STATUS OF AND RESPONSE TO CLIMATE CHANGE IN SOUTHERN AFRICA:

Case Studies in Malawi, Zambia and Zimbabwe

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ACRONYMS

CDM	Clean Development Mechanism
GEF	Global Environment Facility
GHG	Green House Gas
NAPA	National Adaptation Plan of Action
REDD+	Reduced Emissions from Deforestation and forest Degradation
UNFCCC	United Nations Framework Convention on Climate Change
WWF	World Wide Fund for Nature

EXECUTIVE SUMMARY

Southern Africa is experiencing more droughts and floods; reduced rainfall seasons; and rising temperatures. The weather extremes adversely affect economic sectors, landscapes and people. In addition, increased climate uncertainty has rendered traditional coping strategies inadequate and raised the need to infuse new science based knowledge. Unfortunately, some of the initiatives have been uncoordinated and lessons learnt from them not adequately documented and shared. The objective of this Study was therefore to review and document climate change experiences in Malawi, Zambia and Zimbabwe.

Key findings from the Study were that:

- It is difficult to accurately assess the impact of climate change on key sectors of national economies due to lack of reliable and up to date information;
- National frameworks on climate change are weak and technical competence on the subject is limited;
- Climate change adaptation projects have largely focused on conservation agriculture. The projects have stabilized and/or increased crop yields; and improved food security in some pilot areas. However, project results have not been critically analysed, documented and shared;
- Government and non-governmental organizations and the private sector have supported renewable energy projects over the years. Some of the initiatives folded up following the withdrawal of financial and technical support; and,
- The Reduced Emissions from Deforestation and forest Degradation (REDD+) mechanism offers an incentive for good natural resources stewardship. However, REDD+ is still a new mechanism for which Study countries have limited knowledge and experience.

Key recommendations drawn from the Study are the need for:

- Detailed studies on the impact of climate change on key sectors of national economies and on community level vulnerability and adaptation;
- National Climate Change Strategies that have the following elements: a clear vision and coordination mechanism; an enabling institutional mechanism; a capacity building frame work; and a clear national response strategy to international obligations under the United Nations Framework Convention on Climate Change;
- A thorough analysis, documentation and dissemination of conservation agriculture experiences; and the up-scaling of best practices at landscape level;
- Pilot testing of economically viable renewable energy solutions and facilitating their sustainable use through the engagement of all key stakeholders including the private sector; and,
- Preparing countries to implement the REDD+ mechanism. Key elements of the preparations include: quantifying forest carbon stocks in selected landscapes; assessing the country's readiness for REDD+; raising awareness at various stakeholder levels; and preparing government departments and other stakeholders to negotiate and implement pilot REDD+ projects.

INTRODUCTION

Preamble

Climate change refers to long term changes in average weather statistics (e.g. rainfall, temperature and wind) that differ significantly from previous averages. It manifests itself in extreme weather conditions such as droughts and floods caused by global warming or a rise in temperature due to Green House Gas (GHG) emissions. The emissions include carbon dioxide, methane and nitrous oxide and are caused by human activities such as combustion of fossil fuels, industrial processes and deforestation. Africa is responsible for only 3% of the GHG emissions in the atmosphere while North America and Western Europe account for 67% (Parkington, 2007). Table 1 shows GHG emissions for three countries in Southern Africa and the United Kingdom. Despite its very low emission levels, the African continent is most vulnerable to climate change impacts (UNDP, 2007). Reasons for this include:

- Inability to effectively adapt and mitigate against impacts of climate change due to financial, technical and human resource constraints;
- Limited understanding of the climate change phenomenon and its various facets; and,
- Inadequate national frameworks on climate change mitigation and adaptation.

Table 1: GHG inventory Tg CO2 equivalent by source (GHG emissions data for 1994)*

Country	Energy	Industrial Processes	Agriculture	Waste	Total Emissions
Malawi	3 718	58	3 204	90	7 070
Zambia	17 410	327	13 618	1 415	32 769
Zimbabwe	16 759	4 593	5 715	528	27 594
UK	575 620	48 450	51 500	24 150	699 720

**Land use change & forestry (LUCF) is not considered (Source: UNFCCC, 2003)*

Climate change models predict an increase in temperature across the Zambezi Basin of Southern Africa within the next 40 years. The region is expected to have a condensed summer rainfall season (albeit with little change in total rainfall). Furthermore, high impact flooding events are expected to occur more frequently. Increased climate uncertainty has rendered traditional coping strategies inadequate and raised the need to infuse new science based knowledge using participatory approaches. Unfortunately such efforts have been largely uncoordinated and lessons learnt from them not adequately documented and shared.

