both on- and off-farm climate compatible natural resource based income generating activities has had a central role in successful local interventions.

- Development of value chains, particularly when these incorporate small scale enterprises, and are based on locally available resources will be an important means to adapting to climate change.
- Before beginning a local adaptation programme, comprehensive prior assessment is necessary. This relates to socio-economic conditions, technical conditions (for example hydro-geological in the case of water resource development), and institutional conditions (for example extension programmes and their achievements).

Other lessons are more specifically about agricultural technologies:

- There is promise in combining conservation agriculture techniques with small scale irrigation.
- Where animal traction is widely used and livestock are present, fences will be needed to protect fallows.
- Conservation Agriculture is likely to be more widely accepted if the basic principles are broadened to include crop-livestock inter-actions that would encourage multipurpose trees and grass species that can be used for both human and livestock needs.
- Agroforestry practices to assist food and cash crop production, and tree crops themselves can be welcomed and adopted by farmers, but it can be difficult to mobilise broader re-forestation activities due to lack of incentives to maintain them.
- Urgent attention to managing and regulating the harvesting of forest resources, combined with the strengthening of alternative income generation from sources other than charcoal, is vital to climate change adaptation. The development of community forest management plans and the introduction of by-laws serve as a strong basis to maintain the ecological stability of the forests.

The case studies also suggest a number of institutional lessons:

- Establishment and capacity building of community based organisations and local resource management institutions are necessary to manage and sustain the innovations developed by adaptation projects.
- Global and national interest in supporting adaptation to climate change in vulnerable areas such as Guija has enabled government to access international funding and facilitated the institutional coordination necessary to address perennial problems of inadequate water supply in some of the most vulnerable areas, even though the problems experienced are not new, and arguably do not relate to changes in climate.

- Engagement of national sector institutions in local level pilot projects is helpful in assisting them to learn lessons about climate adaptation. Joint working in pilot projects can enable stakeholders to identify how they themselves can adapt their broader approaches to the risks and impacts of climate change.
- So far, however, it is not clear if the projects have helped national institutions to apply the lessons learned more broadly, or scale up joint programming, or what kind of framework for collaboration would be required to encourage this.

5. Stakeholder Workshop

5.1 Objectives and participation

The objectives of the workshop were to present the interim findings of the study and stakeholder perspectives on climate change in the agricultural sector in Mozambique.

There were 45 participants and these were drawn from ministries, departments and agencies of government, international agencies, donor agencies, international research institutes, NGOs, CBOs, the universities and private sector. (a list of participants is annexed).

The workshop took place over one day and was arranged in three sections: (i) opening and presentations; (ii) plenary discussions, and (iii) working groups. Working groups reported on their sessions and a final consensus was reached on the way forward.

The meeting was officially opened by the representative from MICOA, Dra Telma Manjate. The moderator, Professor Firmino Mucavele of Eduardo Mondlane University, and an adviser to the national parliament, stressed the importance of the project in the process of climate learning in agricultural advisory service in Mozambique and asked for full involvement of all for the success of the project.

5.2 Presentations and discussions

The CLAA Mozambique study consultant assisted by the NRI adviser presented the climate learning project on and gave a brief description of the CLAA project objectives, and those of CDKN as the funding agency. There was a series of presentations by representatives of the Ministry of Agriculture, the University of Eduardo Mondlane, MICOA and IFAD. A question and discussion session followed, and the afternoon was devoted to participatory discussions.

Discussions enabled participants to clarify their shared understanding of the impacts of climate change on agriculture and the contributions that agriculture makes to climate change processes. The key points were synthesised by the moderator:

Agriculture's contributions to the causes of climate change:

- The reduction of forest cover substantially alters the hydrological cycle in a region and reduces storage of carbon dioxide.
- In addition to carbon dioxide, methane and nitrous oxide are amongst the principal gases that cause the greenhouse effect. The increasing use of intensive animal production systems becomes a source of solid, liquid and gas emissions that are harmful to the environment.
- Organic and synthetic fertilisers emit gases into the atmosphere; manure, especially liquid manure derived from cattle, is a source of methane.

Effects of climate change on agricultural production:

- Climate change causes more frequent and severe droughts, floods, pressure on water resources, food security, health, infrastructure and overall development.
- Reduced water flows in hydroelectric dams and degradation of biomass for energy.
- Reduced biodiversity, agricultural productivity and reduced grazing areas.
- Climate change contributes to increased prices of agricultural inputs.
- The ability to diversify production is more limited as a result of changing rainfall availability and rises in temperature causing changes to the cropping calendar.
- Climate change will exacerbate variability in availability and overall scarcity of water resources.

Two working groups were formed to discuss priority actions and learning points related to climate at community and national government levels. The groups made recommendations on actions to be taken at the national and community levels to enhance climate information dissemination and learning.

5.3 Working Group findings

Working Group 1: recommended actions at community level

- Identify how communities cope with drought, including traditional knowledge and systems that aim to mitigate drought effects.
- Develop and implement plans on climate change and development that engage rural communities directly.
- Greater integration and implementation of effective adaptation and mitigation into local and community based development plans.
- Strengthened collaboration with the private sector, civil society and development partners, to integrate climate change issues into strategies and development programmes.

- Develop and promote strategies and technologies to manage the impacts of climate change on agriculture and food security, water resources, health, energy and environment.
- Develop and promote information services to public, private and civil society for enhanced awareness and practical management of climate risks.
- Improve data collection, analysis and production of recommendations for activities underway on climate risk management.
- Oversee climate variability and change by strengthening networks and weather stations at national and community level.

Working Group 2: recommended actions at national level

- Identify the needs and constraints of farmers in the implementation of risk management techniques and in the utilisation of climatic information, including seasonal forecasts and products from the Drought Monitoring Center (INAM, INGC).
- Improve communication and outreach to rural communities. This requires identification of existing communication systems and their effectiveness in processing information flow from the producers to the end users (rural communities and small scale farmers), communications constraints and how can they be overcome, and how local knowledge be combined with modern communication systems.
- Promote research and analysis of stakeholder perceptions and perspectives on climate change and climate change mitigation.
- Strengthen institutional capacity and coordination.
- Improve advice and technical assistance available.
- Develop knowledge, management and learning between organisations and institutions in the country.
- Create, empower, indicate the mechanism or institution that will serve as a platform for Climate knowledge dissemination and learning.
- Promote, if possible, regular meetings, debate, sharing of information between institutions on climate change.
- Formulate public policies in such a way as to guide institutions to develop and disseminate appropriate technologies and practices.

6. Concluding Discussion

Small scale agriculture and the food security of rural households in Mozambique are dependent on climate. Erratic weather undermines rainfed agricultural systems, heat stress on crops reduces yields, increases in carbon dioxide concentrations decrease the protein content of vegetation (with implications for both human and livestock health and productivity), rising rates of evapo-transpiration increase pressure on water supplies, especially in areas where river runoff is reduced and shallow wells become unreliable. As a

result farmers face immediate and continuing challenges in adapting farm practices and livelihoods to these increasingly unpredictable climate conditions.

Progress in climate compatible agricultural development in Mozambique has been hampered by the diversity in climatic conditions, variation and change, a predominantly centralised approach to policy and programme development, the size of the country and geographical distance and poor flow of information amongst different organisations and between levels of government.

Farmers lack access to agricultural information, technologies and skills with which to address climate challenges. At present early-warning and forecasting systems use a language that is difficult for rural communities to understand and farmers are limited in their ability to use information received. Coverage is low and available communication channels (community radio, district authorities, churches, etc) are not adequately used by farmers. The information disseminated is not enough for farmers to plan their activities.

Two of the main constraints to successful agricultural adaptation identified therefore include:

- Resistance from rural communities in accepting new technologies, as they have been adopting traditional coping methods and find it difficult to adopt new ones, owing to perceptions of the risks and costs involved;
- Limited assessment of the impact of practical climate adaptation interventions to enable generation of lessons to be shared.

6.1 Institutional issues

The interviews conducted, the projects visited and the workshop all point towards the central importance of institutional conditions in Mozambique in enabling climate learning and adaptation in agriculture to take place at broader scale. The study has identified a number of institutional constraints and issues to be addressed.

The policies and plans from different ministries and institutions identify the causes of the country's vulnerability, and propose mitigation and adaptation measures, which, if implemented would become relevant as immediate responses to on-going climate change. Clearer definition of the role of government in planning and technological development in shaping and mitigating these impacts at the level of the most vulnerable is therefore essential.

In Mozambique, the main barriers to mainstreaming climate change into development relate to lack of alignment of policies/strategies/plans, lack of institutional coordination, lack of integration and of multidisciplinary perspectives, and limited human and financial resources.

The study's informants and workshop participants, including many from central government, stressed that actions at the community level are equally as important, if not more important, than national actions. Actions taken at the community level have a more rapid impact as they (a) can identify the problems at the local level more accurately and (b) can allow preventive measures and rapid responses to be taken at the local level, nearer to the problem. However there is still limited institutional capacity for mainstreaming initiatives at the provincial and district levels. In spite of the decentralisation process, the lack of communication, coordination, funding and poor information dissemination impedes mainstreaming climate change at local level.