Objectives of the Study

The objective of the Study was to review and document climate change experiences in Malawi, Zambia and Zimbabwe with emphasis on available statistics; impacts on key economic sectors; and national frameworks and projects.

METHODOLOGY USED

National consultants were engaged to carry out desk studies in the three countries. Terms of Reference for the studies are given as Annex 1.

RESULTS

Study countries

Some key socio-economic statistics on the Study countries are given in Table 2. Over 65% of their citizens live in rural areas and depend on agriculture and natural resources for survival. Population growth rates range from 1.4% in Zimbabwe to 2.5% per annum in Malawi. A major challenge facing the region is how to increase agricultural output in order to adequately feed the growing population, over 40% of which lives on less than US$1 per day. Given the limited availability of suitable land, there is increasing pressure to convert marginal lands into agriculture. This has contributed to deforestation, land degradation and loss of biodiversity.

Fuel wood is the primary source of energy in the study countries and more than 80% of the round wood produced is used for this purpose. The situation is likely to continue given that wood is the most reliable, affordable and accessible energy source especially for poor households.

Table 2: Some key statistics on the study countries

Parameter	Malawi	Zambia	Zimbabwe
Land area, 000 sq km	118	753	390
Forest area, %	29.6	56.2	45.3
Deforestation rate, % per annum	2.2	2.1	1.4
Land under protected areas, %	11.2	30.4	15.0
Population, million	11.5	10.7	11.6
Annual population growth rate, %	2.5	2.3	1.4
Urbanization, %	15.0	35.0	33.6
Fuel wood consumption , 000 m3 per annum	6 131	8 773	7 897

Source: FAO, 2001; FAO, 2007; SADC, 2003.

Use of fuel wood contributes to deforestation

Climate change statistics

Available climate change information on Malawi, Zambia and Zimbabwe predicts a minor decline in total annual precipitation. Most rainfall models show that the countries will experience decreased dry season and increased wet season rainfall. They further indicate an increase in the proportion of rainfall that falls in heavy amounts within the annual average. This suggests an increased probability of floods. On the other hand, temperatures are expected to increase by up to 2.5 degrees per century (Box 1).

Box 1: Key climate change statistics on Malawi, Zambia and Zimbabwe

Malawi

Malawi's annual rainfall ranges from 700 to 2 400 mm and occurs between October and April. Total annual rainfall declined by 2.3% between 1960 and 2006. However, the magnitude is insignificant, implying no major annual rainfall variations in the country (McSweeney et al, 2008). On the other hand, temperature increased by 0.21 degrees per decade over the same period.

Zambia

The country's annual rainfall ranges between 800 and 1 200mm and is received between October and April. Mean annual rainfall has decreased by an average of 1.9 mm per month per decade since 1960. This is largely due to decreases in rainfall received in December, January and February. However, mean annual rainfall projections do not show large differences (McSweeney et al, 2008). The country's mean annual temperature has increased by an average of 0.29 degrees C per decade.

Zimbabwe

Zimbabwe's annual rainfall ranges from 450 to 1 800 mm per year and falls between October and April. The frequency of the country's annual rainfall variations has increased since the early 1980s, resulting in repeated droughts and floods. Average temperature has been increasing by 0.2 degrees C per decade.

Source: Chiotha, 2011; Shitima, 2011; Mika, 2011.

Study countries have been subjected to frequent episodes of floods and droughts over the past 10-20 years. Fig 1 depicts the situation in Malawi between 1970 and 2006. The country experienced shorter rainy seasons characterized by periods of intense falls and increased unpredictability of the start of the rainy season. In a documentary on perceptions of the rainfall situation, farmers lamented that "instead of late October or early November, parts of Malawi now receive planting rains in December or early January. Worse still the rains stop early and are inadequate thereby adversely affecting plant growth" (Action Aid, 2006). Farmers have responded to this by adjusting their cropping pattern: they now plant maize in December instead of November and grow shorter season crop varieties and drought tolerant crops such as the small grain cereals.