It was expected that the Ministry of Coordination of Environmental Affairs would increase its leverage and convening power to coordinate other ministries that are instrumental for mainstreaming climate change. However, because of the institutional difficulties and inter-departmental coordination issues within MICOA, things have moved slowly.

Climate-resilient planning targeted appropriately at district and at local level in line with Mozambique's on-going decentralisation process has not happened and delegation of responsibilities to provincial and municipal authorities is slow. However, significant progress in building adaptive capacity and resilience to climate change at local level has been made both by UN funded pilot programmes through which central government actors engage with local adaptation planning, and by NGOs, especially CARE and Save the Children through the ACCRA programme. However there are no plans or mechanisms in place for learning systematic lessons from these initiatives and for scaling up.

The workshop revealed co-existence of two distinct approaches amongst stakeholder organisations: on the one hand, a preoccupation amongst central government agencies to secure funding for institutional coordination and sector-led implementation of climate-related activities, and on the other a drive to mainstream climate resilience and compatibility effectively in more decentralised programmes able to respond to locally specific climate challenges in coherent ways, while identifying the broader lessons. Inevitably, there is a degree of institutional inertia, and bureaucratic self-interest within central government institutions, and a discrepancy between the network of actors dealing with climate policy and strategy, and the potential for innovation and learning at lower levels and amongst other actors.

To achieve broader learning and integration of climate concerns into agricultural development it will be necessary to overcome this central-local dichotomy. This in turn will require stronger institutional arrangements for coordination and network-based working amongst multiple actors inside and outside government at provincial and district levels. The current centralisation of policy and planning within both the Agriculture and Environment Coordination Ministries (MINAG and MICOA) does not facilitate a more decentralised, locally responsive approach.

6.2 Agricultural research and extension

Agricultural research and extension, advisory and community outreach organisations activities have introduced climate considerations and collaborated with others to address climate change in *ad hoc* ways. Research has focused on selection of drought tolerant varieties and soil and water conservation appropriate to known recurrent climate hazards in drought prone regions of Mozambique.

Adjusting agricultural practices is a costly option for many farmers, as significant investments are needed for re-sowing, crop replacement, intercropping and irrigation. As found by the ACCRA project synthesis study in Mozambique (Arnall 2012), in the absence of external support, the adaptations within reach of poor farmers are largely confined to adjustments in the timing of planting and harvesting. Moreover poor farmers tend to be suspicious of unfamiliar, externally introduced technical innovations, because of new, unfamiliar risks that these may involve.

Weak policy and institutional development, as well as low levels of state budget allocation constrain the agricultural sector as a whole, whose development is at present largely driven by a combination of large-scale foreign investment in agricultural projects and international donor funding to boost smallholder productivity and integration into markets. As a result it is unlikely that significant learning and innovation can be fostered solely by engaging official actors in agriculture at central level.

The public extension service seeks to promote climate adaptation by disseminating specific technical innovations but has limited operational capabilities. There is a very wide range of public, private and civil society actors engaged in different types of rural extension activities, but a lack of overarching institutional framework or mechanism that could enable more systematic dissemination of adaptive techniques and learning processes, still less in the context of climate change. The findings of the case studies and the stakeholder workshop suggest that three aspects of outreach and communications require attention, rather than simply increasing the emphasis on climate-relevant messages and technologies by agricultural extension and advisory services:

- Improved communications and flow of information to district and community level on a) weather conditions, alerts and climate-related hazards, and b) on relevant existing technologies and approaches to adaptation,
- Broader approaches to community outreach and development of awareness and capacity at local level and amongst active community based organisations that go beyond promotion of relevant agricultural technologies, resource management techniques, and better market access,
- Increased opportunities for feedback to provincial and central levels and exchange of information amongst stakeholders in different locations on climatic conditions,

impacts and successes, opportunities and constraints encountered in promoting adaptation.

New ways and methods are needed to improve access to climate information by farmers to encourage and support them in identifying alternative management practices and technically viable options. Access to regular and updated information will allow farmers to respond, rapidly, for livelihood adaptation in the context of continuously changing socio-economic and climatic conditions. Local people will need to have effective links with local and national institutions that can provide information on good practices, share knowledge and build networks on climate change adaptation.

6.3 Climate knowledge management, communications and awareness

The findings of this study highlight the need for better all-round knowledge management and information flow on climate and development matters and for stronger decentralised collaboration amongst government and non-government actors, for instance at provincial and district levels, to address region specific climate challenges and encourage more comprehensive efforts at adaptation.