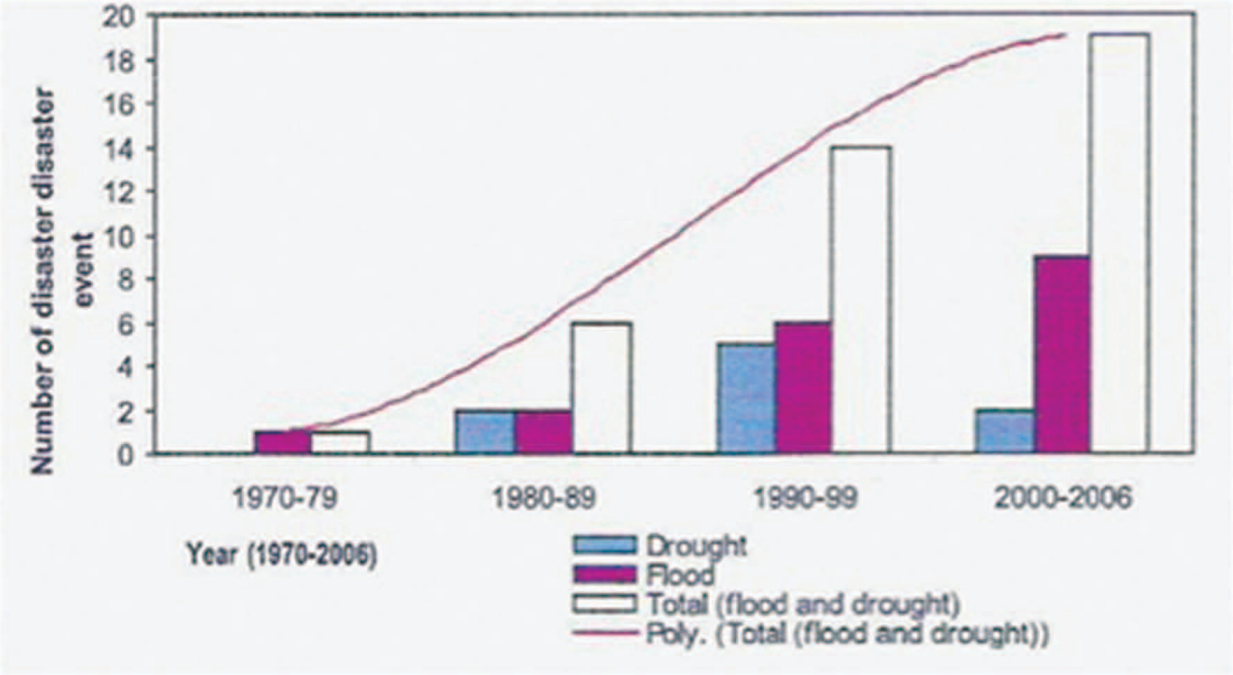

Fig 1: Frequency of droughts and floods in Malawi (Source: Chiotha, 2011)

Impacts of climate change

Weather extremes adversely affect sectors, landscapes, and people. This section highlights the impacts of climate change on agriculture, forestry and human health. The analysis is however constrained by the inadequacy of relevant and up to date information.

Agriculture

Agriculture is the backbone of national economies of Southern Africa. At least 65% of their citizens live in rural areas and rely on rain fed agriculture. Droughts and floods are among the major weather extremes that affect crop production. The 2004/5 drought reduced maize production to 37% of the total food requirement in Malawi (Jain, 2007). Predictions are that droughts could reduce rain fed crop yields by as much as 50% in certain parts of Zimbabwe. Reduced agricultural output worsens food insecurity and malnutrition.

Forests

Forests cover significant land areas of Malawi, 30%; Zambia, 56%; and Zimbabwe, 45% (FAO, 2001). They provide products and services such as industrial timber and timber products, fuel wood, non-timber forest products, habitat for wildlife and environmental services. The latter include the provision of clean water, climate regulation, soil and biodiversity conservation, watershed protection, carbon sequestration and nutrient recycling. With respect to carbon sequestration, the study countries' vast forest resources are significant sinks for carbon dioxide and thus have a role in alleviating and balancing GHG emissions.

Deforestation rates for Malawi, Zambia and Zimbabwe are 2.2%; 2.1 % and 1.4% respectively (FAO, 2001). Loss of trees reduces carbon sinks and contributes to GHG emissions. Climate change also depletes the forest resource base by affecting tree growth, composition and regeneration capacity. For example, it has been observed that drought and excessively high temperatures hamper the regeneration of miombo woodlands (GRZ, 2007) and can increase forest fire activity as demonstrated by simulations in temperate forests (Flanningan et al, 2000).

Woodlands provide habitat for wildlife

Human health

Increased frequencies of droughts and floods contribute to health problems such as malnutrition, malaria, cholera and diarrhoea. The latter two diseases are caused by the use of contaminated water supplies. Malaria cases increase during the rainy season when temperatures are high and bodies of stagnant water are abundant-conditions that favour mosquito breeding. For example, Zimbabwe had a very high incidence of malaria in 1996 due to heavy rains and high temperatures experienced in that year. Some 1.4 million clinical cases of malaria were recorded and an estimated 6 000 people were killed (GOZ, 1998). Conditions for malaria transmission are expected to improve further with climate change.

National frameworks on climate change

The need for greater resilience (flexibility of ecosystems and land use) to cope with and minimize the impacts of climate change in Southern Africa cannot be overemphasized. However, national institutional frameworks to achieve this have remained weak; and technical competencies, skills and awareness are limited at all levels. In addition, there is no coordinated strategy and institutional mechanism to guide and oversee the implementation of climate change initiatives. This partly explains why climate change has not been adequately factored into national development plans (UNDP, 2008). Among the adaptation frameworks pursued by Study countries are: the National Adaptation Plan of Action; the Clean Development Mechanism; and the National Climate Change Strategy as highlighted in this section.

National Adaptation Plan of Action

Study countries are signatories to the United Nations Framework Convention on Climate Change (UNFCCC) and have ratified the Kyoto Protocol. Under the Convention, Least Developed Countries are required to develop National Adaptation Plans of Action (NAPA). The latter identify and prioritize projects that require urgent and immediate action in each sector. However, most of the identified projects have not been implemented due to funding and coordination constraints. Box 2 highlights the status of NAPAs in Study countries.

Box 2: NAPA highlights in Study countries

Malawi
The country's NAPA was officially launched in 2006 to support the revised Malawi Growth and Development Strategy that prioritizes climate change as an environment and development issue. The NAPA identified adaptation and mitigation actions in eight priority sectors that include: agriculture, human health, energy, fisheries, water, forestry, wildlife and gender. Most of the adaptation actions focus on agriculture while those on mitigation are in the forestry and energy sectors.

Zambia
The country developed its NAPA in 2007 in sectors of agriculture and food security; water and energy; natural resources (wildlife and forestry); and human health. Ten project profiles were prioritized in agriculture, early warning, promotion of alternative livelihoods, the management of critical habitats and regeneration of natural forests. Only one agricultural project was funded from the list.

Zimbabwe
The country was not required to develop a NAPA as it does not fall under the Least Developed Countries category. Rather, it produced technology needs assessment and capacity needs self assessment reports.

Source: Shitima, 2011; Chiotha, 2011; Kuona, personal communication.

Clean Development Mechanism

The objective of the UNFCCC is to stabilize GHG emissions in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Under the Kyoto Protocol, Annex 1 (developed countries) committed themselves to reduce their GHG emissions to 5.2% below their 1990 levels. To make this operational, Article 12 of the Protocol established a Clean Development Mechanism (CDM) whereby Annex 1 countries can invest in projects in non Annex 1 (developing) countries to earn credits for their emissions (carbon/emissions trading).

As parties to the UNFCCC, study countries developed projects on reforestation and afforestation under the CDM. However, most of the projects have yet to be funded. In the case of Zambia, the project portfolio is at different levels of maturity with only one project on sustainable energy having been registered with the CDM Board. On the other hand, Zimbabwe identified 21 potential CDM projects in the energy, industry, agriculture and residential sectors. The projects could not be funded as the country had not ratified the Kyoto protocol. It only did so in May 2009. Malawi is still working on its CDM project portfolio.

National Climate Change Strategy

Zambia produced its draft National Climate Change Response Strategy in June 2010. The draft is being discussed with stakeholders. Its key elements are an institutional framework for coordinating and implementing climate change activities and an investment framework for mobilizing resources. The Strategy is viewed as a precursor to the formulation of a national policy/strategy on climate change. Malawi and Zimbabwe have yet to develop National Climate Change Strategies.

Climate change adaptation and mitigation projects

Study countries have implemented climate change adaptation and mitigation projects for some time. Areas covered by the projects include conservation agriculture, cleaner energy solutions and forest carbon trading and are highlighted in this section.