There is a wide variety of initiatives on which it is difficult to track information. A number of these, notably the NGO-led ACCRA programme and UN assisted pilot projects by government have operated through networks of organisations and have sought to promote learning about adaptation to climate change. Community based women's organisations have also sought to do this in some parts of the country. However, there has so far been no opportunity for interaction of the various stakeholders and no systematic attempts to synthesise findings, and disseminate learning and feedback to policy and programme development and design, although individual agencies have sought to do this in their own way.

While the agricultural sector stands out as particularly vulnerable to climate change and variation (INGC 2009), awareness of the practical challenges posed by climate variability is limited. The impacts of climate change on agricultural productivity and food security in different regions of the country have still not been sufficiently analysed, discussed or prioritised in policies. Understanding of increasing climate risks and climate hazards within rural communities is evidently low. The limited progress at national scale in climate adaptation and learning is linked to insufficient data and information availability; weak data and information management and inadequate data and information dissemination about who is doing what, as well as about knowledge of climate change and its actual and potential impacts.

Independent international initiatives to address climate issues and climate change adaptation, such as the present study, are not well linked to on-going national processes and institutions. One of the most significant important projects and studies, the work of the ACCRA programme in Mozambique (Arnall 2012) also supported by CDKN, now has low visibility within Mozambique. The lead NGOs appear to be no longer engaged other than through their own programmes, and although local NGOs continue to operate at the project sites, national stakeholders appeared not to be aware of the findings, which are not being made use of in agricultural planning.

There is a need to compile and integrate existing information on climate scenarios and risks, current activities and existing organisational roles. The present study has been partially successful in bringing together stakeholders and knowledge sharing, but an initiative that is more embedded in on-going activities of organisations active in Mozambique is needed.

A current proposal, as discussed with stakeholders at the study workshop held in February 2013, is for the development of a climate knowledge centre under the Ministry of Science and Technology with a mandate to produce information for policy makers. The Centre would coordinate and manage information but not actually undertake research, although it could commission it, and the collaboration of a range of national and international research organisation would be required. The INGC and University of Eduardo Mondlane plan to cooperate in developing the centre, and funding is anticipated from the World Bank through the SPCR programme. It is understood that the SPCR has made budget provision for a detailed design and implementation of measures to disseminate, discuss and mainstream relevant studies and pilot experience on climate adaptation. As recommended by the study workshop, it would be desirable for such a climate knowledge centre to play a role in national dissemination and communication of climate knowledge and providing policy guidance to the different levels of government and to the public as a whole.

The proposed IFAD ASAP project in southern Mozambique, which aims to increase the climate resilience of value chains and reduce the impact of climate change on productivity and profitability of smallholder farming through the promotion of adaptation policies, techniques and technologies, is expected to generate and disseminate knowledge and information on issues related to climate change adaptation for small farmers and also for policy makers and other key stakeholders. The project could potentially make an important contribution to climate knowledge management for agriculture in collaboration with a national climate knowledge centre and the research organisations engaged.

6.4 Recommendations

The study, especially the workshop, identified that a multiplicity of actors is required to address climate change awareness and mitigation in Mozambique. It is hoped that this study will contribute to strengthen policy and practice directed at strengthening climate resilience

in Mozambique. There is a need for long-term programming in climate-change related activities in Mozambique, in line with the issues below:

1. There is clearly a need for a mechanism to catalyse public and private sectors actors to collaborate and support each other in: (i) awareness-raising on climate change, and (ii) knowledge-sharing. Such a mechanism should aim to strengthen collaboration among the various actors that will promote complementarities of interventions and avoid duplication of efforts.
2. Research on current climate changes, climate change scenarios and impacts on agricultural production and food security should be strengthened, to combat the current weak availability of data.
3. There is also a need for assistance in capacity building to make use of research knowledge related to climate change.
4. Management of climate information for agriculture should be strengthened and information effectively disseminated in a more accessible language and in a timely manner, that is, when and where it will be useful for farmers and can be easily understood by them.
5. Media knowledge of climate change issues should be enhanced and better media linkages established on climate change activities between government, CBOs, international and national NGOs. This will raise the media's advocacy role and to support information dissemination at national and grassroots level. There is also a need to train local people as communication agents responsible for interpretation of messages into local language.
6. Climate-change learning opportunities should take maximum advantage of the existing community radios to disseminate climate- related information.
7. Planning for climate resilience should be linked with the decentralisation process so that it targets vulnerable districts and localities and is in line with local- level planning arrangements.
8. In line with the decentralisation process, responsibilities should be delegated to provincial and municipal authorities for local-level planning to formulate strategies and mitigation responses that will inform national policies and strategies.
9. In coastal areas such as Angoche, where farmers are also fishermen, coping strategies should include artisanal fish production.

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ANNEX 1: List of people met

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John Guernier – CARE WWF Alliance
Ross Hughes, Senior Climate Change Specialist, World Bank
Elias Massicome, INGC
Saquina Mucavele, MUGUDE(Women, gender and development)
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Ernesto Poiosse, IDPPE
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Cesar Tique, AfDB, Maputo
Rita Zacarias, Climate Change Adviser, DfID

ANNEX 2. Principle Laws, regulation and government, international and civil society organisations concerned with climate change in Mozambique

Table A2.1 Mozambique's principal environmental related laws and regulations (source: IFPRI 2011)

Sector	Instrument/Law
The New Republican Constitution	<p>The constitution is the “mother law” that all citizens in Mozambique have the right to live in a balanced environment and the duty to defend it. Public institutions and bodies should adopt environmental protection policies, and ensure the rational use of natural resources. The 1990 Constitution of Mozambique was amended in 2004. The principal modifications made in 2004, which have since been progressively implemented by law, concern in particular: the law-making powers granted to the executive through the introduction of the decree-law; decentralization of decision-making powers; reform of the court system; the creation of an Ombudsman (not enacted); and the establishment of a Superior Council of the Media.</p> <p>The President is the Head of State and presides over the Council of Ministers, composed of the Prime Minister, appointed by the President, and the Ministers. The unicameral Assembly of the Republic, the highest legislative body of the Republic of Mozambique, comprises 250 deputies elected for a five-year term (renewable). Legislation may be initiated, inter alia, by the deputies, the President, and the Council of Ministers. The Assembly adopts draft laws by majority vote of those present (provided that at least half of the deputies are present), these are then promulgated by the President. The 2004 Constitution introduced the decree-law, a legislative act passed by the Council of Ministers pursuant to the authorization of the Assembly of the Republic. The Council of Ministers may ratify agreements, including on trade and investment, by ministerial resolution, while the Assembly ratifies agreements and treaties by the adoption of laws</p>
National Defense and Related Forces	<p>Law 18/97 of 01.10.97</p> <p>Regulates engagement of armed forces and defines situations of war. It is related indirectly to climate change by providing for involvement of armed forces in emergency response.</p>
The Environment Law	<p>Environment Law No. 20/97:</p> <p>Sets the legal basis for the use and proper management of the environment and its components. It also includes specific</p>

Sector	Instrument/Law
	measures of environmental protection, and sets parameters and minimum content of environmental impact assessments.
Creation of the Ministry for the Co-ordination of Environmental Affairs (MICOA)	<p>Presidential Decree Nr. 2/94:</p> <p>The Ministry has the mandate to (i) prepare policies for sustainable development, with the respective legislation and co-ordinate its implementation, (ii) Enable and promote other sectors to include environmental principles in their projects and development programs, (iii) establish rules, regulations and supervise activities related to natural resources, (iv) monitoring to maintain the quality of environment, (v) build the capacity of local communities to sustainably use natural resources. MICOA has established the National Council for Sustainable Development (CONDES) in 1997. As an inter-ministerial body, CONDES now has overall responsibility for Government's CC strategy, for which MICOA is the lead executive agency</p>
Establishment of the National Environment Policy	<p>Resolution No 5/95:</p> <p>This is considered to be the basis for sustainable development, through an acceptable and realistic compromise between economic progress and environmental protection. In order to make the policy operational, a number of laws, resolutions and legal instruments were approved.</p>
The National Policy for Disaster Management	<p>Approved in June/1999:</p> <p>This policy includes threats of droughts, floods and cyclones but leaves open the occurrence of disasters such as fires, earthquakes and others. The policy provides a systemic approach to indicate a "... system of prevention, rescue and rehabilitation...", which requires harmonisation and effective multi-sector co-ordination.</p>
Coordinating Council for Disaster Management (CCGC)	<p>The CCGC was decreed in June, 1999 and was created as an organ by the Council of Ministers with the general mandate to coordinate the activities of multi-sectoral management of disasters including prevention, mitigation, emergency relief and rehabilitation and post-disaster reconstruction.</p>
The National Institute of Disaster Management	<p>INGC was established in 1999. The main areas of intervention are prevention, mitigation, and support to the development of arid and semi-arid areas. The Master Plan for the Mitigation and Prevention of Natural Disasters is both an institutional and political guiding document. It includes vulnerability reduction and mitigation actions which should be considered in</p>