Conservation agriculture

Most pilot climate change adaption projects are in agriculture and employ participatory approaches that are rooted in local knowledge and coping strategies. This has empowered communities to make decisions on the choice and implementation modalities of technical interventions.

Malawi's Ministry of Agriculture and Food Security is promoting soil and water conservation techniques in Chitipa, a hilly district. Prior to the 1980s, inhabitants of the district practiced shifting cultivation, resulting in serious deforestation and land degradation. To arrest this, farmers were encouraged to construct storm water drains and marker ridges that were stabilized by vetiver grass that was planted on them. High and stable crop yields are being realized by the farmers.

The Government of Zambia, with support from various partners, has been implementing a five year conservation agriculture project targeting 120 000 farmers in 13 districts since 2007. The project has shown that conservation farming techniques increase crop yield and lower production costs in the long run (GRZ, 2010).

The Government of Zimbabwe, with support from various stakeholders, has piloted conservation agriculture projects with vulnerable communities in low rainfall areas. Among other innovations, the projects focus on water harvesting, irrigation, minimum tillage and the use of drought tolerant crops and crop varieties. The initiatives have improved crop performance and food security.

Conservation agriculture in Southern Zimbabwe

Cleaner energy solutions

Fuel wood accounts for over 70% of total energy use in Southern Africa. Over 60% of the citizens of Malawi, Zambia and Zimbabwe live in rural areas and rely on wood fuel for energy due to lack of readily available and affordable alternatives. Unfortunately, the inefficient burning of biomass is one of the major sources of GHG emissions. Furthermore, wood energy is a major cause of deforestation. There is therefore need for affordable renewable energy solutions such as bio-fuels, bio-gas, solar, wind and mini hydro power in order to reduce GHG emissions and deforestation. Government and non government organizations have been supporting renewable energy projects in the Study countries over the years. Some of the projects folded up following the withdrawal of financial and technical support-hence the need for more innovative approaches that recognize and improve upon previous efforts. Box 3 summarizes Zimbabwe's experience with a solar energy project.

Box 3: A GEF solar energy project in Zimbabwe

Zimbabwe implemented a Global Environment Facility (GEF) funded Solar energy project from 1994 to 1999 at a total cost of US$7 million. The objective of the project was to improve access of rural areas to electricity and to contribute to a reduction in GHG emissions. The project deployed photovoltaic lighting units/systems to rural households, businesses, institutions and small scale farms on a commercial basis. The units were meant to replace kerosene lamp, candle and biomass based lighting systems in the project areas. The project was implemented by the national power utility (Zimbabwe Electricity Supply Authority), private players/entrepreneurs and non-governmental organizations. Agribank established and managed a revolving fund for lending to end users of the units.

Over 12 000 solar home units were installed country wide compared to a targeted 9 000 units. The success was due to government support through a subsidized finance facility for end users of the units; and component warehousing and tax incentives that reduced the investment cost. The project ushered in a new era of local energy entrepreneurs who were involved in producing solar components, wholesaling, design and installation (including maintenance and repairs of units). More than 75% of the entrepreneurs went out of business on project termination.

Although the project targeted GHG emission reduction through reduced deforestation, it focused on electricity for lighting. Electricity constitutes a minute component of GHG emissions compared to bio-mass. Furthermore, solar home units were, by virtue of their technical size, unable to replace fuel wood, the main energy source and environmental concern in the project areas.

Source: Mika, 2011.

Jatropha: A potential bio-fuel feedstock in Southern Africa

Sustainable Forest Management - the REDD+ Mechanism

Forests play an important role in reducing global warming through carbon sequestration as they are significant sinks for carbon dioxide. However, they are under threat from factors such as population growth, poverty, agricultural expansion and continued reliance on wood fuel. This underscores the need to maintain as much forest cover as possible recognizing the economic activities that compete with forestry. Consequently, the inclusion of Reduced Emissions from Deforestation and forest Degradation (REDD+) onto activities eligible for carbon financing/trading is a positive development that recognizes that tropical forest destruction accounts for at least 20% of global carbon emissions. REDD+ creates economic value for carbon locked up in standing forests. Its key dimensions include forest conservation, sustainable forest management and enhancement of forest carbon stocks (Kowero, *et al,* 2011). Once operational, it will be an important incentive for rural communities, governments and other forest land owners to practice good natural resource stewardship and to reverse some of the economic drivers of deforestation. Consequently, the success of REDD+ will depend on forest law compliance and good governance. Capacities needed to effectively implement it include:

- Establishing national consensus on forest policy aims and implications;
- Being clear on the coverage and application of national forest laws;
- Building capacity for forest law enforcement;
- Establishing clear and equitable land tenure and use rights;
- Monitoring performance through national verification systems; and,
- Developing accountability at national and local levels.