Sector	Instrument/Law
(INGC)	combination with actions of sectoral ministries.
The Disaster Management Policy	<p>The Disaster Management Policy was approved by Resolution 18/99, just after the creation of the INGC and it confers the legal framework and guidelines for disaster management at national level.</p> <p>This is the legal document for the management of disasters including prevention and mitigation of the destructive effects of disasters. It proposes a multi-sectoral and multidisciplinary approach, and the prevention of disasters through a proactive posture.</p>
The Forestry and Wildlife Law	<p>Law/resolution/decreed approved in 1999:</p> <p>This is meant to regulate the basic actions for the protection, conservation and sustainable use of forest resources.</p>
The National Strategy for Gender, Environment and Climate Change	<p>Law/resolution/decreed approved in June 2010:</p> <p>The strategy aims to guarantee equal access and control on natural resources, on climate changes adaptation and mitigation technologies, on development opportunities and benefits between man and woman and, girls and boys for sustainable use of natural resources to fight poverty.</p>
The National Program for Environmental Education, Communication and Dissemination (PECODA)	<p>Launched in 2009:</p> <p>The mission is to see made aware and sensitised the society on the major environmental problems such as uncontrolled burning, poor sanitation, soil erosion, slums, pollution, among others, through lectures, debates, environmental education programs in communities, schools and the media organs in order to contribute to adaptation to climate change and a proper management of natural resources towards sustainable development. The PECODA will influence the Mozambican society for a change of attitude in relation to the environment and climate change through a more participatory environmental management and sustainable.</p>
The Erosion and Uncontrolled Fires	Approved in 2007:

Sector	Instrument/Law
Prevention and Control Plan	This recognises that fires contribute for GHG emissions and to the reduction of sinks for such gases. With this plan Mozambique aims to reduce its direct emissions resulting from uncontrolled fires and soil degradation and therefore improve the conservation of forests, biomass and other terrestrial deterrent of greenhouse gases.
The National Water Policy Law and the Integrated Water Resources Management	Approved in 2007 Policies that recognise water as a vital resource that should be used in a rational and sustainable way. It emphasises the consideration of environmental impacts and conservation of water resources for future. The National Water Resources Management Strategy (ENGRH) approved in 2007, aimed at improving the implementation of the National Water Law. The ENGRH recognises that the country is vulnerable to the occurrence of extreme events such as floods and droughts and that such event will increase in frequency. It defines policies that help to mitigate and manage these events.
The Coastal Zone Integrated Management Strategy	Under development The Coastal Zone Integrated Management Strategy aims at developing actions directed to the protection of the coastal zone, promote inter sectorial coordination, integrate environmental issues into the development process and contribute progressively to poverty eradication. This strategy is being developed by MICOA using participatory approaches.
The National Action for the Fight against Drought & Desertification (PANCSO)	Passed in 2003 The causes of droughts and desertification can be natural or anthropogenic. Natural causes are climate-driven, like lower rainfall while the anthropogenic causes are caused by human influence, like excessive use of soil for agriculture, overgrazing and bush fires, fire wood gathering, among others. Droughts and desertification in Mozambique are a combination of results from low level of precipitation and overuse of agricultural lands. The PANCSO, a strategy being developed by INGC using participatory approaches with all stakeholders, states that the causes of drought and desertification are inter-linked with poverty conditions and population life expectancy. The PANCSO identified the districts prone to droughts and desertification and their main causes, proposing possible solutions and actions to be implemented to mitigate and prevent further degradation.

Source: IFPRI 2011

Table A.2.2 Roles played by Key Government Institutions related to climate change (adapted from IFPRI, 2011)

Ministry	Division / Institution /Working groups	Main Role of the Institution on climate change related issues	Main Stakeholders
MICOA	National Directorate of Environmental Management (DNGA)	Coordinating mandate for all environmental issues. Formulation of national policies on environmental management including climate change (NAPA).	Stakeholders of MICOA are in general, Ministries and Governmental bodies , International and National Organizations, NGOs implementing policies and programs, or funding activities and projects dealing with environment and climate change issues
	National Directorate For Environmental Promotion (DNPA)	Developing and implementing the Gender, Environment and Climate Change Strategy and implementing the Program for Environmental Education, Communication and Dissemination (PECODA)	
	Cooperation Directorate (DC)	Coordinating at national and international levels issues related with environmental conventions including UNFCCC and Second National Communication under the UNFCCC	
	National Directorate for Environmental Impact Assessment	Designated National Authority for Clean Development Mechanism under the Kyoto Protocol	
	NAPA Team	Improving coordination among institutions to strengthen the capacity to implement NAPA outlined objectives and priority programs	Specific stakeholders for NAPA Team: DNGA, DNSA, DNE, DSA, INGC, INAM, INAHINA, GTA, Red Cross Moçambique
INGC		Coordination of prevention and response for natural disasters. Formulation of policies and strategies for natural disaster management	MICOA, MINAG, MPD, INAM, UN humanitarian organisations, local governments, NGOs, media, etc
INAM		Monitoring of meteorological activities, particularly climatology, agro-meteorology, aeronautics, sea and air quality monitoring.	National government, public and private institutions and international networks and bodies.

MINAG	DNSA	Formulation of policies and strategies to mitigate the effects of climate change on agricultural productivity.	INAM, IIAM, MICOA, FEWS NET, SETSAN, WFP, FAO, INGC, local governments, NGOs
	Early Warning Systems	Provision of information on annual crop season, estimates of crop harvest yields, identification of pests and crop losses due to sanitary and climate factors, give up dates on meteorological data from agricultural research stations.	As with DNSA
	IIAM	Research on the main effects of climate change and extreme climate events (droughts and floods) on the production / productivity of crops, livestock and forests. Provide information on land use, means for mitigation of land degradation, sustainable use of natural resources (water, land, forests)	INAM, INGC, MICOA, FEWS NET, CGIARs,
	CENACARTA	Coordination of remote sensing activities in Mozambique and activities in the areas of geodesy, photogrammetry, cartography, aerial photography and political geography. After extreme weather events (floods) and wild fires, production of maps on changes in land use and land cover.	International networks, FAEF, INAM, IIAM, DNTF
MOPH	DNA	Coordination of the HYCOS network (Hydrological Cycle Observation System)	
MAE		Creating awareness at local level government organs to implement and follow up policies at district level	
MCT		Promotion of technology and innovation to make better use of natural resources and science based policy development and decision making.	MICOA, MOPH, INAG, ME, UEM, MIREM, IIAM, INAM, NGOs, International donor community, District governments

ME		Identifying alternative sources of renewable energies and promote their use	MICOA, MOPH, ME, MINAG, UEM, MIREM, INAM, MIC, international investors,
MPD		Responsible for government planning and project design at national and local levels. It is not working on climate change issues, but takes them into consideration.	Civil Society, Private sector, MICOA, MOPH, MINAG, ME, MIREM, IIAM, INAM, NGOs International donor community
Ministry of Tourism		This ministry promotes sustainable tourism development. It is not working on climate change issues, but takes them into consideration.	Various
UEM	Several faculties and three schools	Teaching, research and extension	Various

Constraints/barriers for the inclusion of climate change issues in institutional systems and capacity

For Government bodies in general: Lack of institutional coordination to respond to specific issues related to climate change; lack of clarity in relation to the definition of climate phenomena and climate change related issues/events; difficulties in generating, monitor, transfer, and interpreting information related to climate change at different levels, including at community level, and in managing information for the purposes of risk management; lack of funds for specific training in environmental and climate change issues; no legal mechanism to insert the instruments envisaged in the conventions in the national policies and sectoral plans of the institutions.

For UEM: Lack of funds for specific training in environmental and climate change issues; insufficient infrastructure.

Table A 2.3. Inter-Governmental, International and Non-Governmental Agencies with Disaster Risk Reduction Approach and Climate Change Related Programs (source: IFPRI 2011)

Institution / Organization	Main Role/mandate	Type of Activities	Stakeholders and main information systems
FEWS NET	Early warning activities (integrated activities that provide early warning of environmental, e.g. drought, and socio-economic hazards, and monitoring and assessment of current or future population's vulnerability to food insecurity.	FEWS NET Mozambique works with ARA-SUL for capacity building in floods monitoring, technical support to early warning systems of MINAG in monitoring and dissemination of information for the preparation of crop seasons, working with SETSAN to coordinate monitoring of food security and nutrition status of vulnerable population, support INGC in disaster mgt, provision of national maps on extreme events.	MINAG, INGC, SETSAN, national NGOs, international agencies of the UN, regional information systems networks for early warning.
RED CROSS	Has a Disaster Preparedness Program (DPP) to help communities in preventing and mitigating the effects of disaster and extreme climate events.	Evaluate and update the material and human resources across the country. Support national and local organizations in increase capacity and ability to work on issues related to preparedness and response to vulnerability	MINAG, MISAU, INGC