Study countries have initiated preparatory work on the implementation of REDD+ (Box 4).

Box 4: Some preparatory work on REDD+ implementation

Southern Africa

The Miombo Eco-region Programme of the World Wide Fund for Nature (WWF) has supported the following REDD+ studies in region (WWF SARPO, 2009):

- An assessment of the amount of carbon stored in selected woodlands: Weighted above ground forest carbon stock estimates were 8.9 tons/ha in Kasungu-Malawi; 14.8 tons/ha in the Zambezi headwaters-Zambia; 9.8 tons/ha in Chimanimani-Zimbabwe; 31.5tons/ha in Marromeu-Mozambique; and 7.3 tons/ha in Kasane-Botswana. Despite being rough estimates, the figures generally fall within the 8-50 tons/ha range estimated for Africa's dry forests (Campbell, 1996); and,
- An assessment of the "readiness" of countries to carry out REDD+ projects. Aspects considered included: land tenure status of the forest area; arrangements for sharing benefits with local communities; and institutional capacities to establish baselines (viz. monitoring, reporting and verification). Study countries are deficient in some of these critical areas. Consequently, a considerable amount of work is required to enable them to effectively participate in REDD+.

Zambia

Zambia, along with the Democratic Republic of Congo and Tanzania, are among the first nine countries in the world to pilot the United Nations United Programme for Reducing Emissions from Deforestation and forest Degradation (UN-REDD). The objective of the Programme is to develop: a national strategy to reduce deforestation and forest degradation; a monitoring, reporting and verification framework; and a communication strategy. The country received US$4.49 million to carry out activities for the first three year phase of the programme.

Source: Shitima (2011); Chiota (2011); WWF SARPO, 2009

A REDD+ mechanism will offer incentives for good forest stewardship

RECOMMENDATIONS

Recommendations are made in the following areas: impact of climate change on key sectors; national frameworks on climate change; conservation agriculture; renewable energy solutions; and REDD+ pilot projects.

Impact of climate change on key sectors

It is difficult to accurately assess the impact of climate change on key sectors of the economy due to lack of reliable and up to date information. Detailed studies on the impact of climate change on the sectors; and on community level vulnerability and adaptation are therefore recommended.

National frameworks on climate change

National frameworks on climate change are weak and technical competence on the subject is limited. This poses the following challenges:

- Limited institutional capacity to coordinate the design and implementation of inter and intra sectoral initiatives on climate change; and,
- Inadequate documentation and limited sharing of climate change information and experiences.

The need for a National Climate Change Strategy can therefore not be over emphasized. Such a strategy should have the following elements:

- A clear vision and coordination mechanism for climate change work in the country;
- A capacity building strategy on climate change focusing on: advocacy; up-scaling adaptation and mitigation measures; and documentation and sharing of information on best practice;
- An inter-institutional structure (e.g. a National Forum on Climate Change) to coordinate and up-scale climate change work at different levels. Such a structure could capitalize on the strength of civil society organizations, including the private sector, in terms of outreach and advocacy skills; and,
- A coordinated national response strategy on fulfilling obligations of Parties to the UNFCCC. The latter include national communication reporting; participation at Conference of Parties meetings; and tapping into global funding mechanisms (e.g. the CDM and REDD+).

Conservation agriculture

A number of pilot projects on conservation agriculture are showing encouraging results. However the results have not been adequately analysed, documented and shared. The following recommendations are made:

a. Conservation agriculture initiatives should continue to embrace participatory approaches to ensure the incorporation of community experiences and aspirations (viz. livelihood centred responses to climate change);

b. The design of conservation agriculture projects should embrace the following components:
- A clear understanding of the agricultural production system of the target area/district;
- A community climate change vulnerability assessment by the target inhabitants;

- A technical vulnerability assessment of the agricultural production system. This is a function of the hazard exposure of the production system minus the community adaptive capacity (viz. socio-economic status and coping strategies). Hazard exposure relates to weather changes; and,
- The incorporation of new technical interventions that reduce the vulnerability of the agricultural production system; and,

c. Results of previous and current projects should be thoroughly analysed, documented and disseminated and best practices should be up-scaled;