WFP	The world's largest humanitarian agency, has the mandate to protect and help food insecure communities, to fight against hunger and to gather and disseminate information about emerging vulnerability to natural disasters and extreme weather events.	Compile and collect data and assess available information on climate change, conduct vulnerability assessments, participate in capacity development and give technical support on food security analysis and risk management related to climate change. Promotes improved livelihoods and adaptation/mitigation of climate change effects through food and cash transfers for climate change impact for the vulnerable at a community level. Funding of local projects and studies.	MICOA, MINAG, INAM, FAO, INGC, UNHABITAT, UNEP, UNDP, UNIDO, DFID, among others and Government and Non- Governmental institutions at the province and district level. Information, services and tools: Vulnerability and analysis mapping unit (VAM); an emergency preparedness branch; GIS technology; Weather index-based insurance first used in Ethiopia and extensive regional and international network.
FAO		Is leading a ONE UN project on mainstreaming climate change in Mozambique, which aims in creating awareness, mainstream climate change in policy formulation and implement adaptation in a district level in the Southern Mozambique. Funding of local projects and studies	
UNDP		Provides technical assistance to government in strengthening coordination capacity of INGC, in strengthening the DNA capacity to develop and implement policies for water and environment management (e.g. support the implementation of the National Program for Environmental Management). Establishment of a fund to support local and community initiatives for reduction of disaster risks,	DNA, INGC, and a network of NGOs, national and local government institutions Provides geographical and population information on areas at risk for disasters.

World Vision; CARE International; Save the Children and Centro Terra Viva	Several local and international NGOs include climate change in their activity plans. However, activities tend to be on emergency aid and mitigation of the effects of climate change on rural community lives. While many of these organizations have the human and financial resources to support their projects, they still lack the specific capacity to target activities to adaptation and risk reduction to climate change and to extreme weather events. Lack of systematic information (available reports, newsletters, data bases, etc) brings additional difficulties to identify which organisations and what programs are implemented nationwide related to climate change and specific organizational capacity /resources and strategies exist.
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ANNEX 3. Agriculture related national strategy documents in Mozambique

(Source: Chilonda *et al.*, 2011)

Action Plan for Absolute Poverty Reduction (PARPA I) 2001–2005: This aimed to continue government efforts at socio-economic reconstruction in a more inter-sectoral strategic manner after the devastating war, which ended in October 1992. During PARPA I, agricultural performance was severely affected by floods in the southern and central regions in 2000–01, and by a severe drought in 2004–05.

Action Plan for Absolute Poverty Reduction (PARPA II) (2006–09): The rural development component of PARPA II outlined the government's approach for addressing agricultural development.

Agricultural Policy and Implementation Strategy (PAEI) 1995: This is the longest-standing strategy document for agriculture in Mozambique. It provides a political perspective on what the agriculture sector is, emphasises the socio-economic importance of agriculture and sets out the overall goals and priorities.

Green Revolution Strategy (ERV) 2007: The ERV was developed within MINAG and to provide a long-term overarching strategy for a green revolution in agriculture, which sets out the current government's vision for the future transformation of agriculture.

Action Plan for Food Production (PAPA) 2008-2011: In part to operationalise the GRS. Its preparation was fast-tracked due to the looming global food crisis at the time, accompanied by serious interest and prioritization from the government.

National Agricultural Development Programme (PROAGRI II) Memorandum of Understanding (2007): Although not a strategy as such, the PROAGRI II (Programa Nacional de Desenvolvimento Agrário) MoU outlines some important aspects (for example, prioritising MINAG core functions and local development projects) that are being developed through PARPA II.

PROAGRI II document, 2003-04: Was never officially approved and used for planning and decision- making. Some critics of PROAGRI I at that time argued that it was addressing mainly institutional- development issues rather than supporting production.

Agrarian Priorities Document (Documento de Prioridades), 2006: Based on a MINAG internal priority- setting exercise conducted in early 2006 with a focus on agricultural production.

Agrarian Intensification and Diversification Programme (PIDA); (Programa de Intensificação e Diversificação Agrária), 2006: Announced by MINAG in late 2006 as one of the highlights of its annual economic and social plan for 2007.

Fisheries Policy and Implementation Strategy (PPEI) (Política de Pescas e Estratégia de Implementação) 1999 was followed by the Plan for the Development of the Fisheries Sector (PDSP): Designed in 2002, the PDSP (Plano de Desenvolvimento do Sector das Pescas , 2002–06) envisages operationalising the PPEI.

Action Plan for Poverty Reduction, (Plano de Acção para Redução da Pobreza) (PARP), 2011: The third national poverty reduction strategy to be implemented until 2014.

Strategic Plan for the Development of the Agriculture Sector, Plano Estratégico de Desenvolvimento do Sector Agrário (PEDSA) 2011: This is the latest over-arching strategy document for the agriculture sector and has been under development since 2007.

Irrigation strategy, Estratégia de Irrigação (EI) 2010: To guide irrigation development for the next 10 years.

National Extension Programme, Programa Nacional de Extensão (PRONEA): Addresses the effectiveness of agricultural extension, particularly the public extension services.



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