Renewable energy solutions

The need to promote renewable energy solutions that reduce deforestation and GHG emissions; and improve the quality of life of Southern Africa's citizen's cannot be overemphasized. The following recommendations are made:

a. Pilot test economically viable renewable energy solutions by:

- Identifying potential renewable energy solutions and their technological needs and gadgets;
- Conducting economic viability assessments on potential renewable energy solutions and their technological requirements and recommending appropriate business models (market studies); and,
- Pilot testing economically viable renewable energy solutions.

b. Facilitate the sustainable use of renewable energy solutions by:

- Identifying and nurturing local entrepreneurs to source and service renewable energy solutions and technological needs and gadgets;
- Promoting research and development cooperation in renewable energy technologies among entrepreneurs and universities within and outside the region;
- Spurring the development of a domestic renewable energy equipment industry;
- Raising awareness and building the capacity of various stakeholders on renewable energy solutions; and,
- Documenting and sharing experiences on renewable energy solutions.

Solar power unit

REDD+ pilot projects

REDD+ is a relatively new mechanism whose success depends on good forest governance. Operational modalities for REDD+ are still under discussion and Study countries are preparing for its implementation. There is therefore need to:

- Quantify forest carbon stocks locked up in selected landscapes (both above and below ground) and assess their economic value. This provides information on the socio-economic development opportunities that come with REDD+;
- Carry out detailed assessments of the country's readiness to implement REDD+ with emphasis on: the land tenure status of the forest area; arrangements for sharing benefits with local communities; institutional capacities to establish baselines, to enforce the law and to implement projects; and the presence of emission reduction accounting capability (viz. monitoring, reporting and verification);
- Prepare governments and other key stakeholders for the development, negotiation, marketing, implementation and monitoring of forest carbon financing deals under REDD+; and,
- Design and implement pilot REDD+ projects. The projects could start in protected areas and their hinterland as such areas have some security of tenure and are involved in natural resource management programmes. REDD+ could provide an additional income source for the normally poorly resourced national parks and their neighbouring local communities. Given the trans-boundary nature of most national park areas, this provides opportunities for trans-boundary project development involving both wildlife and forests in a synergistic manner. Such an initiative could provide incentives for communities in neighbouring countries to work together through the creation of trans-boundary community forums whose functions could include: sharing experiences on sustainable natural resources management; identifying resources that should be jointly managed (e.g. joint hunting quota setting); and monitoring and reporting on illegal timber harvesting/trading and wildlife poaching.

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ANNEX 1: TERMS OF REFERENCE FOR THE STUDY

Introduction

Climate change refers to any long term change in weather over periods of time that range from decades to millions of years. Under the environmental helm, it manifests itself in extreme weather conditions such as droughts and floods caused by global warming or rise in temperatures due to Green House Gas (GHG) emissions. The emissions, that include carbon dioxide, methane and nitrous oxide, are caused by human activities such as combustion of fossils fuels, industrial processes and deforestation. Global warming impacts on genetic diversity, distribution of vector borne diseases (e.g. malaria, and foot and mouth), seasonal soil water availability to crops and livestock, human health, ecological adaptability of crops, ecosystem health and human livelihoods. Although Southern Africa is a net emission sink, it is likely to suffer the most from impacts of climate change as it is unable to effectively adapt due to resource constraints. Unfortunately, there is limited understanding of climate change issues by the region's citizens. Consequently, the phenomenon has not been adequately factored into national development plans.

Given the foregoing background, Southern Africa has adopted and/or plans to implement climate change adaptation and mitigation measures.

Objective

The overall objective of the Study is to review and document experiences on climate change adaptation and mitigation in Southern Africa and to identify pilot projects/studies on the subject with emphasis on Malawi, Zambia and Zimbabwe.

Terms of Reference

1. Define climate change. Give trends in climate change statistics for your study country in terms of rainfall amount, variability, season length and probabilities of droughts and floods.

2. What are the current and expected impacts of climate change in various sectors and landscapes of your study country (e.g. agriculture, forestry, industry/manufacturing, wetlands, protected areas and grasslands).

3. What is climate change adaptation and mitigation? Explain by giving examples.

4. Document and describe practices/projects being undertaken/or planned in your study country to adapt to or mitigate climate change impacts. Describe the indicative results from at least two of the practices/projects.

5. Recommend and describe at least two pilot climate change adaptation and/or mitigation projects/studies based on TOR 1-4 above.

WWF

Sida